Identification of alternative forms of specific learning disabilities.

Barbara Anne Murphy Smith

University of Massachusetts Amherst

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IDENTIFICATION OF ALTERNATIVE FORMS OF SPECIFIC LEARNING DISABILITIES

A Dissertation Presented by
Barbara A. M. Smith

Submitted to the Graduate School of the University of Massachusetts in partial fulfillment of the requirements for the degree of DOCTOR OF EDUCATION

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IDENTIFICATION OF ALTERNATIVE FORMS OF SPECIFIC LEARNING DISABILITIES

A Dissertation

by

Barbara A. M. Smith

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[Signatures]

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(May) 1976
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CHAPTER I
INTRODUCTION

The elementary schools of this country are faced with a continuing crisis. One out of four students, nation-wide, has significant reading deficiencies. In large school systems, up to one half of the students read below expectation.\(^1\) \textit{deHirsch} points out that, depending on the authority consulted, fifteen to thirty percent of the elementary school population has serious reading difficulties.\(^2\)

Many of the children who have reading deficiencies do not have observable, gross sensory, intellectual, emotional or neurological defects. These children are generally found in the normal elementary school track because of the absence of such gross defects. Special instructional aid should be provided for these children at the earliest possible level in their educational program. Failure to remediate these deficiencies tends to cause many in this group to exhibit hostility and become serious discipline problems in the succeeding school years. Most of these students ultimately drop out of school or graduate from high school as functional


illiterates. Quite possibly, this group of students contribute to many of the current social problems which exist in the secondary schools and beyond.¹

The evidence indicates that the remedial techniques used currently with the disabled reader group are not working effectively as the elementary schools are still populated with children who are failing to learn to read for no apparent reason. A new approach to solving the learning problems of this group is needed. Better tools are needed to diagnose the underlying cause or causes of the specific problems or combination of problems faced by each student in the disabled reader group. A qualified remedial teacher, equipped with information concerning the specific problems facing the child, would become much more effective in attacking these problems and reducing the number of children who, for no apparent reason, can not read at the appropriate level.

Statement of the Problem

The purpose of this paper is to solve the problem of identifying the underlying factors which are contributing to the learning failures of children who are disabled readers and who exhibit no gross sensory, intellectual, emotional, or neurological defects. These underlying factors will be identified through the

¹"Target for the '70's, The Right to Read," pp. 2-4.
development of a battery of tests that will systematically diagnose Specific Learning Disabilities.

Definition of Specific Learning Disabilities

For the purposes of this paper, Specific Learning Disabilities (SLD) will be defined as the failure of a child to master the basic skills presented on the elementary school level due to disturbances in one or more of the cognitive processes such as perception, memory, or concept formation. According to this definition, these disturbances are confined to specific combinations of cognitive processes. These combinations of cognitive processes may be assembled in a variety of patterns of failure peculiar to specific groups on the basis of age, sex, socio-economic class and IQ. The children in this category have average or above average intelligence and have been enrolled in classes where other students with similar background and IQ have learned to read at grade level. Furthermore, the SLD cases have no gross neurological, psychological or sensory defects.

Children who are failing in the classroom for no apparent reason should be subjected to an interdisciplinary

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set of examinations by qualified psychologists, medical doctors, and neurologists. The purpose of this examination is to screen out gross sensory, intellectual, emotional and neurological defects that may be contributing to the malfunction. When gross problems are diagnosed, they should be treated by the appropriate specialists as part of the special remedial programs developed for children with gross defects.

Once the group with gross defects has been screened out of the general population, there remains another group left in the population of disabled readers who are failing due to a number of secondary causes such as emotional, social, physical, and/or educational causes. The group with reading disabilities due to secondary causes can be separated from the SLD population by evaluating a child's basic cognitive processes. Proficiency in these areas indicates that the child is not a SLD case.

The group of disabled readers that remains, after the group with gross defects, and the group with secondary causes have been eliminated, consists of children who have Specific Learning Disabilities.¹

¹A child who has Specific Learning Disabilities usually exhibits some emotional disturbance. It is difficult, if not impossible, to determine whether the emotional problem is the cause or the result of the Specific Learning Disabilities. In any event, the child should be given remedial therapy for the Specific Learning Disabilities based on the results of the test
When the term "Specific" is used in conjunction with SLD in this thesis, it will refer to the specific patterns of errors exhibited by disabled readers in the various combinations of communication modalities and cognitive processes measured by the Specific Learning Disabilities Test Battery.\(^1\) The SLD Test Battery results will be plotted on a profile so that comparisons can be made with population norms to identify deficiencies in specific cognitive processes. The profile may also be useful for identifying patterns of errors in SLD cases which may be related not only to reading failure but also to independent variables such as sex, age, grade level, socio-economic class and IQ. An examination of the pattern or patterns of errors related to SLD cases will be discussed in Chapter Five.

Need for the Specific Learning Disabilities Test Battery

General inspection of test batteries, such as the Hampden County Battery, the Schiffmann Battery and the Cruickshank Battery,\(^2\) indicates that the available batteries battery to be developed in this thesis. In addition, a qualified psychologist should determine whether the child should also be treated for the related emotional problem.

\(^1\)The battery of tests to be developed in this thesis will be called the Specific Learning Disabilities Test Battery. Hereafter, the Specific Learning Disabilities Test Battery will be referred to as the SLD Test Battery.

\(^2\)See Appendix III for a description of these batteries.
do not directly approach the subject matter through the type of cross sectional grid system which will be developed in this paper. The objectives of the batteries have often been more limited and the methods of test selection apparently more informal. The portions of the batteries which measure cognitive processes are not detailed enough and the results are less significant, not only in terms of identifying the child with SLD, but also in pointing out the specific areas of weakness.

One of the most important objectives of the battery developed in this thesis is to identify specific areas where the learning function has broken down. Once these areas of weakness are identified, the remedial therapist will be able to organize an individual program for each child designed to concentrate remediation on those areas that are deficient. The test data will also identify areas of strength which the therapist can capitalize on when teaching the child with SLD.

**Development of the Thesis**

The following is a brief discussion of the topics that will be covered in subsequent chapters of this paper. Chapter Two will present a review of the research dealing with the relationship between cognitive process deficiencies and academic achievement in the elementary school. This review will help determine which tests of cognitive processes
should be included in the test battery. Chapter Three will deal with the development of the two dimensional grid system, the review of available tests of cognitive processes, and the subsequent incorporation of these tests into the grid system. The rationale for the selection of tests for the final test battery will be developed in Chapter Four. Chapter Five will deal with a primary research study designed to ascertain the effectiveness of the test battery for identifying the segment of the population with SLD. Chapter Five will also include a description of a profile developed for use with the battery. Chapter Six will deal with a reconstitution of the SLD Test Battery on the basis of statistical evidence presented in Chapter Five. Finally, the summary and conclusions will be given in Chapter Seven.
CHAPTER II

EXPLORATION OF THE RELATIONSHIP BETWEEN PROCESS DEFICIENCIES AND READING FAILURE

This chapter will present a review of the empirical studies that explore the relationship between process deficiencies, such as deficiencies in perception, memory and concept formation, and academic failure. The review of the literature is confined primarily to children attending elementary schools.¹

The studies reviewed in this chapter can be subdivided into two broad categories: Predictive studies involving research to determine whether process deficiencies as diagnosed by various measures can predict future academic success or failure, and concurrent studies involving research to determine whether process deficiencies are present in children who are currently failing academic subjects in elementary school. Most of the studies

¹Footnotes for the numerous studies cited in this chapter will be presented at the end of the chapter in order to facilitate the readability of the material.
selected sampled populations of non brain-injured children stratified on the basis of high and low achievers. Only a minority of studies dealt with brain-damaged subjects.

The validity of the studies presented in this paper varies in terms of thoroughness, quality, size of sample, and control of variables. Except for brief general statements, a detailed analysis of the study data is beyond the scope of this thesis. The following outline will be followed in subsequent sections to facilitate the review:

Section I Perception

A. Visual

1. Discrimination
2. Part-whole
3. Perceptual Constancy
4. Closure
5. Figure-ground
6. Left-right Orientation
7. General Perceptual Ability (Perception incorporating 1-6 above)
8. Brain Damage and Visual Perception
   a. Part-whole Visual Perception
   b. Figure-ground Perception
   c. Discrimination
   d. General Visual Perception
9. Summary of Visual Perception Research

B. Auditory

1. Discrimination
2. Closure
3. Brain Damage and Auditory Perception
4. Summary of Auditory Perception Research

C. Tactile

1. Discrimination
2. Figure-ground
3. Summary of Tactile Perception Research
D. Visual-Auditory

1. Auditory-Visual Integration
2. Visual-Auditory Integration

Section II Memory

A. Visual Short-Term

1. Memory for Designs
2. Visual Sequencing
3. Summary of Visual Short-Term Memory Research

B. Auditory Short-Term

1. Sequential Memory
2. Blending
3. Other
4. Summary of Auditory Short-Term Memory Research

C. Long-Term Memory

1. Auditory-Vocal Automatic
2. Naming Letters
3. Hearing Sounds and Words
4. Learning Tasks
5. Research on Brain Damage (Short vs. Long-Term Memory)
6. Summary of Long-Term Memory Research

Section III Concept Development

A. Predictive Studies

1. Vocabulary and Classification Skills
2. Higher Cognitive Functions
3. General
4. Studies That Tend To Deny Predictivity Of Concept Development

B. Concurrent Studies

1. Speech Factors
2. Vocabulary and Classification Skills
3. Higher Cognitive Functions
4. General Language Facility
5. Studies That Tend to Refute The Concurrent
Relationship Between Concept Development and School Achievement

C. Summary of Concept Development Research

Section IV General Summary Of The Review Of The Literature On Perception, Memory and Concept Formation

A. Perception

1. Visual
2. Auditory
3. Tactile
4. Auditory-Visual

B. Memory

C. Concept Formation

D. Conclusion

Section One
Perception

A. Visual

1. Visual Discrimination

The predictive group of studies involving visual perception will be discussed first. Study data which supported a significant relationship between first grade visual discrimination skill and future reading success in the primary grades, one through three, were presented by Alshan, Ashlock, deHirsch, Goins, Morency and Olson. The results of one study by Weiner pointed out a significant relationship between low first grade visual discrimination scores and poor fourth grade reading skill. Ashlock was the only researcher identified in the review of the literature.
who found no significant correlation between first grade
discrimination ability and third grade reading success.

Concurrent research data showing a significant
relationship between poor visual discrimination and low
achievement in reading were presented by Ayres, Davol, Fildes, Kass, Wechsler and Hagin, and Whipple and
Kodman. The ages of the subjects in these studies ranged
from five to ten years.

Concurrent research studies, showing no significant
differences between high and low achievers on visual
discrimination tasks were conducted by Ball and Owens, Malmquist, Ombredane, Bachmann and Santostefano, et al. The Ombredane and Santostefano studies involved
subjects over nine years of age.

In summary, the studies in the area of visual
discrimination point to a significant relationship between
poor visual discrimination and poor reading in the primary
grades. The study data also indicates that children who
exhibit poor visual perception in first grade tend to be
poor readers in the primary grades. It is difficult to
reach any conclusions about the relationship between poor
reading and poor visual discrimination in older children
since the research in that area is limited.

2. Visual Part-Whole Perception

A number of studies in this section involved the use
of such tests as the Bender Gestalt, Draw a Man, Kohs Block,
Winterhaven Perceptual Forms Test and other measures of part-whole perception. The studies reviewed in this section will be classified in terms of specific tests whenever a test has been used a sufficient number of times to warrant such individual classification. The studies will be broken down into age groups whenever possible.

Predictive studies supporting a relationship between high achievement on measures of part-whole perception and reading success in the primary grades will be discussed first. Koppitz, deHirsch and Smith and Keogh found that the Bender Gestalt Test was highly predictive of reading success in the primary grades. Coleman and deHirsch found similar information about the predictive validity of the Draw-a-Man Test. Barrett, using a form copying test, and Berry, using the Developmental Test of Visual Motor Integration, came to the conclusion that these tests were good predictors of reading success.

One study supporting the long term predictive validity of the Bender Gestalt Test was conducted by Keogh. She found that very high and very low kindergarten Bender scores were highly predictive of sixth grade reading achievement.

Study data showing no significant relationship between part-whole perceptual measures and future reading achievement were presented by Keogh and Somwaru. Keogh found that low first grade Bender scores were not highly predictive of low third grade reading achievement. Somwaru
followed a group of children for several years and found no relationship between kindergarten Draw-a-Man scores and reading success in later years.

Concurrent research studies identifying a significant relationship between reading problems and deficient part-whole perception in the primary grades were conducted by several investigators. Chang, Galifret-Granjon, Koppitz and Lachmann found significant correlations between the Bender Gestalt Test and reading proficiency in children six to eight years of age. Lowder and Kagerer reported similar results using the Winterhaven Perceptual Forms Test. Benger using the Spatial Relations Subtest from the Frostig Developmental Test of Visual Perception, Galifret-Granjon, using the Kohs Block Test, Manekin and Profile Tests from the Arthur Scale and Graubard and Wolf, using the Mazes Subtest from the Wechsler Intelligence Scale for Children (WISC), found that poor readers scored low on these measures.

Concurrent studies dealing with older children which pointed out a significant relationship between poor part-whole perception and poor reading ability were not as plentiful as studies dealing with primary grade children in this category. Most of the studies discussed in this category involved youngsters between the ages of nine and eleven. Galifret-Granjon and Lachmann found a significant relationship between poor Bender scores and poor
reading performance. Graubard and Wolf found that inadequate readers tended to perform poorly on the WISC Mazes. Gredler reported that low achievers in reading performed poorly on the Minnesota-Percepto Diagnostic Test.

Other concurrent studies, not broken down by age groups, which demonstrated a significant correlation between poor part-whole perception and poor reading performance will be discussed next. Crosby, deHirsch, and Clements and Peters, Lachmann and Fisher found a significant relationship between low Bender scores and poor reading achievement. Fabian, using the Winterhaven Perceptual Forms Test, Zangwill using the Kohs Block Test, and Fisher and Silver, using the Draw a Man Test, reported results similar to those of the Bender studies.

Concurrent studies involving primary grade children which supported no significant relationship between poor part-whole perception and poor reading will be the next topic under consideration. Chang and Connor found little correlation between Bender scores and reading achievement in the primary grades. Benger, Lyle and Singer and Brunk, using the Frostig V, WISC Block Design and an elastic design test, respectively, also reported that poor readers did not fail these measures any more frequently than good readers. Cohn, using a controlled experimental design, analyzed pre and post experimental scores, and
arrived at the conclusion that visual perception did not influence success or failure in reading.

Concurrent studies involving children above the primary grade level which demonstrated no relationship between poor part-whole perception and poor reading achievement will be the last topic of discussion in the area of visual perception. Koppitz\(^{105}\) and Lachmann\(^{107}\) found little relationship between Bender scores and reading achievement in fourth grade. Similar results were reported by Sutton,\(^{162}\) Lyle,\(^{112}\) Van De Riet et al.,\(^{167}\) and Kosiba\(^{109}\) who employed various measures of part-whole perception such as the WISC Design and the Winterhaven Perceptual Forms Test.

In conclusion, the research indicates that measures of part-whole perception are good predictors of future reading success in the primary grades. Due to the lack of research data in this area dealing with older children, it is impossible to reach any conclusions concerning the predictive validity of these measures when dealing with more mature groups.

The concurrent validity studies, on the other hand, involve both primary and intermediate grade youngsters. The majority of the studies favored a significant relationship between poor part-whole perception and inadequate reading skills.
3. Visual Perceptual Constancy

The literature in the area of perceptual constancy through the usual sources was exceedingly sparse. However, one study by Olson, indicated that the Frostig Constancy Subtest was not a substantial predictor of future reading achievement.

4. Visual Closure

All the research reviewed in this section involves concurrent studies. Some researchers have found a significant relationship between visual closure disabilities and reading disabilities. Galifret-Granjon and Goins found that young children with reading problems often had poor visual closure and Kass and Rochford and Williams identified closure disabilities in reading problem cases when dealing with both older and younger children.

Galifred-Granjon and Santostefano, et al., on the other hand, found no relation between reading problems and poor visual closure when studying older children.

Interestingly, two different researchers, McLeod and Wolf, found that poor readers scored significantly higher than successful readers on the WISC Picture Completion Subtest, but that they did not score higher than normal readers on any other WISC Subtests. These studies involved older children.
The limited study data reported in this section does not allow for significant generalizations concerning the relationship between visual closure and skill in reading.

5. Visual Figure-Ground Perception

Two predictive studies, by deHirsch and Olson indicated that first grade figure-ground perception tests did not accurately predict reading failure in the primary grades. There was no research identified in the usual sources which supported the predictive validity of figure-ground perception tests.

Several concurrent studies supported a significant relationship between poor figure-ground perception and poor reading achievement. Ayres and Benger studies primary grade children and found a high and positive correlation between reading and figure-ground perception. Ayres, Benger, Elkind, et al, Santostefano, et al, Silver and Hagin, and Stewart reported the same results with intermediate grade children.

In conclusion, concurrent studies provide a great deal of evidence to support a significant relationship between figure-ground perception deficiencies and reading disabilities.

Only two predictive studies in this area were identified in the review of the literature.

Although these studies indicated that first grade
figure-ground test scores were not good predictors of future reading success, more research is needed before any valid generalization can be made in this area.

6. Left-Right Orientation Involving the Position of the Body in Space

Hermann and Norrie,\textsuperscript{18} Benton and Kemball,\textsuperscript{19} Silver and Hagin,\textsuperscript{151} Cohn,\textsuperscript{37,38} Belmont and Birch,\textsuperscript{16} Dugas\textsuperscript{55} and Fildes\textsuperscript{66} reported concurrent study data supporting a significant relationship between poor left-right orientation and academic failure. Benton\textsuperscript{18} and Harris\textsuperscript{86} found this disorientation to be only slightly higher in poor readers than in the normal population.

The concurrent research data tends to indicate that a significant relationship exists between poor reading and other academic failures and left-right orientation confusion.

7. General Perceptual Ability

A number of investigations in the area of visual perception involved a general classification of perceptual ability not broken into components such as discrimination, closure, part-whole perception, constancy and right-left orientation. These general studies will be discussed below.

Predictive studies in this area, dealing with young children, which showed a significant relationship between
general perceptual ability and future reading success were presented by Bryan, Calvert, Frostig and Rosen.

A predictive study, dealing with older children which showed general visual perception to be a good predictor of future reading success was conducted by Somwaru.

Predictive studies supporting no significant relationship between general visual perception and future reading success in the primary grades were conducted by Ohnmacht, Wilson, Deputy and Olson. A predictive study, dealing with older children, which yielded no significant relationship between perceptual ability and future reading success was conducted by Ashlock.

In the concurrent research data, Ashlock, Justison, Lyle and Goyen, Marantz and Reed found that children in the primary grades with reading problems tended to exhibit general perceptual problems. Similar results were found with older children in research studies by Thurstone and Thurstone, Werner et al, Harootunian, Silver and Hagin, Doehring, Ellenhammer, Feldman and Frostig.

A concurrent study failing to support a significant correlation between general perceptual defects and reading failure in primary grade children was conducted by Trussell. Concurrent study data dealing with older children, which were presented by Belmont and Birch, Gates, and Satterly, indicated no significant correlation between general perception and reading achievement in this age.
In conclusion, the concurrent research data seemed to support a significant relationship between general perceptual defects and reading problems at both the primary and intermediate grade levels. The research data presented in the predictive area provided no conclusive evidence to show that general perceptual ability predicted future reading success.

8. Brain Damage and Visual Perception

A number of studies in the area of visual perception have involved children with cerebral palsy and other types of brain damage. Most of the studies that will be under consideration in this section provided no information concerning the degree of reading retardation or other types of academic retardation exhibited by these youngsters. It is very probable that academic retardation was present when the brain damage was diffuse. Research on brain damage will be presented throughout this paper for two reasons: 1) Even though the test battery has been developed for use with children with specific, and not general, learning disabilities, it is conceivable that such a battery could be used to identify areas of strength as well as areas of weakness in the brain damaged group in order to provide a more effective program for these youngsters; 2) Many experts in the field of learning disabilities, such as Cruickshank, and McCarthy
and McCarthy, stress that children with specific learning disabilities exhibit the same kind of process deficiencies as children diagnosed as being brain damaged. These experts conclude that these children could be suffering from minimal brain damage which is not easily detected through the usual neurological test battery, but which can be detected through the use of the appropriate tests of cognitive processes.

The review of the literature in this area will be classified by type of perceptual problem.

a. Part-whole visual perception. Some researchers found that brain-damaged subjects exhibited poor performance on the Bender Gestalt Test whereas normal subjects did not exhibit such tendencies. These researchers were Anglin, Hanvick, Koppitz and Pascal and Suttell. Wise found that a copying stick designs test differentiated between brain-damaged and non brain-damaged groups. Pascal's study also indicated that the Bender did not identify brain-injured subjects after nine years of age. No other studies were identified which supported Pascal's findings in the review of literature.

b. Figure-ground perception. Figure-ground perceptual deficiencies were found to be more prevalent in the brain-damaged group, as opposed to the normal group, by Cruickshank, Bice, Wallen and Lynch, Dolphin and
Cruickshank\textsuperscript{53} and Werner and Strauss.\textsuperscript{159}

c. \textbf{Visual discrimination}. Gaddes\textsuperscript{75} measured visual discrimination in brain-damaged and normal groups and found the brain-damaged group inferior in this area.

d. \textbf{General visual perception}. Two studies involving general visual perceptual skills were conducted by Frostig\textsuperscript{72} and Alexander and Money.\textsuperscript{1} The Frostig Developmental Tests of Visual Perception identified brain-damaged subjects. Alexander and Money found a defect of visual perception in children with Turner's Syndrome who did not have reading problems. There is a good chance that the disease did not effect the association areas of the brain, thus explaining the absence of any related reading problem.

In summary, the research in the area of brain damage points out that brain-damaged children do exhibit deficiencies in visual perception. The two areas most often mentioned in the research as being deficient in brain-damaged children are part-whole and figure-ground perception.

9. \textbf{General Summary of Visual Perception Research}

In general, concurrent studies indicate that both younger and older children with reading problems tend to exhibit deficiencies in part-whole perception, figure-ground perception, right-left orientation and in general visual perceptual skills. Visual discrimination problems
tend to be prevalent in the younger age group of disabled readers but are not apparent in older disabled reader groups.

The research in the areas of visual constancy and closure is sparse and, thus, no conclusions can be reached concerning the relationship between deficiencies in these functions and reading failure.

Concurrent research data in the brain damaged category indicated that brain damaged subjects showed deficiencies in part-whole perception and in figure-ground perception more often than non-brain damaged subjects.

In the predictive study category, the research data was less plentiful. In many instances there was an equal number of studies supporting and rejecting the predictive value of measures of visual perception. The only tentative conclusion that could be drawn from the study data presented above is that visual discrimination and part-whole perception tests tend to be good predictors of future reading achievement in the primary grades. More research is needed with older children in the area of predictive validity.

B. Auditory Perception

1. Auditory Discrimination

Most of the concurrent research data supported a significant relationship between poor auditory discrimination and poor reading. Studies dealing with younger children,
ages six to eight years, which yielded a positive relationship between poor reading and poor auditory discrimination were conducted by Benger,¹⁷ Christine and Christine,³⁴ Deutsch,⁵¹ Harrington and Durrell,⁸⁵ McLeod,¹⁷⁰ Monroe,¹²⁰ Morency¹²² and Wepman.¹⁷³ Studies dealing with older children, ages nine to fifteen, which also supported a positive relationship between reading and auditory discrimination were conducted by deHirsch,⁴⁹ Deutsch,⁵¹ Goetzinger et al,⁷⁸ and Wolf.¹⁸⁵ Other studies, not broken into specific age groups, which revealed a significant relationship between these two factors were executed by Dykstra,⁵⁷ Katz and Deutsch,¹⁰¹ Orton,⁷⁷ and Sonenberg and Glass.¹⁵⁶

Bryan²⁹ conducted the only concurrent study identified in this review of the literature which failed to support a significant relationship between poor reading and poor auditory discrimination.

No predictive studies were identified which negated the effectiveness of measures of auditory discrimination as being good predictors of future reading success. Studies supporting the predictive validity of measures of auditory discrimination in the primary grades were conducted by deHirsch,⁴¹ Dykstra,⁵⁷ and Thompson.¹⁶³ Somwaru¹⁵⁵ followed youngsters past the primary grades and found that tests of auditory discrimination administered in kindergarten predicted the success of the same youngsters several years later. Somwaru's study was the only one, identified in the
review of the literature, which followed the subjects for such an extended length of time.

2. Auditory Closure

One study, identified in the literature, which indicated that poor readers tended to have poor auditory closure was executed by Golden. Golden used second grade subjects in his study.

3. Research on Brain Damage and Auditory Perception

Boydston, et al found that subjects, ranging in ages from six to twelve years, who were diagnosed as being minimally brain damaged, exhibited poor auditory perception whereas normal subjects in the same age range did not exhibit such a dysfunction in auditory discrimination. Sabatino studied children between the ages of six and twelve who had brain damage and compared them with normal subjects with no identifiable brain damage. He found that the brain-damaged group exhibited significantly poorer performance on an auditory discrimination task, executed with and without background noise, than did the normal, control group.

4. General Summary of Auditory Perception Research

The concurrent research reported in this section unquestionably indicates that a significant number of children who have reading problems also have poor auditory discrimination. Research on brain damage, although limited
in terms of the number of studies presented, suggests that subjects who have brain damage, minimal or severe, also exhibit poor auditory perception. The predictive studies, also limited in terms of number presented, suggest that auditory discrimination tests are good predictors of reading achievement in the primary grades. More research is needed to determine the effectiveness of auditory discrimination tests as predictors of reading success in the intermediate grades.

C. Tactile Perception

The research in this area was limited. Some studies dealt with tactile-visual modalities whereas others dealt with tactile-kinesthetic modalities. All the studies were of the concurrent type and thus no breakdown by study type was necessary. The studies will be discussed below under the type of process involved in the execution of study tasks.

1. Tactile Discrimination

Studies conducted by Ayres, Birch and Belmont showed a significant relationship between poor tactile discrimination and poor reading ability. Ayres' study involved the tactile-kinesthetic modality whereas Birch and Belmont's study involved both the tactile-visual and tactile-kinesthetic modalities. Ford, on the other hand, found an insignificant correlation between tactile-visual integration and reading scores.
Studies by Wilson\textsuperscript{181} and Reiten\textsuperscript{137} dealing with brain-damaged subjects, pointed out that brain-damaged subjects scored significantly lower on tasks involving tactile-kinesthetic discrimination than did non brain-damaged subjects. The Reitan research dealt with brain-damaged adults whereas the Wilson research dealt with brain-damaged children. Conners\textsuperscript{41} and Cruickshank\textsuperscript{46} found that brain-damaged childrens' performance, was significantly poorer than non-brain damaged childrens' performance when transmitting information from touch to vision.

2. Figure-ground Tactile Perception

One study by Cruickshank, Bice and Walen\textsuperscript{46} dealt with cerebral palsied youngsters. These researchers found that the cerebral palsied youngsters had significantly lower scores on tasks requiring the differentiation of figure from the background when the background was confused.

3. Summary of Tactile Perception Research

Although the amount of research data is limited, the five studies in the area of brain damage indicate that there is a correlation between brain damage and poor tactile perception.

In the reading disability research, on the other hand, only two studies supported a significant relationship between poor tactile perception and poor reading ability. Therefore, it is impossible to draw any sensible conclusions based
on the limited data.

D. Visual-Auditory Perception

The studies in this area are concurrent in nature and deal with all age ranges.

1. Auditory-Visual Integration

Most of the studies of auditory-visual integration deal with translation from auditory stimuli, like beeps, to visual stimuli, like dots. Berry, Birch and Belmont, Flower, Kahn and al., Muehl, and Sterritt and Rudnick reported research data which supports a significant relationship between auditory-visual integration and reading ability. Kahn found a significant relationship between this function and word knowledge.

Studies in auditory-visual integration, failing to indicate a significant relationship between this function and reading success, were conducted by Birch and Belmont, Bruininks, Ford, Sterritt and Rudnick, and Sterritt, Martin and Rudnick. It should be noted that the Birch and Belmont study concerned older children and that, when they studied younger children, as noted above, a correlation was found between this function and reading skill. The other studies dealt with all age levels.

2. Visual-Auditory Integration

Berry, Katz, Muehl, and Sterritt, Martin and
Rudnick, found significant relationships between visual-auditory integration and reading ability. However, Sterritt, Martin and Rudnick only found this relationship when the transition occurred from visual-temporal to auditory-temporal data and not when the transition was from visual-spatial to auditory-temporal data or from auditory to visual data.


One can tentatively conclude, on the basis of the study data, that auditory-visual and visual-auditory integration are significantly related to reading achievement.

Section Two
Memory

A. Visual Short-Term Memory

The studies reviewed for this section employed memory for designs tests or visual sequencing tests as measures of visual short term memory. The studies will be presented under these two test classifications. There will be no classification by age as the studies in each section represent both primary and intermediate grade levels.

1. Memory for Designs Tests

The group of concurrent studies employing memory for designs tests which pointed out a significant correlation between poor test performance and poor reading performance
were conducted by Bronner,\textsuperscript{18} Golden,\textsuperscript{80} Lyle, Shankweiler,\textsuperscript{147} and Trieschmann.\textsuperscript{165} On the other hand, Sutton\textsuperscript{162} and Winer et al.\textsuperscript{182} failed to find a significant relationship between poor reading and poor visual short term memory.

One predictive study by Weiner\textsuperscript{171} indicated that a memory for designs test administered in first grade did not predict fourth grade reading success or failure.

2. Visual Sequencing Tests

The visual sequencing studies can be subdivided into those involving linguistic symbols and those involving designs.

When the subject matter involved linguistic symbols, such as nonsense words, all the research, reviewed, supported a significant relationship between visual sequential memory and reading proficiency. The researchers were Bakker,\textsuperscript{9} Kolers,\textsuperscript{104} Lyle and Goyen,\textsuperscript{114} McLeod,\textsuperscript{118} Rosenberger,\textsuperscript{142} Golden\textsuperscript{80} and Alwitt.\textsuperscript{4}

When the subject matter involved designs, the research data were equivocal. Bateman,\textsuperscript{13} Graubard,\textsuperscript{81} Kass\textsuperscript{97,98} and Kolers\textsuperscript{104} presented research data to support a significant correlation between the low Illinois Test of Psycholinguistic Abilities (ITPA) Visual Sequencing Subtest scores and poor reading performance. However, Sutton\textsuperscript{162} and Golden\textsuperscript{80} found no significant relationship between low ITPA Visual Sequencing Subtest scores and low reading performance.
3. Summary of Visual Short Term Memory Research

The concurrent research generally supported a significant correlation between poor visual memory and poor reading ability for both primary and intermediate grade children.

B. Auditory Short Term Memory

The studies in this area have been subdivided into studies dealing with auditory sequential memory span, involving the repetition of series of letters or numbers; auditory blending studies, dealing with the synthesis of words pronounced in parts by the examiner; and studies which used various measures not falling into categories one or two above. The studies, collectively, dealt with a wide range of age levels within each classification system, thus, negating the need to break down the studies by age groups.

1. Auditory Sequential Memory Span Tests

Bateman,13 deHirsch,49 Ellehammer,60 Golden,80 McLeod,118 Wolf,185 Johnson92 and Reynolds138 all conducted concurrent studies which showed a significant relationship between poor auditory sequential memory span and poor reading ability. There were no studies refuting the findings of these researchers.

A predictive study was conducted by deHirsch49 who found that imitation of tapped out patterns was significantly related to future reading success at end of second grade. However, deHirsch found that auditory memory span for three
of four nonsense words was not significantly related to second grade reading success.

2. Auditory Blending

Concurrent research by Chall et al., Bateman, Golden, Kass, and Wolf indicated that a significant correlation existed between poor auditory blending skill and poor reading. Flower and Braubard produced study data which showed no significant correlation between these factors.

Alshan found that first grade blending scores were highly predictive of reading success at the end of the first year in school.

3. Studies Not Falling into Categories One or Two Above

Bronner, Cabrini, Sandstedt, Shepard, and McLeod found significant relationships between various measures of auditory memory and reading achievement. These were concurrent studies. No concurrent studies with negative results were identified in this review of the literature.

One predictive study by Morency indicated that measures of auditory memory devised by the author, administered in first grade, predicted reading achievement in third grade.

4. Summary of Auditory Short Term Memory Research

The majority of the concurrent studies in this section supported a significant relationship between poor reading and poor auditory short term memory.
The limited number of predictive studies presented in this section showed that short term memory tests administered in first grade do tend to predict reading achievement in the primary grades.

C. Long Term Memory

The studies in this section will be broken down into subtopics by type of learning task involved in the studies. Age classifications will be presented only when there is a high concentration of research studies dealing with either the primary or intermediate grade levels.

1. Auditory-Vocal Automatic

Graubard, Bateman and Kass found that children with reading problems exhibited poor recall of automatic speech patterns. Sabatino was the only researcher, identified in the review of the literature, who found a low correlation between these two factors. No predictive studies have been identified in this area.

2. Naming Letters

Durrell, Monroe, Silvaroli, and Alshan found that the ability to name letters in the beginning of first grade was a good predictor of the end of first grade reading success. One concurrent study by Sutton supported a correlation between poor letter naming ability and poor reading at the second grade level.
3. Hearing Sounds in Words

Alshan and Olson found that the ability to recall letter sounds is a good predictor of future reading success at first and second grade levels, respectively. Concurrent research data by Sutton pointed out a significant correlation between reading success and recall of letter sounds in second grade children.

4. Learning Tasks

The studies in this category deal with tasks designed to test the subject's ability to learn words and to associate symbols with responses as in the WISC Coding Subtest. Olson, Gavel and Nicholson found that proficiency on learning tasks was highly predictive of reading success in the primary grades.

Morgan, Shakweiler, Altus, et al., Kallos, et al., Whipple and Roberts executed concurrent studies in this area which showed a correlation between reading failure and poor performance on specific learning tasks.

5. Research on Brain Damage and Memory

Researchers who found that brain-damaged subjects scored significantly lower than normal controls on tasks of short term memory are Anglin, Aten, Sabatino and Forrest. Hutt on the other hand, found that brain-damaged subjects had difficulty with long term memory and habituation and not with short term memory.
6. Summary of Long Term Memory Research

The predictive research indicates that letter naming, sound identification and certain learning tasks are predictive of reading success in the first and second grades.

The concurrent studies suggest that the areas of automatic speech patterns and specific learning tasks are significantly correlated with reading achievement at all age levels.

Although the research data presented here are limited, there is a strong indication, based on these studies, that brain damaged subjects perform poorly on short term memory tasks. It would seem to follow logically that brain-damaged subjects would also perform poorly on long term memory tasks but more research must be presented before any such conclusions can be reached.

Section Three
Concept Development

Studies in the area of concept development and its relationship to academic success are subdivided into predictive and concurrent study categories. Most of the studies involve language functions such as listening, comprehension, ability to tell a story, vocabulary proficiency, syntactic competence, analogies and speech development. Only a few studies deal with the classification of items into categories.

Studies concerning language functioning will be
included in this section because many experts in the area of cognitive development espouse the theory that a strong relationship exists between language development and the development of higher thought processes such as conceptualization and inductive and deductive reasoning. Piaget\textsuperscript{74} indicates that "it is quite possible that language is a necessary condition for the achievement of logical structures. But this does not by itself make a sufficient condition of logical formation . . . ." Bruner\textsuperscript{28} states that "language is a necessary mediator for higher level thinking . . . ." Bannatyne\textsuperscript{11} asserts that "although language is not thinking, it is a symbolic medium for facilitating, expressing or communicating thought."

Although the final test battery will not include measures to evaluate cognitive processes beyond the level of concept development due to time limitations, studies involving thought beyond the perceptual level will be included in this section.

The studies will be broken down and discussed by type of study (concurrent or predictive) and by the language function being studied.

A. Predictive Studies

1. Vocabulary and Classification Skills

Johansson\textsuperscript{91} found that a synonym and antonym test given in grade two was highly predictive of reading success
or failure in fourth grade. deHirsch⁴⁹ used a Categories Test and found a low but significant correlation between first grade performance on this measure and second grade reading achievement.

2. Higher Cognitive Functions
deHirsch⁴⁹ and Weiner¹⁷⁰ found that story telling ability was highly predictive of reading success in the primary grades.

3. General
Alshan² found general language proficiency to be a good predictor of reading success in first grade.

4. Studies That Tended to Deny the Predictivity of Concept Development

Studies rejecting the predictive value of certain language functions in relationship to future reading success were conducted by Benger¹⁷ and deHirsch.⁴⁹ Both researchers found that Peabody Picture Vocabulary Test scores were not significantly related to future reading success. deHirsch also found that oral comprehension, naming pictures, sentence elaboration skills and definitional skills were not significantly related to future reading success.

B. Concurrent Studies

A wealth of concurrent studies are available to support a significant relationship between language skills and reading
achievement. Collectively, the studies involve children in
the seven to fourteen year old age range.

The favorable concurrent studies will be classified
by type of language function in the review of the literature
presented below.

1. Speech Factors

Several researchers have reported a significant
correlation between speech factors and reading achievement.
Eisenson\(^7\) and Ingraham\(^7\) found that poor readers often
exhibited articulatory speech defects, whereas, Saunders\(^7\)
Shire\(^49\) and Strickland\(^160\) found that poor readers were weak
in the area of grammatic construction. Shire\(^49\) and Strickland\(^49\)
also pointed out that poor readers displayed an inability to
use complex sentences.

2. Vocabulary and Classification Skills

A second group of studies in the favorable, concurrent
category deal with vocabulary and classification skills.
deHirsch,\(^49\) McLeod,\(^119\) Morgan,\(^123\) Wood,\(^186\) Sabatino,\(^144\)
Saunders,\(^77\) Winter,\(^183\) Wolf\(^185\) and Zeddler\(^187\) reported study
data which revealed a significant correlation between
vocabulary skill and reading achievement. Graubard,\(^81\) Kass,\(^97\)
Rabinovitch,\(^132\) and Braun\(^26\) reported significant correlations
between classification ability and reading success. Blank
and Bridger\(^24\) and Wieder\(^179\) found that disabled readers
have difficulty assigning verbal labels to describe perceptual
data.

3. Higher Cognitive Functions

The third group of studies in the favorable concurrent category deal with higher cognitive functions, such as the ability to sense relationships between concepts and reasoning. Brown, 27 Elsenson, 77 Erhard, 61 Ingraham, 77 Lundsteen 110, 111 and Winter 183 found a significant relationship between the auditory receptive comprehension function and reading achievement. deHirsch, 49 Grautard 81 and Kahn 95 found that poor readers tended to have poor expressive ability. Lundsteen 111 found a relationship between adequate abstract and concrete thought processes and reading proficiency in a study of sixth grade students.

4. General Language Category

The last group of studies in the favorable concurrent category deal with general language ability rather than with specific components of language such as those that were discussed above. Belmont, and Birch 15 Reed, 135 Holroyd 88 McLeod, 119 and Warrington 168 presented research data to show a significant relationship between general language ability and reading success.

5. Studies That Tended to Refute the Relationship Between Concept Development and School Achievement

Three concurrent studies revealed no significant
relationship between reading achievement and higher thought processes. Kass found that most of the higher level process tests on the ITPA did not identify disabled readers in the seven to ten year old age group. Reed studied first graders who were experiencing difficulty in learning to read and found that they showed poor performance on the WISC Performance rather than on WISC Verbal Scale. Wolf found that the WISC Verbal Subtests, other than the Vocabulary Test, did not differentiate between high and low achievers in reading in third and fourth grades.

C. Summary of Concept Development Research

In the area of predictive studies, tasks such as story telling, vocabulary and categorization skills, and listening comprehension were found to be good predictors of reading success in primary grades.

Concurrent studies, dealing with measures of various language functions, indicated that a significant correlation exists between concept formation and reading achievement for children ranging in ages from seven to fourteen years.

Section Four

General Summary of the Review of the Literature on Perception, Memory and Concept Formation

A. Perception

1. Visual Perception

Concurrent studies in the area of visual perception
indicate that children in both the primary and intermediate grades who are poor readers tend to have deficiencies in part-whole, figure-ground and in general visual perceptual skills. Poor visual discrimination was correlated with reading failure at the primary grade level only. The study results suggest a need for the inclusion of higher level measures of visual perception in a battery of tests designed to identify Specific Learning Disability. This need is the result of the fact that perceptual deficiencies in older subjects are apparently more efficiently identified through the use of more sophisticated, higher level, part-whole perception and figure-ground tests.

The brain damage concurrent research in visual perception also points out a deficiency in part-whole and figure-ground visual perception in brain damaged subjects. Non-brain damaged control groups did not exhibit such deficiencies. It should be noted that both studies dealing with disabled readers and studies dealing with brain damaged subjects tended to identify parallel defects in figure-ground and part-whole visual perception. As indicated earlier, on page 29 of this chapter, it is this type of parallel data that led many in the field of learning disabilities to conclude that children with serious reading problems have minimal brain damage which can be identified through the administration of tests of cognitive processes, including tests of visual perception.
The predictive studies in the area of visual perception dealt mainly with primary grade subjects. The conclusions, based on the study data, are that part-whole visual perception and visual discrimination tasks predict reading achievement in the primary grades.

2. Auditory Perception

Concurrent studies, presented in this section, indicate that poor readers in both the primary and intermediate grades tend to exhibit poor auditory discrimination.

Although the number of studies dealing with brain-damaged subjects presented in this chapter were limited, there is some indication that brain-damaged subjects tend to have poor auditory discrimination.

The results of the limited number of studies dealing with prediction suggest that auditory discrimination tests are good predictors in the primary grades.

It should be noted that there appears to be a sparsity of research involving higher level auditory, perceptual skills such as closure and figure-ground perception. However, the research studies, presented in this section, point out the necessity of including measures of auditory discrimination in a SLD test battery.

3. Tactile Discrimination

A tentative conclusion, based on limited research
data, is that tactile discrimination tends to be related to a brain-damage syndrome. However, very little research was identified to support a relationship between poor tactile discrimination and poor reading ability. Measures of this function should be included in the final battery until evidence is available to indicate that there is no significant correlation between reading and tactual perception. The time spent in evaluating tactual perception should be held to a minimum until the relationship is more strongly established.

4. Auditory-Visual Perception

The concurrent research in this area presents data to support a significant relationship between poor auditory-visual and visual-auditory integration and poor reading achievement. The research indicates that measures of these functions should be included in a SLD test battery.

B. Memory

Concurrent research in the areas of long and short term memory indicates that there is a correlation between poor memory and poor reading. The number of predictive studies in this area is limited. There is some indication that long term memory tasks, such as letter naming, sound identification and learning tasks are good predictors of reading achievement in the primary grades. No predictive
research was identified which dealt with intermediate grade children. There was not enough data available to draw any conclusion about the predictive validity of measures of short term memory.

The brain-damaged subjects studied tended to perform poorly on measures of short term memory. As suggested earlier, one would expect that brain-damaged subjects would also perform poorly on long term memory tasks but more research data must be made available in this area before any conclusions can be reached.

The research indicates that measures of various memory functions should be included in a SLD test battery.

C. Concept Formation

The predictive studies in this area dealt with primary grade subjects. Most of the studies show that various measures of concept development tend to predict reading success in the primary grades.

A number of concurrent studies indicate that there is a significant correlation between reading failure and poor concept development for both the primary and intermediate grade levels.

These studies point to a need for diagnostic evaluation of concept development as part of a Specific Learning Disabilities test pattern.
D. Conclusion

The review of the literature points to a significant correlative relationship between deficiencies in cognitive processes and poor reading ability. Measures of each of these processes should be included in a SLD test battery designed to identify perceptual, memory and conceptual process deficiencies.

In most of the areas there is considerable evidence to indicate that deficiencies in cognitive processes are significantly correlated with reading failure. In a few areas, such as tactile discrimination and visual constancy, the correlations with reading are not significant or the research evidence is sparse. Tests of these functions will be included in the SLD Test Battery because one of the chief purposes of the battery is to identify specific areas of weakness that might yield to remediation. If the test of a specific process is excluded prior to the development of hard data that indicates that there is no relationship between failure in that process and reading failure, then, by exclusion, the diagnostician might fail to identify the area that requires remediation.
Footnotes for Chapter Two


5. Anglin, Raymond; Pullen, Maxwell; and Games, Paul. "Comparison of Two Tests of Brain Dysfunction." Perceptual and Motor Skills, XX (1965), 977-980.


37. Cohn, R. "Delayed Acquisition of Reading and Writing Abilities in Children: A Neurological Study." Archives of Neurology, IV (1961), 153-164.


53. Dolphin, J. E., and Cruickshank, William M. "The Figure Background Relationship in Children with Cerebral Palsy," Journal of Clinical Psychology, VII (1951), 228-231.


149. Silvaroli, Nicholas J. "Intellectual and Emotional Factors as Predictors of Children's Success in First Grade Reading." Paper presented at 10th Annual Convention of the International Reading Association, Detroit, Michigan, May, 1965.


179. Wieder, Serena. "Conceptual Deficiencies in Handling Temporal Patterns in First Grade Readers." Graduate Research in Educational Related Disciplines, 3(2) (1967), 89-175.


CHAPTER III

EXAMINATION AND CLASSIFICATION OF ALTERNATIVE TESTS
BY COGNITIVE PROCESS AND MODES OF COMMUNICATION

Chapter Three will be subdivided into two sections. Section one will deal with the development of a two dimensional grid system which cross-correlates cognitive processes and channels of communication. Section two will deal with the placement of tests, reviewed in the thesis, into the appropriate sections of the two dimensional grid system.

Development of the Two Dimensional Grid System

The two dimensional grid system which will be developed in this section of Chapter Three, provides a systematic framework for delineating all the possible process-modality combinations which should be evaluated when diagnosing alternative types of Specific Learning Disabilities.

The grid system, as presented in Grid A, is laid out within the framework of a two dimensional cross sectional system. The row sections of the grid identify the cognitive

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1 The review of tests has been confined to Appendix A to facilitate the readability of the chapter.

2 Grid A is presented on p. 70a.
processes to be evaluated whereas the columnar sections identify the modes of communication to be evaluated. Each individual cross sectional compartment within the grid represents a process-modality combination. Each process-modality combination is represented by a number written in its corresponding grid compartment. For example, the grid segment labeled "two" represents the tactile-constancy process-modality combination whereas the segment labeled "seven" represents the visual discrimination process-modality combination.

The remainder of this section will deal with a discussion of the cognitive processes and modes of communication incorporated in the grid system.

The cognitive processes will be discussed first in the order that they are presented as row headings in the grid system.

Perception

"The process of perception stands midway in a continuum between direct sensing to thinking by which we organize and give meaning to information we receive through our senses."¹ The act of perceiving can be broken down into several components which are listed

as row headings on the grid. These components are discrimination, constancy, figure-ground, closure, and part-whole perception. They will be discussed below in the order that they appear on the grid.

Discrimination involves the ability to perceive differences and likenesses among sensory stimuli. Visual discrimination involves the ability to identify identical forms from among a group of similar forms. Auditory discrimination involves the ability to differentiate between similar sounds.¹

Perceptual constancy involves being able to recognize a stimulus when there are slight alterations in that stimulus. Visual constancy, for example, involves the recognition of a visual stimulus when it has been altered in terms of texture, shading, size, context, script (when letters are involved), or position in space.² Auditory constancy involves the recognition of an auditory stimulus when it has been slightly altered in terms of pitch, loudness,

¹No attempt will be made in this chapter to give examples of tasks representing a process such as discrimination using each modality listed in the vertical column section of the grid. Examples of tasks representing each process-modality process combination will be presented in Chapter Four.

direction, or context.

Figure-ground perception involves the recognition of a stimuli when it is embedded in a structured or complex background. Visual figure-ground perception tasks would involve the identification of pictures embedded in a complex background. Auditory figure-ground perception would involve the ability to select a relevant auditory stimulus from a background of irrelevant stimuli. 1

Closure is the ability to fill in the missing elements to form a whole stimulus. Visual closure tasks involve recognition of familiar objects when portions of these objects are missing. Auditory closure can be measured by asking an individual to identify the whole word when parts of the word are pronounced.

Part-whole perception encompasses the ability to break a whole into its component parts, recognize the relationship between these parts, and then to combine these parts into a meaningful whole. Visual part-whole perception tasks, such as copying tests and puzzle and block design tasks, include the breaking down, analyzing and combining of visual elements. Auditory part-whole perception would involve the synthesis of sounds into a word.

Memory

Memory can be defined as "the mental capacity or facility of retaining and reviving impressions, or of recalling or recognizing previous experiences." The two types of memory emphasized in the grid are long and short term memory. Long and short term memory differ in terms of the time interval between the initial presentation of a stimulus and the subsequent retrieval of that stimulus. These time intervals can range on a continuum from one second to a year or longer. The problem which arises is the delineation of the time interval along this continuum which separates long from short term memory. Generally, for the purposes of this paper, long term memory tasks will involve a time interval of a full hour or longer between the initial presentation of the stimulus and the expected retrieval of that stimulus. Conversely, short term memory tasks will involve a time interval of less than a full hour between the stimulus presentations.

There is one exception to the foregoing rule in this paper as the WISC Coding Subtest, with a time interval of less than an hour, has been included as a test of long term memory. The rationale used for this classification is

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presented on page 122 of Chapter Four.

Visual short term memory tasks involve the recognition of stimulus figures within a minute after presentation. Visual long term memory tasks involve retrieval of visual stimuli an hour or more after the initial presentation of that stimuli.

Auditory short term memory tasks usually involve the recall of auditory stimuli, such as the recall of a tapped out sound pattern, within a minute after presentation. Auditory long term memory tasks, on the other hand, involve the retrieval of auditory stimuli, an hour or more after the initial presentation of that stimuli.

Concept Formation

"A concept is an abstract idea derived from the grouping of objects in terms of some common property."¹ Tests of concept development include classification tasks, analogies and vocabulary tests.

Higher Cognitive Processes

Higher cognitive processes, such as comprehension, synthesis, analysis and critical thinking, have not been included in the grid due to time limitations² and, thus,

¹Ruch, Psychology and Life, p. 723.
²See Chapter Four, page 80, for a detailed discussion of the time factor.
will receive no further consideration in this paper.

The second topic under consideration in section one of this chapter concerns the identification of the channels through which communication flows. These channels are presented on the horizontal or columnar segments of the grid.\(^1\)

The avenues of communication include the receptive modalities through which sensory data is received and the expressive modalities through which a response is made. The receptive modalities are the tactile, visual and auditory pathways. The expressive modalities are the vocal and motor pathways.

Many times two or more modalities are involved in the processing of information. For example, a visual copying task involves both the visual and motor channels of communication and an oral reading task requires the use of the visual-vocal modalities. The combination of channels represented in the grid are the auditory-visual, visual-motor, visual-vocal, auditory-motor, and auditory-vocal modalities. A detailed discussion of each of these modality combinations will be included in Chapter Four when tasks representing each grid segment are individually presented.

\(^1\)The terms, modes of communication, channels of communication and modalities, will be used interchangeably throughout this paper.
A review of tests of cognitive processes will be presented in Appendix A. Whenever possible, the following information about each test has been provided: title, author, publisher, date of publication, ages suitable for, purpose, brief description, and statistical information, including norms and reliability and validity data. In addition, each test has been classified in terms of the process-modality combinations it appears to measure.

Placement of Tests into the Grid System

The last section of this chapter will deal with the placement of the tests, identified in Appendix A, into the appropriate sections of the grid system based on the process-modality combination they purport to measure.

In cases where no formal measures were identified, informal measures were constructed. These informal measures can be found listed alphabetically by title in Appendix B.

Since placement of the tests into the actual grid would prove cumbersome due to the large number of tests to be classified, they will be outlined below the grid. Each grid segment in Grid A has been numbered. Tests representing a specific function will be grouped in the outline under the

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1 The test reviews have been confined to Appendix A to facilitate the readability of the chapter.
numbers corresponding to the numbers in the grid system itself. For example, Grid Twelve represents auditory discrimination. The tests to be included in that grid, the Halstead Rhythm Test, the Wepman Discrimination Test and the Gates Discrimination Test, will be classified in the outline under Grid Twelve.
<table>
<thead>
<tr>
<th>Modalities — Proceeds →</th>
<th>Receptive Modalities</th>
<th>Expressive Modalities</th>
<th>Integration of Receptive Modalities</th>
<th>Integration of Receptive and Expressive Modalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception Discrimination</td>
<td>7</td>
<td>7</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Perception Constancy</td>
<td>3</td>
<td>8</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Perception Figure-Ground</td>
<td>4</td>
<td>7</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Perception Closure</td>
<td>5</td>
<td>16</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td>Perception Part-Whole</td>
<td>6</td>
<td>11</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>Memory Long Term</td>
<td>52</td>
<td>53</td>
<td>52</td>
<td>54</td>
</tr>
<tr>
<td>Memory Short Term</td>
<td>53</td>
<td>53</td>
<td>57</td>
<td>51</td>
</tr>
<tr>
<td>Concept Formation</td>
<td>72</td>
<td>73</td>
<td>74</td>
<td>75</td>
</tr>
</tbody>
</table>
TESTS INCORPORATED INTO GRID SYSTEM A

Grid 1
a. The Halstead Tactual Performance Test--Part One
b. The Modified Halstead Tactual Performance Test--Part One

Grid 2
a. The Halstead Tactual Form Recognition Test
b. The Modified Halstead Tactual Form Recognition Test

Grid 3
Informal Test of Tactile Constancy

Grid 4
Informal Test of Tactile Figure-ground Perception

Grid 5
Informal Test of Tactile Closure

Grid 6
Informal Test of Tactile Part-Whole Perception

Grid 7
a. Marianne Frostig Developmental Test of Visual Perception--Five
b. Kuhlmann-Finch Tests--Two and Five
c. SRA Primary Mental Abilities Perceptual Tests
d. The Ilg and Ames Developmental Examination Tests
e. The John Hopkin's Perceptual Test
f. The Slingerland Test for Identifying Children with Specific Language Disabilities--Part IV
g. The Horst Reversals Test
h. The Gate's Word Matching Test

Grid 8
a. Kuhlmann-Finch Subtest Seven
b. The Marianne Frostig Developmental Test of Visual Perception--Three

Grid 9
a. The Marianne Frostig Test of Visual Perception--Two
b. Closure Flexibility Test by Thurstone

* Informal tests, for which credit has not been given in this section, are tests which have been developed by the author. Those test descriptions are in Appendix B.
Grid 10
   a. The SRA Primary Mental Abilities Space Subtest
   b. The Kuhlmann-Finch Test Three
   c. The Thurstone Closure Test

Grid 11
   a. The Leiter International Performance Scale-Subtest Four
   b. Informal Puzzle Test

Grid 12
   a. The Halstead Rhythm Test
   b. The Wepman Test of Auditory Discrimination
   c. The Gate's Test of Auditory Discrimination

Grid 13
   No tests included

Grid 14
   Informal Test of Auditory Figure-Ground Perception

Grid 15
   Modified ITPA Auditory Closure Test

Grid 16
   Modified ITPA Auditory Sequencing Test

Grids 17 through 26
   No tests included

Grid 27
   Buzzer Test IV

Grid 28
   Auditory-Visual Constancy

Grid 29
   Visual Closure Test from the Illinois Test of Psycholinguistic Abilities (ITPA)

Grid 30
   Auditory-Visual Closure

Grid 31
   a. Buzzer Test IV
   b. Buzzer Test III

Grid 32
   a. The Arthur Point Seguin Goddard Form Board Test
   b. Modified Arthur Point Seguin Goddard Form Board Test
**Grid 33**  
No tests included

**Grid 34**  
The Embedded Figures Test

**Grid 35**

a. The Leiter International Performance Scale Subtests VII-3, X-4, and XVIII-3
b. The Ilg and Ames Developmental Examination Tests—Subtest 2d Man Figure Completion Test
c. The SRA Primary Mental Abilities Space Subtest

d. **Grid 36**

a. Slingerland Screening Tests for Identifying Children with Specific Language Disability
b. Detroit Tests of Learning Aptitude—Designs—Part a
c. Bender Visual Motor Gestalt Test
d. Ilg and Ames Developmental Examination Tests—Copying Six Basic Forms (Test 2c and 3c)
e. Benton Revised Visual Retention Test—Administration C
f. The Marianne Frostig Developmental Test of Visual Perception—Five
g. Winterhaven Perceptual Forms Test
h. Minnesota-Percepto-Diagnostic Test
i. Reitan's Modification of Halstead-Wepman Aphasia Test—Copying Simple Forms
j. Berry Test of Visual Motor Integration
k. Block Design, The Object Assembly and the Mazes Subtests from the Wechsler Intelligence Scale for Children
l. The Two Figure Form Board, Manekin, Mare and Foal, Porteus Maze, Kohs Block, Stencil Design and Causist Form Board Subtests from the Arthur Point Scale
m. The Strauss and Werner Marble Board Tests
n. The Golstein-Scheerer Kohs Block Test

**Grid 37 through 38**  
No Tests Included

**Grid 39**

a. Cruickshank Syracuse Figure-Ground Test
b. Strauss and Lehtinen Visual Figure—Background Test

**Grid 40**  
The Wechsler Intelligence Scale for Children—Picture Completion Subtest
**Grid 41**
Informal Test of Part-Whole Visual Vocal Perception

**Grids 42 through 45**
No tests included

**Grid 46**
Informal Test of Part-Whole Auditory-Motor Perception

**Grid 47**
The Informal Sound Identification Test

**Grid 48**
No tests included

**Grid 49**
The Informal Auditory-Vocal Figure-Ground Perception

**Grid 50**
Visual Closure Test from the Illinois Test of Psycholinguistic Abilities (ITPA)

**Grid 51**
No tests included

**Grid 52**
 a. The Finger Agnosia, Astereognosis, and Finger Tip Writing Subtests from the Halstead Modification of the Halstead-Wepman Aphasia Test
 b. The Tactile Agnosia Subtest from the Eisenson Aphasia Test

**Grid 53**
Modified Halstead Tactual Performance Test-II

**Grid 54**
Informal Visual Long Term Memory Test

**Grid 55**
 a. ITPA Visual Sequential Memory Test
 b. The Bannatyne Visuo-Spatial Memory Test
 c. The Durrell Visual Memory Test
 d. Slingerland Screening Tests for Identifying Children with Specific Language Disability
 e. The Leiter International Performance Scale Subtest XIV-3

**Grid 56**
The Informal Auditory Long Term Memory Test
Grid 57
a. Basic Concept Inventory--Part Three--Number Nineteen
b. Buzzer Test I

Grid 58
The Ilg and Ames Naming Animals Test from the Developmental Examination Tests

Grids 59 through 61
No tests included

Grid 62
a. Grammatic Closure Subtest from the ITPA
b. The Halstead Speech Sounds Discrimination Test
c. The Auditory Memory Test from the Slingerland Screening Tests for Identifying Children with Specific Language Disability
d. Letter Sounding Tests V-2 and VI-2 from the Gates-McKillop Reading Diagnostic Tests

Grid 63
Buzzer Test V

Grid 64
a. Math Examples from The Halstead Adaptation of the Halstead-Wepman Aphasia Test
b. Coding Test from the Wechsler Intelligence Scale for Children

Grid 65
a. The Knox Cube Subtest from the Arthur Point Scale
b. The Bearea Visual Motor Gestalt Test
c. The Visual Memory Subtest from the Slingerland Screening Tests for Identifying Children with Specific Language Disability
d. The Durrell Visual Memory Test
e. The Designs Subtest from the Detroit Test of Learning Aptitude
f. The Visual III (4b) Subtest from the Ilg and Ames Developmental Examination Tests
g. The Benton Visual Retention Test (Administration A)

Grid 66
a. Reading Items from Halstead's Modification of the Halstead-Wepman Aphasia Screening Test
b. The Durrell Naming Letters Subtest
c. The Naming Parts of Body Subtest from the Ilg and Ames Developmental Examination Tests
d. The Reading A Subtest from the Wide Range Achievement Test
The Visual Attention Span for Objects
Visual Attention Span for Letters Subtests from the Detroit Tests of Learning Aptitude

Spelling and Writing Sentence Components of the Halstead Modification of the Halstead-Wepman Aphasia Test
The Auditory Memory Subtest from the Slingerland Screening Tests for Identifying Children with Specific Language Disability Test Battery
The Writing Name and Address Test from the ILG and Ames Developmental Examination Tests
Spelling Subtest from the Durrell Analysis of Reading Difficulties

Copying Tapping Patterns Subtest from the Basic Concept Inventory
Imitating Tapped-out Sound Sequences Test from the deHirsch Test Battery
Buzzer Test VI

Oral Spelling Components from the Halstead Modification of the Halstead-Wepman Aphasia Test
The Eisensohn Auditory Agnosia Test

The Torman and Merrill Digit Memory Span Lists
The Echolalia Test from the Halstead Modification of the Halstead-Wepman Aphasia Test
The Echolalia Test from the Slingerland Screening Tests for Identifying Children with Specific Language Disability
The Monroe Blending Test
The Gates Blending Test
The Auditory Attention Span for Unrelated Words and Auditory Attention Span for Related Syllables from the Detroit Learning Aptitude Test
The Roswell Chall Auditory Blending Test
The Wechsler Intelligence Scale for Children Digit Span Subtest
The ITPA Sound Blending and Auditory Sequential Memory Subtests

No tests included
a. The Halstead Categories Test
b. The ITPA Visual Reception and Visual Association Subtests
c. The Detroit Learning Aptitude Pictorial Opposites Subtest-3a
d. The Goldstein-Scheerer Object Sorting Test
e. The Gleb Goldstein-Scheerer Color Sorting Test
f. The SRA Primary Mental Abilities Intermediate Reasoning Subtest
g. The Raven Progressive Matrixes
h. Kuhlmann-Finch Analogies—Subtest Four

a. The ITPA Auditory Reception Subtest
b. The SRA Primary Mental Abilities Intermediate Reasoning Subtest

The ITPA Verbal Expression Subtest

No tests are included

a. The Peabody Picture Vocabulary Test
b. Finding Things Described Subtest from The Basic Concept Inventory
c. The SRA Primary Mental Abilities Primary and Intermediate Verbal Subtests
d. Full Range Picture Vocabulary Test

Healy Picture Completion Subtest from the Arthur Point Scale
b. Eleven Subtests from the Leiter International Performance Scale Subtests
   1. V-0 Genus Test
   2. VI-1 Analogous Progression Test
   3. VI-2 Pattern Completion
   4. VI-3 Matches on Basis of Youth
   5. VII-7 Circle Series
   6. VII-3 Series of Radii
   7. IX-1 Dot-Estimation
   8. IX-2 Analogous Designs
   9. XII-2 Similarities
   10. XII-4 Matching Animals
   11. XIV-2 Analogous Designs
c. ITPA Visual Association Subtest
Grid 79
a. The Strauss and Werner Object Sorting Test
b. The Goldstein-Scheerer Color-Form Sorting Test

Grid 80
a. deHirsch Categories Test
b. The Verbal Opposites and Likenesses and Differences Subtest from the Detroit Learning Aptitude Pictorial Opposites
c. The Similarities and Vocabulary Subtest from the WISC
d. The Auditory Association Subtest from the ITPA

Grid 81
ITPA-4 Auditory Association
CHAPTER IV

SELECTION OF TESTS FOR THE FINAL DIAGNOSTIC BATTERY

In Chapter III above, the various tests which are candidates for inclusion in the final battery were identified and placed in the appropriate grid segments.

The object of this chapter is to select the individual tests to be included in the final battery.

In Grid A, Chapter III above, the tests were not evenly dispersed into the alternative grid compartments. When a grid segment contains more than one test the following criteria will be utilized to select the test which will appear in the grid segment in the final battery (Grid B) at the end of the chapter.

Criteria For Final Selection Of Tests To Appear In The Test Battery

1. Availability of the Tests in Question

Some tests were not easily obtainable because of restrictions imposed by the publisher or because they were, as of this writing, not in published form. In cases where the publisher did not give permission to use a specific test in the final battery, it is possible that an inferior test might have been substituted for inclusion in the final battery.
2. Practicality of the Test

Factors such as administration time, cost, and ease of scoring were extremely important when selecting a test for inclusion in the final battery.

a. Cost of the test. If two tests appeared to be acceptable measures of the same function the least expensive test was selected. In some cases superior tests had to be omitted because of their obviously inflated costs. If a battery of fifty tests or subtests is to be a useful diagnostic tool for school age children the cost must be realistic in terms of school departments' limited budgets.

b. Administration and scoring time. If two tests seemed to be equally efficient, then the test which took the least amount of time to administer and score was selected. In some cases even a more efficient test was discriminated against because it took too long to administer.¹

3. Validity

Validity refers to the degree to which the test

¹It is important to attempt to limit the amount of time allotted to any individual test because the eventual battery will contain approximately fifty identifiable tests or subtests. The total length of the administration time must be kept within reasonable limits if it is to be operative and useful.
measures what it is purported to measure. The types of validity are listed below.

a. **Construct Validity.** Construct Validity refers to the degree to which a test measures the trait or construct it purports to measure. A construct is a human characteristic assumed to exist in order to account for some aspect of human behavior. If a test purports to measure a trait or quality, it is possible to develop theories about this construct and then to make predictions based on these theories. If the predictions and the data produced by the instrument agree, the evidence supports the construct validity of the instrument.2

b. **Concurrent Validity.** Concurrent validity refers to the degree of correlation between behavior measured by a test and an independent current criterion measure of the same trait.3

c. **Predictive Validity.** Predictive validity refers to the degree of accuracy the instrument exhibits

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3Ibid., pp. 296-297.
in predicting future behavior on the basis of test data.\(^1\) This type of validity is established by correlating test scores with a criterion measure which represents some specific future outcome. For example, a Kindergarten test of visual perception for predicting reading achievement in grade three might be validated by correlating the scores on the kindergarten test with scores on a reading achievement test administered in grade three.

d. **Content Validity.** Content validity refers to the degree to which the content of the instrument samples the subject matter which it purports to measure. Usually this type of validity is reported in conjunction with measures of achievement. However, when developing tests of cognitive processes, it is first necessary to identify tasks which seem to measure these processes and then to construct an instrument containing these tasks.\(^2\) The next step would be to establish the construct validity of the instrument. It is

\(^1\)Ibid., p. 295.

entirely possible that this instrument's validity would not be verified through empirical research.

When developing the final battery, in cases where there is no empirical research available to validate the test of a particular cognitive process, it will be necessary to rely on the inherent content validity of a measure.

4. Reliability

Measures of reliability determine the stability of the test. There are various methods of estimating the reliability of a test. Some of these methods are thorough and identify many sources of error, whereas other methods identify only a few sources of error, thus providing a less accurate picture of the tests' stability. Below is a brief outline of the various measures of reliability listed in order of importance from most accurate to least accurate measures.

a. Alternate Form Reliability With a Lapse of Time Between First and Second Testing. This type of reliability provides the best measure of test stability as it identifies the following sources of error.¹

1. Error due to variations arising within the measurement procedure itself. Examples of

¹Thorndike, Measurement and Evaluation, p. 182.
such errors include errors in giving directions and errors in scoring.

2. Error due to changes in the individual from day to day. Examples of such errors include emotional or physical factors that influence the day to day performance of an individual.

3. Error due to changes in the specific sample of tasks. For example, one sample of reading passages in a silent reading test might be related to the subject's experience background whereas another sample of reading passages may not deal with a topic that is unfamiliar to the testee.

4. Error due to changes in the individual's speed of work. For example, when testing is done during two different time periods there may be a change in the individual's speed of response.

b. Alternate Form Reliability With No Lapse Of Time Between the First and Second Testing. This type of reliability reflects all sources of error presented under "a" above with the exception of sources of error due to changes in the individual
from day to day.  

c. **Test-Retest with a Time Interval Using the Same Test.** This form of reliability reflects all sources of error under "a" above with the exception of errors due to changes in the specific sample of tasks.  

d. **Test-Retest with no Time Interval Using the Same Test.** This type of reliability reflects all sources of error presented under "a" above except changes in the individual from day to day and changes in the specific sample of tasks.  

e. **Split-half Reliability Coefficients.** This involves the division of a particular test into equivalent halves. An estimate of total test reliability can be then attained by applying the Spearman-Brown Prophecy Formula. This form of reliability reflects all the types of error presented in "a" above except changes in the individual from day to day and changes in the individual's speed of work.  

5. **Norms**  

When evaluating the norms provided for a specific test

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1^Ibid., p. 182.  
2^Ibid., p. 182.  
3^Ibid., p. 182.
one should consider both the types of norms provided and the size and representativeness of the norming population. Since it is the responsibility of the statistician or expert in the area of test construction to determine whether the norming population was of adequate size and to determine whether the sample used represented the various segments of the population, this parameter will not be considered when choosing the tests for the final battery unless the test has been reviewed by an expert in the field.

The types of norms used in conjunction with standardized tests will be delineated below in order of their acceptability from the most acceptable to the least acceptable types of norms.

a. **Standard Score Norms.** Standard Score norms provide information concerning the number of standard deviations an individual falls above or below the mean of the single age or grade group to which he belongs. Equal standard score differences represent equal differences in raw score points, thus facilitating interpretations based on these norms. When raw scores are converted to standard scores with the same mean and deviation, one can compare performances on two tests standardized using the population.

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1Ibid., p. 127.
b. **Percentile Norms.** Percentile norms represent the percentage of a population surpassed by an individual in the single age or grade group to which he belongs.¹ Unlike standard score norms, percentile norms do not have equal raw score points between percentile score points. For example, many more raw score points are included between the ninetieth and ninety-fifth percentiles, than between the fiftieth and fifty-fifth percentiles. This unequal score point factor makes interpretation of percentile norms more difficult.²

c. **Age and Grade Norms.** Age and grade norms represent the matching of an individual test performance to the successive age or grade group in terms of raw score points.³ When using age and grade norms one year's growth does not represent a standard unit of growth. These norms are most appropriate when measuring traits which exhibit a normal growth curve such as reading or math skills. A significant disadvantage of the age or grade

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¹Ibid., p. 127.
²Ibid., pp. 135-136.
³Ibid., p. 127.
norms is that the individual is not compared with the individuals of the same age or grade group. Therefore, a grade equivalent score does not have consistent meaning for an individual in terms of his own reference group. For example, a grade equivalent score of 4.2 on a reading test might place an individual in the fortieth percentile in terms of his own reference group whereas the same grade equivalent score on a math test might place him in the seventieth percentile in regard to that same reference group. These differences can be attributed to differences in the rate of growth in both mathematics and reading.

Rationalization And Selection Of Tests To Be Placed In The Final Grid For Use In The Test Battery

The remainder of this section will address itself to the rationalization and selection of the tests to be included in the final battery. The final selection of tests will be chosen from among the alternatives listed in the grid in Chapter Three. The chapter will be organized by first identifying the function to be tested, and then by discussing each of the tests of a specific function in terms of the criteria for selection that was discussed in the first section of this chapter. The number of the grid section
under consideration as well as its corresponding process-modality combination will be delineated in order to facilitate the presentation.

1. Perception

Grid 1—Tactile Discrimination

The Halstead Tactual Performance Test—Part One is the only formal test incorporated into grid segment one. Validity data indicates that this is a fairly good predictor of brain damage. There are no norms for this test and reliability data is not available. The test is economical in terms of administration and scoring time, but is uneconomical in terms of cost.¹ Because of the cost factor, an informal test of tactile discrimination has been substituted for the Halstead Tactual Performance Test in the final test battery. The informal test is patterned after the Halstead Test but less expensive material has been substituted in place of the relatively expensive Seguin Goddard Form Board which is used in the Halstead Test. See the appendix for a complete description of the Modified Halstead Tactual Form Recognition Test.

¹See Appendix B for a complete description of the Modified Halstead Tactual Form Recognition Test.
Grid 2--Tactual Visual Discrimination

The Halstead Tactual Form Recognition Test is the only alternative in grid section two. There are no norms or reliability data available for this measure. The test has been validated as a measure which identifies brain damaged subjects. The test is practical in terms of administration and scoring time as well as cost. A modified version of the test has been selected for use in the final battery with adjustments in the directions and in the original test material. See Appendix B for a complete description of the Modified Halstead Tactual Form Recognition Test.

Grids 3 Through 6--Tactile Constancy, Tactile Figure-ground Perception, Tactile Closure and Tactile Part-Whole Perception

Grids three through six have been deleted from the final test battery due to the unavailability of formal tests to measure these functions. Although informal tests of

\[1\] All informal test descriptions can be found in Appendix B.
these functions are included in the grid sections three through six in Grid A, above, they have not been included in the final battery because it is essential to gather the most pertinent information during the initial diagnostic test sessions. Immediate information about the tactile channel in conjunction with all the above mentioned areas is not essential since disabilities in this channel probably would not be debilitating if the visual and auditory channels were intact. The time factor was the major reason for deleting these informal tests from the final battery. It would be advisable to administer the informal tests once remedial therapy has been initiated if the therapist needs information concerning the feasibility of using the tactile modality as an adjunct to other deficient modalities in the learning process.

**Grid 7—Visual Discrimination**

Alternative measures of this function incorporated into the grid are the Mariann Frostig Developmental Test of Visual Perception—Five, Kuhlmann-Finch Tests—Two and Five, The SRA Primary Mental Abilities Perceptual Tests,
The Ilg and Ames Developmental Examination Tests—(IV-a-Visual 1), the John Hopkin's Perceptual Test, The Slingerland Test for Identifying Children with Specific Language Disabilities—Part IV, The Horst Reversals Test and the Gate's Word Matching Test. The visual discrimination items in the tests listed above can be separated into two categories: tests dealing with pictorial material and tests dealing with words.

The tests dealing with pictorial material will be discussed first. These tests include the Frostig, The Kuhlmann-Finch, The Primary Mental Abilities, the John Hopkin's Perceptual Test, and the Ilg and Ames Developmental Examination. The John Hopkin's Test can be eliminated immediately as an alternative for the final battery because there are no norms available for this test. The remaining tests, involving pictorial material, are economical in terms of administration and scoring time and in terms of cost. A comparison of these measures on the basis of the adequacy of their validity, reliability and norming data, will follow:

1. Validity: The Frostig Five is included
in a battery of tests that has been validated as a measure of visual perception. The remaining measures are parts of total batteries which have not been validated as measures of perception but which have been validated as measures of general intellectual growth.

2. Reliability: The Frostig Battery uses test-retest as well as split-half reliability coefficients. The other tests use split-half reliability only. All measures exhibit acceptable reliability coefficients, but the Frostig Test's coefficients are slightly superior because a more accurate measure of reliability was utilized for determining these coefficients.

3. Norms: The Kuhlmann-Finch, Ilg and Ames and Frostig Tests provide age norms. However, the Frostig also provides means for determining the perceptual quotient for children between the ages of three and ten. The Primary Mental Abilities Test provides deviation IQ and age norms.
In summary, the Frostig is superior to the other tests in the areas of validity, and reliability. The Primary Mental Abilities deviation IQ norms are superior to the Frostig age norms. However, the Frostig Test does provide a Perceptual Quotient for the total test which is a unique feature peculiar to this particular test battery.

Tests dealing with word forms rather than pictures are the Slingerland Screening Test for Identifying Children with Specific Language Disabilities, the Horst Reversals Test and the Gates Word Matching Test. None of these tests were acceptable alternatives for the final battery. The Slingerland has not been standardized and thus is not a useful measure for the final battery, when standardized tests are available. The other two alternatives, although standardized measures, are standardized for the first grade population, thus making the norms useless for older children. In conclusion, the Frostig Test V has been selected as the measure that will be used in the final
battery because of its superior reliability and validity coefficients and because the total test battery yields a perceptual quotient which may be useful for interpreting the maturity of a child's perceptual function.

**Grid 8--Visual Perceptual Constancy**

The alternatives for this grid segment are Kuhlmann-Finch Subtest Seven and The Marianne Frostig Developmental Test of Visual Perception--Three. The Frostig has been chosen as the measure of this function for the final battery. Since the rationale for choosing the Frostig and not the Kuhlmann-Finch Test is essentially the same as that expressed in the grid segment seven, above, the reader is referred to that section for details about the selection process.

**Grid 9--Visual Figure--Ground Perception**

The two alternative tests in this grid segment are The Marianne Frostig Test of Visual Perception--Two and the Closure Flexibility Test by Thurstone. Since the Closure Flexibility Test was standardized for adult males
rather than for children, The Frostig II was selected for use in the final battery.

Grid 10—Visual Closure

The alternative measures included in grid segment ten are the SRA Primary Mental Abilities Space Subtest, The Kuhlmann-Finch Test—Three, and the Thurstone Closure Test.

The Thurstone Closure Test can be ruled out as an alternative because the norms were established for adult males and not for children.

The other two alternative measures are economical in terms of cost and administration scoring time. Both used split-half reliability coefficients which appear adequate and both have been validated as measures of general intelligence. However, the Primary Mental Abilities Space Subtest has been selected for the final battery because it shows high correlations with reading and mathematics achievement at the seven to eleven age range whereas no such validity information is available for The Kuhlmann-Finch Test, and because the Primary
Mental Abilities Space Subtest deviation
I.Q. norms are superior to the Kuhlmann-Finch age equivalent norms.

Grid 11—Visual Part-Whole Perception

The only formal test of this function in grid eleven is the Leiter International Performance Scale—Subtest Four. However, The Informal Puzzle Test has been selected for use in the final battery in place of the Leiter because the Leiter Subtest has no separate norms and because the subtest is part of an expensive test battery.

Grid 12—Auditory Discrimination

The alternative measures incorporated into grid twelve are The Halstead Rhythm Test, The Wepman Test of Auditory Discrimination, and The Gate's Test of Auditory Discrimination. The Gates Test can be eliminated as an alternative because there are no norms available for this subtest of The Gates Diagnostic Test Battery.

When comparing the remaining two alternatives in terms of the selection criteria, the Wepman can be rated as slightly superior to the Halstead Rhythm Test. In the first
place, the Wepman age norms cover a wider age range than the Halstead critical score norms. Secondly, the Wepman validity studies deal with normal subjects who have learning problems while the Halstead validity studies deal specifically with brain damaged children. Non-brain injured subjects who are experiencing learning problems are excluded from the Halstead study data. Thirdly, while the two tests appear to be economical in terms of administration and scoring time, the Halstead Test is more cumbersome to administer as it requires the use of a tape recorder which might prove to be an additional burden for the diagnostician who must travel from school to school. Lastly, this writer has no information about the reliability of the Halstead Test. However, the reliability coefficients for the Wepman Test appear adequate. For the reasons cited above, the Wepman Test has been selected over the Halstead Test for inclusion in the final test battery.

Grid 13—Auditory Constancy

This writer was unable to locate a test
designed to assess this function. One possible explanation for the unavailability of such a test is that it is relatively difficult to delineate the test tasks which appear related to this function.

Grid 14—Auditory Figure-Ground Perception

No formal measure of this function is included in this grid segment. An informal measure has been developed. However, due to time limitations, this informal test should be administered during remedial therapy if other auditory channels have been diagnosed as inadequate or if the child seems to be easily distracted by a high noise level. When informal tests have been included in the final battery, specific rationale for their inclusion has been presented.

Grid 15 and 16—Auditory Closure and Auditory Part-Whole Perception

There are no formal measures of these functions incorporated into these grid segments. Informal tests of these functions have been developed which are modified versions of the ITPA Auditory Closure and Auditory Sequencing Subtests. These tests should be
administered as part of the final battery if the subject fails the ITPA Sequencing or Closure Subtests. Although there are time limitations which must be considered when constructing the final battery, the inclusion of these informal measures is justifiable because they measure the receptive aspects of two important processes involved in the act of decoding words.

**Grids 17 Through 26—Vocal and Motor Expression of Perceptual Abilities**

There are no tests of these functions because perception must involve the interpretation of incoming sensory data before this data can be expressed through the vocal and motor channels of communication.

**Grid 27—Auditory-Visual Discrimination**

Two different tests of this function, cited in the research literature, will be discussed below. These tests were not included in the test review section because they have been used in the laboratory situation for research purposes and, to the best of this writer's knowledge, are not in published form.

The first test under consideration is
a test of visual-auditory integration which was developed by Sterritt and Rudnick.\(^1\)

This test involves the use of apparatus, such as audiometric devices and NE thirty-four lamps for measuring the subject's ability to match visual with auditory stimuli. The experimenters found a relationship between the ability to match visual-temporal data with auditory-temporal data and reading scores obtained nine months later for third and fourth grade boys.

The Sterritt and Rudnick measures are still in the experimental stage but, even if the test were available in published form, the equipment would be expensive and cumbersome to manipulate for the learning disability diagnostician who must be prepared to provide diagnostic evaluations in various locations.

The second measure of the function under consideration is a visual-auditory

\(^1\)Graham M. Sterritt, Virginia E. Martin and Mark Rudnick, "Sequential Pattern Perception and Reading," in Reading Disability and Perception, ed. by George D. Spache (Newark, Delaware: 1959), pp. 61-71.
integration test which was developed by Birch and Belmont. This test involves the matching of visually presented dots to acoustically presented taps. Birch and Belmont found a significant relationship between low reading scores and low scores on above mentioned tests for primary grade children.

An informal buzzer test based on the Birch and Belmont technique has been developed for use in the final test battery. This informal test is called The Informal Buzzer Test II. This informal test has been included in the final battery in spite of time limitations because the auditory-visual integration function appears to be an essential component of the acts of reading and writing.

Grid 28 and 30—Auditory-Visual Constancy and Auditory-Visual Closure
No published tests of these functions have been incorporated into the grid system. One

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possible reason for the apparent lack of tests in these areas is that it seems difficult to delineate the tasks that appear related to these functions.

Grid 29--Auditory-Visual Figure-Ground Perception
The only formal measure of this function incorporated into the grid is the ITPA Visual Closure Test. Although this is called a closure test, the test task resembles a figure-ground test as the subject must identify parts of familiar objects which are embedded in a complex background of visual stimuli. The auditory component of this test involves the examiner's naming of the familiar object which must be identified by the subject. It should be noted that in this test the auditory stimuli are not presented in a confused background as are the visual stimuli.

The ITPA Closure Test has been chosen for the final battery because it is part of a well standardized test battery.

Grid 31--Visual-Auditory Part-Whole Perception
There are no published tests of this function incorporated into this grid segment. Two
informal tests included in the grid system involve translating from visual to auditory stimuli and translating from auditory to visual stimuli. The first test is called The Buzzer Test III, and the second test is called The Buzzer Test IV. These informal tests have been included in the final grid because they seem to measure functions involved in such tasks as learning to read (visual to auditory integration) and learning to write (auditory to visual integration).

Grid 32—Visual-Motor Discrimination

The Arthur Point Seguin Goddard Form Board is the only formal test incorporated into grid section thirty-two. This test is part of a well standardized test battery but is not practical in terms of the cost of the test material. Due to the expense of the Arthur Point material, a Modified Arthur Point Seguin Goddard Form Board Test, incorporated in this grid, has been chosen for the final test battery. The informal test is patterned after the Arthur Point Test but less expensive material has been
substituted in place of the Seguin Goddard Form Board.

**Grid 33—Visual-Motor Constancy**

No formal tests of the function are incorporated in the grid. One possible reason for the apparent lack of tests in this area is difficulty involved in isolating the test tasks which seem to measure visual-motor perceptual constancy.

**Grid 34—Visual-Motor Figure-Ground Perception**

The Embedded Figures Test has been placed in this grid segment as a measure of this function. This is a standardized test with adequate validity and reliability coefficients. The test has been standardized for children ages eight through fourteen. A modified version of the test is also available for younger children. Administration of this test is very time consuming and because of this time factor the test has not been included in the final test battery. This test should be administered during remedial therapy if the child has failed other figure-ground tests or if he has failed the Visual-Motor Part-Whole Perception Tests which are included
in grid section thirty-six.

**Grid 35—Visual-Motor Perceptual Closure**

The formal tests included within this grid segment are Leiter International Performance Scale Subtests VII-3, X-4, and XVIII-3; The Ilg and Ames Developmental Examination Tests--Subtest 2d Man Figure Completion Test; and the SRA Primary Mental Abilities Space Subtest.

The Leiter Subtests can be eliminated as alternatives for the final battery due to the expense of purchasing the material and because no age norms are available for individual subtests in the battery.

The Primary Mental Abilities Space Subtest is not a suitable alternative as it is only appropriate for children in kindergarten through grade two.

The Ilg and Ames Subtest is an appropriate alternative. As indicated in other parts of this chapter, this test is fairly well standardized. The test will not be used as part of the final battery due to time limitations. However, the test should be administered during the therapeutic program.
if the child has failed the Visual-Motor Part-Whole Perception Tests which are discussed next in grid number thirty-six, or if he has failed other visual closure tests included in the final battery.

**Grid 36—Part-Whole Visual-Motor Perception**

There are many measures of the function incorporated into this grid section. Tasks involving part-whole perception are of the following types: puzzles, block designs, mazes, marble designs, and paper and pencil copying tasks. In order to facilitate this presentation, the material will be broken down into two subtopics: (1) Paper and pencil copying tests and (2) Tests which do not require paper and pencil copying tasks.

The paper and pencil copying tests will be discussed first. Paper and pencil copying tests incorporated in this grid include the following ten tests:

1. Slingerland Screening Tests for Identifying Children with Specific Language Disability

2. Detroit Tests of Learning Aptitude—Designs-Part a
3. Bender Visual Motor Gestalt Test
4. Ilg and Ames Developmental Examination Tests—Copying Six Basic Forms (Test-2c and 3c)
5. Benton Revised Visual Retention Test—Administration C
6. The Marianne Frostig Developmental Test of Visual Perception—five
7. Winterhaven Perceptual Forms Test
8. Minnesota-Percepto-Diagnostic Test
9. Reitan's Modification of Halstead-Wepman Aphasia Test—Copying Simple Forms
10. Berry Test of Visual Motor Integration

Some of the above mentioned tests can be immediately eliminated as acceptable alternatives for the final test battery. The Benton C, Reitan Aphasia and Minnesota have been eliminated because of the lack of norms for these tests. The Winterhaven has been eliminated because its reliability and validity data are limited compared with the remaining alternatives.

The Slingerland Screening Test will not be eliminated as an alternative for the final battery even though it is not a standardized test because it is the only
available measure of word copying.

The remaining alternatives are well standardized, economical measures of this function. They all provide age norms. All the alternatives, with the exception of the Detroit Subtest, tend to present data supporting the construct validity of the measure as tests of visual-motor perception. The Detroit Test on the other hand, presents study data supporting the validity of the test as a measure of general intelligence. Adequate test-retest reliability coefficients were provided for all of these alternative measures.

The three copying tests which have been chosen for the final battery are the Frostig, the Bender Gestalt and the Slingerland Screening Test. Each of these measures can be administered in a relatively short period of time. Each measure evaluates the function of part-whole visual-motor perception but each test has been included in the battery because it represents a different level of difficulty. The Bender
is the easiest measure because the individual must copy simple designs. The Frostig is more difficult because the subject must copy a complex design within the bounds provided by a structured framework. In The Frostig, the framework itself might confuse the individual who has poor figure-ground perception. The Slingerland should prove to be the most difficult test because the subject must copy complex letter forms in the proper sequence. As in The Frostig Test, the person with poor figure-ground perception might become confused when copying letters embedded in a complex background of other letter forms.

Tests which do not involve paper and pencil copying tasks will be discussed next in an attempt to determine whether any of these tests should be included in the final test battery. The tests in this section include the Block Design, the Object Assembly and the Mazes Subtests from the Wechsler Intelligence Scale for Children; The Two Figure Form Board, Manekin, Mare and Foal, Porteus Maze, Kohs Block, Stencil Design and Causist Form Board Subtests from the Arthur
Point Scale; The Strauss and Werner Marble Board Tests; and the Goldstein-Scheeerer Kohs Block Test. The Strauss and Werner and Goldstein-Scheeerer Tests do not provide norms for children and therefore, are not acceptable alternatives for the final test battery.

The Wechsler Intelligence Scale for Children and The Arthur Point Scale are the remaining two alternatives within the category of tests which do not involve paper and pencil copying tasks. Although both measures are well standardized, neither one has been included in the final test battery because it has been the assumption throughout this paper that the learning disability diagnostician would be working as part of an interdisciplinary diagnostic team and that a child would be tested by a qualified psychologist before the initiation of Specific Learning Disability examination. It has been further assumed that if the psychological examination were to take place, then the Wechsler Intelligence Scale for Children would be included as part of the examination because this is a superior and
generally accepted test of intelligence. However, if for some reason, psychological services are not available, the Wechsler Intelligence Scale for Children should be given as part of the total Specific Learning Disabilities test battery.

In summary, The Frostig, Bender and Slingerland Tests have been selected as the measures of part-whole visual motor perception to be included in the final battery.

Grids 37 and 38—Visual-Vocal Discrimination and Visual-Vocal Perceptual Constancy
No formal or informal tests of these functions have been incorporated in these grid sections because it is difficult to delineate the tasks which seem to measure these functions.

Grid 39—Visual-Vocal Figure-Ground Perception
Two formal measures of this function incorporated into this grid are the Cruickshank Syracuse Figure-Ground Test and the Strauss and Lehtinen Visual Figure-Background Test. Both of these measures provide no norms or reliability data. They both have been validated as tests which differentiate
between brain injured and normal subjects. The Syracuse includes items which are more difficult than the items on the Strauss Test. The Strauss Test has been chosen for the final test battery because the material is less expensive and less cumbersome to manipulate.

**Grid 40--Visual Vocal Closure**

The Wechsler Intelligence Scale for Children Picture Completion Subtest is the only formal test incorporated into this grid section. If this test has not already been administered as part of a psychological examination, the remedial therapist should administer this test in cases where the child has failed other visual closure of figure-ground tests included in the final grid system. No test of this function was included in the final battery.

**Grid 41--Part-Whole Visual Vocal Perception**

No formal tests of this function have been incorporated into this grid segment. An informal test of this function has been developed which should be administered during remedial therapy if the subject has
failed other tests in the visual-vocal or part-whole perception areas.

Grids 42 Through 45—Auditory-Motor Discrimination, Auditory-Motor Constancy, Auditory-Motor Figure-Ground Perception and Auditory-Motor Closure
No formal tests have been incorporated into these grids. No informal tests have been devised because it is difficult to delineate the tasks which seem to be associated with these functions.

Grid 46—Part-Whole Auditory-Motor Perception
No formal tests of this function are available. No formal or informal test of this function was included in the final battery. An informal measure has been developed which should be administered during therapy if the subject has failed other auditory perceptual tests included in the final battery.

Grid 47—Auditory-Vocal Discrimination
No formal tests of this function are incorporated in this grid section. An informal test of this process has been
developed for the final battery, and has been included in the final battery because it seems to measure functions involved in learning to read. This test is called The Informal Sound Identification Test.

**Grid 48—Auditory-Vocal Perceptual Constancy**

This grid segment includes no formal tests. No formal test are suggested because it is difficult to identify the tasks which seem to represent this function.

**Grid 49—Auditory-Vocal Figure-Ground Perception**

This grid segment contains no formal measures. An informal measure of this function, The Informal Auditory-Vocal Figure-Ground Perception Test, has been developed and should be administered during therapy if the subject has failed the auditory-vocal tests incorporated in the final grid system. No formal or informal test has been included in the final battery.

**Grid 50—Auditory-Vocal Perceptual Closure**

The ITPA Auditory Closure Test is a standardized measure of this function and is included in the final test battery. This was the only
test in this grid segment.

**Grid 51—Auditory-Vocal Part-Whole Perception**
This grid segment contains no formal measures. No informal tests have been developed because it is difficult to identify the tasks which seem to represent this function. No formal or informal tests of this function were incorporated in the final battery.

### 2. Memory

**Grid 52—Tactile Long Term Memory**
The tests incorporated into this grid system are the Finger Agnosia, Astereognosis, and Finger Tip Writing Subtests from the Halstead Modification of the Halstead-Wepman Aphasia Test and The Tactile Agnosia Subtest from the Eisenson Aphasia Test. None of the tests have norms; all are economical in terms of cost and administration time; none of the tests have any reliability or validity data for the individual tests. All the tests, with the exception of the Eisenson Aphasia Test, call for the naming of numbers, coins, or figures. Some of the students being tested may not know the numbers, names, coin denominations or the finger names. The
Eisenson Aphasia Test has been chosen because it involves naming only familiar figures.

**Grid 53—Tactile Short Term Memory**

The formal measure of this function incorporated into the grid is the Modified Halstead Tactual Performance Test—II. The Halstead Tactual Performance Test has norms for older children and has been validated as a measure which distinguishes between brain damaged and normal subjects. This test has been selected for inclusion in the final battery with one slight modification. The form board used in the Tactile Discrimination Test (grid one) has replaced the relatively expensive Seguin Goddard Form Board included as part of the Halstead Tactual Performance Test.

**Grid 54—Visual Long Term Memory**

No formal measures of this function have been identified for incorporation into this grid. An informal measure of this function has been developed and should be administered during therapy if the subject fails other visual memory tests included in the final
battery.

Grid 55—Visual Short Term Memory

The alternative measures of this function are the ITPA Visual Sequential Memory Test, The Bannatyne Visuo-Spatial Memory Test, The Durrell Visual Memory Test, Slingerland Screening Test—Three and The Leiter International Performance Scale--Subtest XIV-3. The only standardized measures of this function is the ITPA-3 and thus, this measure has been included in the final test battery.

Grid 56—Auditory Long Term Memory

No formal tests of this function are included in this grid. The informal test incorporated into this grid, called The Informal Auditory Long Term Memory Test should be administered during remedial therapy if the subject has failed the auditory motor, auditory vocal and auditory visual long term memory tests which have been incorporated in the final test battery.

Grid 57—Auditory Short Term Memory

The formal test included in this grid segment is the Basic Concept Inventory—
Part Three--Number Nineteen. No norms have been developed for this test. Although the authors indicated that this test is suitable for older children who are slow learners, the test tasks are relatively simple and appear more appropriate for kindergarten and first grade children.

The Informal Buzzer Test I incorporated in this grid segment, was developed for use in the final battery to provide items which vary in difficulty from relatively simple to more complex test tasks.

**Grid 58--Vocal Long Term Memory**

The Ilg and Ames Naming Animals Test from the Developmental Examination Tests is the only formal measure of this function incorporated in this grid segment. There are norms available for this test and the validity and reliability of this test have been fairly well established. This test has been incorporated in the final grid.

**Grids 59, 60 and 61--Motor Long Term Memory, Vocal Short Term Memory and Motor Short Term Memory**

These grids have been deleted from the final test battery because no formal measures are
available and because it is difficult to develop an informal test to measure memory unless the subject uses the visual and auditory channels as well as the motor channel when answering test items.

**Grid 62—Auditory-Visual Long Term Memory**

The formal test alternatives included in this grid segment are the Grammatic Closure Subtest from the ITPA, The Halstead Speech Sounds Discrimination Test, The Auditory Memory Test from the Slingerland Screening Tests, and Letter Sounding Tests V-2 and VI-2 from the Gates McKillop Reading Diagnostic Tests.

The Halstead Test is extremely long and is only suitable for older children. The Slingerland Test has not been standardized. Therefore, both of these tests have been excluded as alternatives for the final battery.

Both of the remaining alternatives have been included in the final battery because they are standardized measures of two distinct functions. The ITPA Grammatic Closure measures the child's automatic recall
of familiar grammatical forms while the Gates Tests measure the child's ability to learn sound symbol relationships which are not reinforced daily as part of the child's automatic pattern of communication.

**Grid 63—Auditory-Visual Short Term Memory**

Since no formal measures have been incorporated into this grid segment, the Informal Smith Buzzer Test V has been developed for the final battery.

**Grid 64—Visual-Motor Long Term Memory**

The two formal alternative measures in this grid are the Math Examples from The Halstead Adaptation of the Halstead-Wepman Aphasia Test and the Coding Test from the Wechsler Intelligence Scale for Children.

The WISC Coding Subtest has been selected for the final battery because there are no norms available for the Halstead Test. This was the only economical, easy to administer, standardized measure available and since it required retaining visual stimuli for a longer period of time than many short term visual memory tests, this measure has been included in the final
battery as a measure of long term visual-motor memory.

Grid 65—Visual-Motor Short Term Memory

The alternative measures of this function are the Knox Cube Subtest from the Arthur Point Scale, the Berea Visual Motor Gestalt Test, the Visual Memory Subtest from the Slingerland Screening Test, The Durrell Visual Memory Test, The Designs Subtest from the Detroit Test of Learning Aptitude, The Visual III(4b) Subtest from the Ilg and Ames Developmental Examination Tests, and The Benton Visual Retention Test (Administration A).

The Knox Cube, Slingerland, Berea, and Durrell Tests have been eliminated as acceptable alternatives due to lack of norms and proper standardization.

The Detroit Designs Subtest is composed of three parts. Part one deals with perception whereas parts two and three deal with memory. General norms have been established for all three tests in the design section, but no specific norms have been designed exclusively for the memory sections. Therefore,
this test is not an acceptable alternative for the final battery since there are other measures with appropriate norms available.

The Benton Visual Retention Test and the Ilg and Ames Visual Subtest are the remaining two alternative measures under consideration for inclusion in the final battery. The Benton has been chosen because it has been validated as a measure of visual-motor memory which differentiates between brain damaged and normal subjects. The Ilg and Ames Subtest has not been selected for the final battery because no validity data is available showing that it differentiates either between brain damaged and normal subjects or between high and low achievers in reading and mathematics. One disadvantage of the Benton is that no age norms are available for the six and seven year age levels. Therefore, it was necessary to set arbitrary cut off points when scoring for these age levels.

**Grid 66--Visual-Vocal Long Term Memory**

The formal test alternatives for this grid are the Reading Items from Halstead's Modification of the Halstead-Wepman Aphasia

The first two measures have been eliminated as alternatives for the final battery due to the unavailability of norms.

The third alternative, the Ilg and Ames Test, has been eliminated because of inadequate normative data. The only normative data available for this test is the percentage of correct responses made by youngsters in each age group. It, therefore, becomes difficult to establish cut off points because no information is provided to indicate the correct number of responses typical for each age group.

The Wide Range Achievement Reading Test A has been selected for inclusion in the final battery because standard score norms are available for the subtest and because the reliability and validity data are excellent. Another advantage of using this test is that it includes a letter naming test for children who are unable to read words. If a child above the first grade level who has had the
opportunity to learn has failed to memorize letters then he has a possible visual memory problem.

Grid 67--Visual-Vocal Short Term Memory

The formal test alternatives in this section are the Visual Attention Span for Objects and Visual Attention Span for Letters Subtests from the Detroit Tests of Learning Aptitude. The Detroit Battery is a well standardized measure of intelligence with age norms provided for each subtest. Both subtests have been included in the final battery. The Naming Objects Subtest should be administered to children who do not know the names of the lower case letters whereas the Naming Letters Subtest should be administered to children who do know the names of these letters.

Grid 68--Auditory-Motor Long Term Memory

The alternative measures in this grid are the Spelling and Writing Sentence Components of the Halstead Modification of the Halstead-Wepman Aphasia Test, the Auditory Memory Subtest from the Slingerland Screening Test, The Writ-Name and Address Test from the Ilg
and Ames Developmental Examination Tests and Spelling Subtest from the Durrell Analysis of Reading Difficulties.

The Halstead and Slingerland subtests can be eliminated as alternatives because no norms have been developed for these specific tasks.

When comparing the Durrell Spelling Test and the Ilg and Ames' Writing Name and Address Test, the Ilg and Ames is superior in terms of reliability and validity data and economy of administration time while the Durrell is slightly superior in terms of the type of normative data provided. The Ilg and Ames norms indicate the percentage of correct responses made at each age level. Therefore, it becomes necessary to establish the level at which the child should be able to perform these tasks based on the percentage of information provided in the test manual. The Durrell age norms are based on time factor and not on number of items correctly answered. Durrell's failure to take the number of correct responses into consideration limits the usefulness of these norms. Therefore, based on the above considerations, the Ilg and Ames
Tests have been chosen for the final test battery.

Grid 69—Auditory-Motor Short Term Memory

The alternative formal measures for this grid are the Copying Tapping Pattern Subtest from the Basic Concept Inventory and the Imitating Tapped out Sound Sequences Test from the deHirsch Test Battery. These tests lack adequate norms and reliability data. The deHirsch test was found to be an adequate predictor of future reading success. No validity data was available for the Basic Concept Inventory Subtest.

A modification of the deHirsch Test has been developed for the final battery. The modification involves the use of a buzzer set for tapping out sound sequences. This test has been called the Informal Buzzer Test VI.

Grid 70—Auditory-Vocal Long Term Memory

The formal measures included in this grid are the Oral Spelling Components from the Halstead Modification of the Halstead-Wepman Aphasia Test and the Eisenson Auditory Agnosia Test. Both measures have no norms or reliability
and validity data available. Since poor spelling reflects a poor visual memory,¹ as well as a poor auditory memory, the Eisenson Aphasia Test is a more appropriate measure for use in the final battery because these test tasks do not involve the use of the visual modality. It is possible that the Eisenson Test tasks will not discriminate between good and poor readers due to the simplicity of the test items. If this occurs, then a more complex informal measure of this function should be substituted for the test as part of the Specific Learning Disabilities diagnosis. The Eisenson Aphasia Test has been selected for inclusion in the final test battery.

Grid 71—Auditory-Vocal Short Term Memory

The alternative measures incorporated into the grid are The Terman and Merrill Digit Memory Span Lists, the Echolalia Test from the Halstead Modification of the Halstead-Wepman Aphasia Test, The Echolalia Test from

the Slingerland Screening Test, the Monroe Blending Test, the Gates Blending Test, The Auditory Attention Span for Unrelated Words and Auditory Attention Span for Related Syllables from The Detroit Learning Aptitude Test, The Rosewell Chall Auditory Blending Test, the Wechsler Intelligence Scale for Children Digit Span Subtest and the ITPA Sound Blending and Auditory Sequential Memory Subtests.

The Slingerland and Halstead Subtests have been eliminated as alternatives for the final battery because no norms have been developed for these measures.

Since The Wechsler Intelligence Scale for Children and ITPA are the only tests from the group which have standard score norms developed for their subtests, alternative measures with age or grade norms have not been considered for inclusion in the final battery.

The Sound Blending and Auditory Sequential Memory ITPA subtests have been chosen for the final battery because they measure not only digit span memory as in the Wechsler Intelligence Scale for Children, but
also Sound Blending which is not evaluated in the Wechsler Intelligence Scale for Children. Sound blending skill is an important aspect of learning to read and thus should be included in an auditory memory test. Another reason for the selection of the ITPA is that the scores on the ITPA subtests can be compared to determine whether a person with poor digit recall also has difficulty in blending sounds into words.

Grid 72--Tactual Concept Formation

Measures of this function have not been included in the final battery due to the unavailability of formal or informal test material to evaluate this function.

Grid 73--Visual Concept Formation

The alternative measures available for measuring this function are the Halstead Categories Test, the ITPA Visual Reception and Visual Association Subtests, the Detroit Learning Aptitude Pictorial Opposites Subtest 3a, The Goldstein-Scheerer Object Sorting Test, The Gleb Goldstein-Scheerer Color Sorting Test, The SRA Primary Mental Abilities Intermediate Reasoning Subtest, The Raven

The Gleb Goldstein-Scheerer Color Sorting Test and The Goldstein-Scheerer Object Sorting Test can be eliminated as alternatives for the final test battery because no norms have been developed for these tests. The Raven Progressive Matrixes can be eliminated as an alternative for the final battery because, although the norms have been developed for the total test, no norms are available for the concept items. The Detroit and the Kuhlmann-Finch Tests have age norms available but can be eliminated because other alternatives offer standard score norms. The two tests remaining in the grid as alternatives for the final battery are the Primary Mental Abilities and ITPA Subtests. Both of these tests are acceptable alternatives for the final test battery based on the criteria presented in the beginning of this chapter. The writer has selected the ITPA Subtests for the final battery because these tests are part of a total battery of twelve tests used to identify deficiencies in various linguistic functions. Since standard score norms are available for
this test battery, it is possible to compare a subject's performance in these twelve areas and then to identify apparent areas of weakness.

**Grid 74—Auditory Concept Formation**

The alternative measures in this grid include the ITPA Auditory Reception Subtest and The SRA Primary Mental Abilities Intermediate Reasoning Subtest. Again, as in the preceding grid, both of these measures are acceptable alternatives. The ITPA subtest has been selected for the final battery for the same reasons outlined in the grid segment seventy-three above.

**Grid 75—Vocal Concept Formation**

The ITPA Verbal Expression Subtest is the only alternative incorporated in this grid segment. This test does incorporate a visual component. However, the test has been included in the final battery as a measure of vocal concept formation as it is predominantly a measure of the subject's ability to express himself verbally.

**Grid 76—Motor Concept Formation**

No formal or informal tests have been...
developed to measure this function.

Grid 77—Auditory-Visual Concept Formation

The alternative formal measures of this function are the Peabody Picture Vocabulary Test, Finding Things Described Subtest from The Basic Concept Inventory, The SRA Primary Mental Abilities Primary and Intermediate Verbal Subtests, and the Full Range Picture Vocabulary Test.

The Basic Concept Subtest has no normative data, and, thus, can be eliminated as an alternative for the final test battery. The Full Range Picture Vocabulary Test has age norms while the other alternatives have standard score norms and, thus, this test can be eliminated as an alternative measure for the final battery.

The final two alternatives, The Peabody Picture Vocabulary Test and the Primary Mental Abilities Subtest, both have standard score norms and are economical in terms of scoring and administration time. However, the Peabody Picture Vocabulary Test has superior reliability and validity data and, therefore, has been chosen for the final
battery.

**Grid 78—Visual-Motor Concept Development**

The alternative measures of this function incorporated in this grid segment are the Healy Picture Completion Subtest from the Arthur Point Scale, ten subtests from the Leiter Scale, and the ITPA Visual Association Subtest.

The Leiter has no norms for each subtest and, therefore, can be eliminated as an alternative for the final battery.

The Healy Subtest from the Arthur Point Scale is too expensive and, thus, can also be omitted as an alternative for the final battery.

The remaining alternative, the ITPA Visual Association Subtest, has been selected for the final battery because it meets all of the criteria presented at the onset of this paper.

**Grid 79—Vocal Concept Development**

The alternative measures in this grid are The Strauss and Werner Object Sorting Test and The Goldstein Scheerer Color-Form Sorting Test.
The Strauss and Werner Object Sorting Test can be eliminated as an alternative for the final battery because it would be extremely time consuming to classify the fifty-six objects included in the test and because of the lack of norms and reliability data.

The Goldstein Scheerer Color-Form Sorting Test has been selected for the final battery, in spite of its many limitations in terms of lack of norms and adequate reliability and validity data, because this test is economical in administration and scoring time. This test has been modified as, in addition to the sorting tasks, the subject must also verbalize the concepts involved.

Grid 80—Auditory Vocal Concept Development

The alternative measures incorporated in Grid Eighty are the deHirsch Categories Test, The Verbal Opposites and Likenesses and Differences Subtests from the Detroit Battery. The Similarities and Vocabulary Subtests from the WISC and the Auditory Association Subtest from the ITPA.
The deHirsch Categories Test can be omitted as an alternative for the final battery because its norms are only suitable for very young children which limits its use with the total elementary school population.

The Detroit Subtests use age equivalent norms, whereas the remaining alternatives use standard score norms. Thus, the Detroit Subtests can be eliminated as alternatives for the battery.

Both the WISC and the ITPA Subtests are acceptable alternatives for the final battery based on the selection criteria. The ITPA has been selected for the final battery for reasons outlined in grid number seventy-one. Refer to this grid segment for further information.

Grid 81—The ITPA4—Auditory Association is the only formal test incorporated into this grid segment. Therefore, this test will be included in the final battery.

Summary

The tests which have been selected for the Specific
Learning Disabilities Test Battery appear in their appropriate grid segments in Grid B below. Table B-1 below presents a summary sheet which delineates the extent to which the tests in the final SLD Test Battery meet the four selection criteria established in Chapter Four.

The final battery consists of tests or subtests to measure approximately fifty percent of the process modality combinations represented in the grid. It should take between four and five hours to administer this test battery.
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<table>
<thead>
<tr>
<th>Modalities →</th>
<th>Receptive Modalities</th>
<th>Expressive Modalities</th>
<th>Integration of Receptive and Expressive Modalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processes ↓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Textile</td>
<td>Visual</td>
<td>Auditory</td>
</tr>
</tbody>
</table>
| Perception  | Holstead Test; verbal & form reasoning, tests 1, 2, 3, 4, 5; 4.7; good predictor of damage | Visual: 
| Discrimination | 1. Excellent          | Auditory: 
| Perception  | 2. A - 1.72 - 50 | Vocal: 
| Constancy   | 3. Age norms | Motor: 
| Perception  | 4. Age norms | Visual: 
| Figure-Ground | Same as Grid 7 | Auditory: 
| Perception  | Same as Grid 7 | Motor: 
| Closure     | Modified 15 | Visual: 
| Perception  | ITPA - 7 | Auditory: 
| Part-Whole  | Same as Grid 55 | Motor: 
| Memory      | Modified 11 | Visual: 
| Long Term   | ITPA - 11 | Auditory: 
| Memory      | Same as Grid 55 | Motor: 
| Short Term  | Same as Grid 1 | Visual: 
|             | Same as Grid 57 | Auditory: |

Continued on next page.
GRID B-1 Continued

<table>
<thead>
<tr>
<th>Concept Formation</th>
<th>ITPA 1.6</th>
<th>ITPA 1</th>
<th>ITPA 2</th>
<th>PPVT 1-2</th>
<th>ITPA 10</th>
<th>Goldstein 77</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same as Grid 55</td>
<td>Same as Grid 55</td>
<td>Same as Grid 55</td>
<td>Same as Grid 55</td>
<td>Same as Grid 55</td>
<td>Same as Grid 55</td>
<td>Same as Grid 55</td>
</tr>
</tbody>
</table>

Key to Interpreting Summary Sheet

(The criteria are presented in each grid segment in the order that they are outlined below.)

1. Practicality—Practicality is rated as follows:
   - Excellent—Practical in cost, scoring and administration time
   - Good—Practical in cost and scoring or administration time
   - Fair—Practical in scoring and administration time only
   - Poor—Practical in only one area

2. Validity—Validity coefficients are presented when the information is available. The following abbreviations will be used when referring to type of validity established for each test.
   - C—Concurrent Validity
   - P—Predictive Validity
   - Const—Construct Validity
   - Con—Content Validity

3. Reliability—Reliability coefficients are presented when the information is available. The methods used for estimating reliability will be designated by the letter preceding each procedure outlined below.
   a. Test-retest with time interval—alternate forms
   b. Test-retest with no time interval—alternate forms
   c. Test-retest with time interval—same form
   d. Test-retest with no time interval—same form
   e. Split-half reliability

4. Norms—The following abbreviations are used to designate norms.
   - Standard score—SS
   - Percentile—%ile
   - Age equivalent—age
   - Grade equivalent—grade

5. A line (____) will be used to designate unavailability of information in the areas outlined below.
CHAPTER V

RESEARCH DESIGN, SAMPLE SELECTION, ADMINISTRATION, STATISTICAL TEST PROCEDURE, AND RESULTS OF THE SLD BATTERY'S ABILITY TO DIAGNOSE AND OR PREDICT SPECIFIC LEARNING DISABILITIES

The SLD Battery has been developed as a diagnostic tool to identify specific cognitive process deficiencies that are contributing to reading failure. As suggested in Chapter One, the information gained through administration of the battery should serve as the basis for planning an effective remedial program for the child with Specific Learning Disabilities.

One purpose of the research study in this thesis is to determine whether or not students with severe learning problems do exhibit failures in the processes measured by the tests in the battery to a greater extent than students in the same IQ range who are not failing academically. If there is a significant correlation between achievement in reading and performance on the tests on the SLD Battery, then there is some indication that the tests do, in fact, differentiate between high and low achievers in reading.

Other questions to be answered when evaluating the effectiveness of this battery as a diagnostic tool concern first, each test's ability to measure separate functions and second, the battery's ability to be shortened without
destroying its effectiveness as a diagnostic tool. Third, has any significant bias developed in the study on the basis of parameters such as sex, age, grade level or IQ? Fourth, patterns of failure on the tests in the battery for high and low achievers based on age and IQ will be examined. Finally, two tentative shortened test batteries will be developed.

The purpose of the first shortened battery will be to attempt to identify failures in learning which are related to maturation. The purpose of the second shortened battery will be to investigate the causal linkage between SLD and related emotional problems. The development of these batteries should facilitate the diagnosis and treatment of disabled learners.

The SLD Battery was not designed to be administered to every child in a particular school or on a system-wide basis as a means of predicting future reading failure. Prediction of future reading failure is an important and worthy objective that ought to be pursued. Early identification of possible learning problems and immediate attempts to remediate these problems will help avoid the development of related emotional problems.\(^1\) This battery, as a subsidiary benefit, may make a contribution in the area of prediction of future reading failure even if not constituted for this purpose.

Finally, the battery as presently constructed, does not represent the final form for the purposes of this paper. The results of the analysis of the SLD Battery will tend to expose

\(^1\)Related emotional problems usually accompany and complicate the academic problems of children who have a history of failure in the school situation.
weaknesses in the battery as presently constituted. Chapter Six will address itself to needed alterations exposed as a result of the analysis in this chapter.

The remainder of this chapter will deal with the research design, research administration, results, and discussion of results.

Research Design

The rationale upon which the SLD Battery has been constructed was that if we are to attack effectively SLD problems, we must identify logically the specific cognitive process deficiencies which are causing the learning failures in students who, by the normal criteria such as IQ, should not be exhibiting failures.

The field research will address itself to the following questions: Is a battery constituted on this systematic rational basis a useful diagnostic tool? Does it identify Specific Learning Disabilities in children with serious reading problems who are not responding to current diagnostic and remedial techniques? Has any significant bias occurred in this study because of variations in independent variables such as age, sex, grade level or IQ? Finally, do children with SLD problems exhibit specific patterns of errors based on age and IQ?

A primary testing of the SLD Battery was conducted in the fall and winter of 1969-1970 to answer the above questions.
The subjects were selected from the student population in the second through fourth grades located in western Massachusetts. The location of the population stretched from Pittsfield to Ware, Massachusetts. The major concentration tended to be in the Greater Springfield Area. Data concerning the geographical distribution of the study sample will be presented below in Table 5.1.

**TABLE 5.1**

Geographical Distribution of the Study Sample

<table>
<thead>
<tr>
<th>City or Town</th>
<th>Number of Subjects</th>
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<tbody>
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<td>Agawam</td>
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<td>Chester</td>
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<tr>
<td>East Hampton</td>
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<td>East Longmeadow</td>
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<td>Holyoke</td>
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<tr>
<td>Lee</td>
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<tr>
<td>Ludlow</td>
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<tr>
<td>Pittsfield</td>
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<tr>
<td>Springfield</td>
<td>20</td>
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<tr>
<td>Ware</td>
<td>5</td>
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<tr>
<td>Westfield</td>
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</tbody>
</table>

There were sixteen members in the field research team. The research team selected to administer the SLD Test Battery was, for the most part, composed of teachers presently employed in the western Massachusetts public school systems. Three of the sixteen field researchers were not currently employed in the school systems. Fifteen of the members of the research team were, in addition, graduate students at American International College or surrounding institutions and were specializing
in the field of learning disabilities. All but three of the currently employed teachers that made up the research team were employed as specialists in the area of remedial reading or learning disabilities. All but three of the members of the research team had received training and were certified as being qualified to administer the ITPA. The three persons who were not certified to administer the ITPA were assisted by a certified team member when administering this battery.

All the members of the research team were enrolled in a graduate course at American International College which was conducted by this writer. This course, entitled, Education 435: Problems in Diagnosing Specific Learning Disabilities, was a graduate workshop designed to provide specialized training and field research in the identification of SLD. The administration of the SLD Battery was incorporated as a major portion of this course. This procedure was useful because it provided a measure of control and discipline over the field researchers. It was also useful because the field team was enthusiastically interested in the SLD field and in the project.

A series of nine formal instructional sessions, two-and one-half hours in length, were held in October and November, 1969 for the purpose of training the research team to administer and score the tests in the battery. The objective of these sessions was to attempt to control tester error.
During these sessions the research team was presented with detailed instructions concerning the administration and scoring procedures for each test in the CID Battery. Between sessions the research team administered the tests covered in the previous session on a trial basis. In the subsequent session the problems experienced concerning administration of these tests were identified and solved. A more detailed description of each test session is presented in Appendix F below.

Procedures for the selection of subjects were also delineated at the formal instructional sessions. These procedures will be discussed below.

The sample groups were to be selected on the basis of the following criteria:

1. The subjects selected were to have an IQ range between ninety and one hundred-twenty. The object of this requirement was to meet the average and above average IQ criterion specified in Chapter One above. The cut-off of one hundred twenty was inserted to avoid extreme cases in the upper range of intelligence scores.

2. The subjects could not have any gross neurological, psychological, or sensory defects. Children in special classes for the blind, deaf or emotionally disturbed were excluded from the sample. Although children with gross problems, such as those presented
above, are not found in the typical classroom, each subject's school records were checked to rule out any possibility of severe defect. The object of this screening was to again meet the criterion set forth in Chapter One above.

3. As mentioned above, the subjects were to be selected from the second through fourth grades only. The objectives of this requirement were to provide a reasonably homogeneous sample population and because this is the time when remediation should be administered to avoid secondary consequences.

4. The sample subjects were chosen on the basis of reading level. Two stratified groups were selected; those who were high achievers in reading and those who were low achievers in reading. The following specific criteria were used to select the high and low achievers.

   a. The subjects chosen for the high group had to be in the high reading group. The subjects chosen for the low group had to be in the low reading group.

   b. The subjects chosen for the high group had to rank in the upper twenty-five percent of their class in reading based on standardized reading tests. The subjects chosen for the low group had to rank in the lower twenty-five percent of their class based on standardized reading test scores.

   c. The subjects chosen for the high group must have achieved one-half year or more above grade level scores on the Gates Oral Reading Test. The subjects chosen for the low group must have achieved three-fourths of a year or more below grade level scores.
4. (Continued)

As a final check on the selection criteria stated above, the Bond and Tinker Formula for Determining Expected Reading Grade was administered. The formula is as follows:

\[
\text{Expected Reading Grade} = (\text{IQ} \times \text{years in school} + 1.0)^2
\]

Arbitrary cut-off points were established concerning the degree of reading disability that would be used to define a disabled reader. The cut-off points are presented in Table 5.2 below.

**TABLE 5.2**

<table>
<thead>
<tr>
<th>Verification Criterion for Selection of Disabled Readers by Grade Level Using Formula V.1 Above.</th>
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</thead>
<tbody>
<tr>
<td>Grade Level</td>
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<tr>
<td>3</td>
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<td>4</td>
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</tbody>
</table>

The above final check was added to make doubly sure that the proposed subjects were not incorrectly grouped in the reading area.

\[1\] Guy I. Bond and Miles A. Tinker, Reading Difficulties: Their Diagnosis and Correction (New York: Appleton-Century-Crafts, 1967), p. 91.
Field Research Administration

The actual field selection, testing of subjects, and coding of data was accomplished during December and January, 1969-1970.

The field activity progressed smoothly, for the most part, although specific problems did arise which required some variance in the procedure. These problems will be identified briefly below.

The members of the field research team were not given specific detailed instructions as to the procedure for obtaining candidates to meet the criteria presented above. This procedure was omitted because it became apparent early in the original design stage that the field research team was going to have to obtain the subjects from available sources. As most members of the research team were presently working in a number of different school systems, the available sources of subjects were located in each team member's respective school system. Due to the limitations in funds and logistic problems no other procedure was feasible. Most of the school systems involved in the study had their own individual formal and structured rules concerning procedures for selecting candidates for inclusion in the study. It should be stressed that the criteria for the actual selection of candidates discussed above in the design section were strictly adhered to during the field execution stage.
As discussed in Appendix F below, the research team was instructed to hold the test sessions in a quiet environment with just the tester and testee present. The interest factor was stressed.

The field researchers were carefully instructed to avoid opinions whenever possible when coding the results in order to reduce the halo effect. The research team administered the test independently and, therefore, there is no way of determining whether or not they adhered to the exact instructions. It should be stressed that in all cases the researchers were dedicated and conscientious persons and that there is a very high degree of probability that they did follow the instructions accurately.

Results of the Study

Description of the Population

The population from which the sample was taken was composed of students between the ages of seven and eleven who were located in urban, suburban and rural settings in western Massachusetts. The sample of students was chosen on the basis of achievement in reading. An attempt was made to control IQ by limiting the range from ninety to one hundred-twenty. All other parameters, such as age, sex, grade and socio-economic, class, were assumed to be selected on random basis by the field research team within the framework of the IQ and
reading ability criteria outlined above.1

The data resulting from the study were analyzed to attempt to identify any systematic bias in the parameters assumed to be held constant. The statistical results of this aspect will be discussed below.

The (t) test was used to identify any significant differences between the high and low achievement groups in reading that might be due to IQ, age, and grade. The resulting (t) values are listed below in Table 5.3.

**TABLE 5.3**

<table>
<thead>
<tr>
<th>Item</th>
<th>T Ratio</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>IQ</td>
<td>4.68</td>
<td>Significant at .01 Level</td>
</tr>
<tr>
<td>Age</td>
<td>.98</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Grade</td>
<td>.38</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

There were no significant differences between high and low achievement groups with reference to the age and grade parameters. This indicates that age and grade bias was adequately controlled in the study.

1Detailed discussion of the selection and training of the field researchers and field research administration is discussed on pages 143 to 148 and in Appendix F.
As noted in Table 5.3 above, there was a significant difference between the mean IQ scores of high and low achievement groups. The significant (t) ratio finding is probably the result of the fact that most of the functions tested in the Slosson Intelligence Test are also functions tested by the SLD Battery. The SLD Battery, of course, measures a great many cognitive processes that are not included in the Slosson Intelligence Test. The actual relationship between reading proficiency and IQ for each of the tests will be presented and discussed in the next section.

The relationship between high and low reading achievement and sex was examined through use of the Chi Square ($x^2$), because of the implicit dichotomous nature of this factor. The Chi Square was 3.16 which was insignificant at the .05 level. We can therefore assume that bias due to differences in sex was adequately controlled in the study.

Insufficient data was available to test for bias resulting from the socio-economic factors.

**Tester Bias**

Significant tester bias was examined by determining the coefficient of multiple correlation between the twelve ITPA sub-tests and reading for each tester. These tests were...

---

1 Personal interview with Dr. Arnold Well, PhD, Professor of Psychology, University of Massachusetts, on 5/20/76.
used in the correlation because they had equal standard score units and were standardized on the same population. Other tests in the study were not standardized on the same population and were therefore omitted. This technique was selected as it was the most sophisticated available. The data did not conform to the basic assumptions concerning randomness necessary for other statistical techniques such as analysis of variance.

Table 5.4 below presents the actual multiple correlations obtained for fifteen of the sixteen testers. One tester was omitted because she tested a smaller number of subjects which would tend to distort the findings.

**Table 5.4**

Coefficient of Multiple-Correlation for Each Tester on the Twelve ITPA Sub-Tests.

<table>
<thead>
<tr>
<th>Tester</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.92</td>
</tr>
<tr>
<td>2</td>
<td>.88</td>
</tr>
<tr>
<td>3</td>
<td>.82</td>
</tr>
<tr>
<td>4</td>
<td>.95</td>
</tr>
<tr>
<td>5</td>
<td>.99</td>
</tr>
<tr>
<td>6</td>
<td>.94</td>
</tr>
<tr>
<td>7</td>
<td>.84</td>
</tr>
<tr>
<td>8</td>
<td>.90</td>
</tr>
<tr>
<td>9</td>
<td>.87</td>
</tr>
<tr>
<td>10</td>
<td>.91</td>
</tr>
<tr>
<td>11</td>
<td>.96</td>
</tr>
<tr>
<td>12</td>
<td>.98</td>
</tr>
<tr>
<td>13</td>
<td>.81</td>
</tr>
<tr>
<td>14</td>
<td>.93</td>
</tr>
<tr>
<td>15</td>
<td>.99</td>
</tr>
</tbody>
</table>
The dependent variable being tested is reading. The independent variables are the ITPA sub-tests. A high correlation coefficient would imply that the tester administering the tests was successful in predicting reading success on the basis of the tests administered.

To measure tester error the standard error of multiple correlation was found by first obtaining the mean of the correlation coefficients presented in Table 5.4 above. The mean was .914. Based on this mean the standard error of the estimate was found to be ±.095. This means that one can expect 2/3 of the sample R's to lie within .095 of the population R. One can also expect that 95 per cent of the sample R's will lie ±.19 of the population R. Using these figures one can assume that the obtained R's are not close to zero or negative correlations.

Inspection of the actual obtained correlation coefficients indicates that all but one of the coefficients lie within one standard error of the estimate. We can conclude on the basis of this technique that no significant bias was the result of tester error at the .05 level.1

Presentation of Percentage Data and Discussion of Cautions That Should Be Used When Interpreting The Data

Results of the tests administered by the research team were recorded on a profile designed for the SLD Battery.

Appendix D presents a sample and description of the procedure for setting up the profile used in the field study. When developing the profile, the change from grade level to age level was made necessary because most of the standardized tests in the 3LD Battery are normed on the basis of age. The Bond and Tinker Formula, described above, which was used in the process of selecting each of the disabled subjects took the age into effect. This original grade level procedure was made necessary because the available reading tests used grade equivalent norms.

Table 5.5 below presents the percentage of high and low achievers that passed each of the tests and the percentage differential between the scores of high and low achievers in reading. If the differential was positive then the high achievers on the average tended to perform better than the low achievers; if the score was negative the low achievers performed better than the high achievers.

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Name of Test</th>
<th>% of High Passing</th>
<th>% of Low Passing</th>
<th>Differential Between H &amp; L Achievers</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Wide Range</td>
<td>97</td>
<td>7</td>
<td>90</td>
</tr>
<tr>
<td>41</td>
<td>Ilg&amp;Ames Writ. Address</td>
<td>75</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>15</td>
<td>Bender</td>
<td>81</td>
<td>33</td>
<td>48</td>
</tr>
<tr>
<td>33</td>
<td>Buzzer V</td>
<td>87</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>17</td>
<td>Slingerland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Copying Test</td>
<td>89</td>
<td>43</td>
<td>46</td>
</tr>
<tr>
<td>34</td>
<td>ITPA 5-Aud. Seg. Mem.</td>
<td>78</td>
<td>35</td>
<td>43</td>
</tr>
<tr>
<td>43</td>
<td>PPVT</td>
<td>87</td>
<td>48</td>
<td>39</td>
</tr>
<tr>
<td>43</td>
<td>Inf. Sound Iden.</td>
<td>87</td>
<td>50</td>
<td>37</td>
</tr>
<tr>
<td>16</td>
<td>WISC Coding</td>
<td>95</td>
<td>59</td>
<td>36</td>
</tr>
<tr>
<td>9</td>
<td>PMA Spatial Rel.</td>
<td>92</td>
<td>56</td>
<td>36</td>
</tr>
<tr>
<td>29</td>
<td>Buzzer IV</td>
<td>94</td>
<td>59</td>
<td>35</td>
</tr>
<tr>
<td>Test No.</td>
<td>Name of Test</td>
<td>% of High Passing</td>
<td>% of Low Passing</td>
<td>Differential Between R &amp; L Achievers</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------</td>
<td>------------------</td>
<td>------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>48</td>
<td>ITPA 4- Aud. Assoc.</td>
<td>89</td>
<td>56</td>
<td>33</td>
</tr>
<tr>
<td>44</td>
<td>ITPA 11-Aud. Clos.</td>
<td>76</td>
<td>43</td>
<td>33</td>
</tr>
<tr>
<td>25</td>
<td>Detroit Letter</td>
<td>89</td>
<td>56</td>
<td>33</td>
</tr>
<tr>
<td>42</td>
<td>Buzzer VI</td>
<td>89</td>
<td>57</td>
<td>32</td>
</tr>
<tr>
<td>32</td>
<td>Gates V-2</td>
<td>95</td>
<td>63</td>
<td>32</td>
</tr>
<tr>
<td>27</td>
<td>Buzzer II</td>
<td>89</td>
<td>57</td>
<td>32</td>
</tr>
<tr>
<td>35</td>
<td>Wepman</td>
<td>86</td>
<td>56</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>Frostig-3</td>
<td>84</td>
<td>54</td>
<td>30</td>
</tr>
<tr>
<td>30</td>
<td>ITPA 9-Gr. Closure</td>
<td>78</td>
<td>50</td>
<td>28</td>
</tr>
<tr>
<td>16</td>
<td>Frostig-5</td>
<td>84</td>
<td>57</td>
<td>27</td>
</tr>
<tr>
<td>11</td>
<td>ITPA 3-Vis. Seg. Mem.</td>
<td>81</td>
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<td>27</td>
</tr>
<tr>
<td>22</td>
<td>ITPA 7-Vis. Closure</td>
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<td>27</td>
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<tr>
<td>13</td>
<td>ITPA 6-Vis. Assoc.</td>
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<tr>
<td>49</td>
<td>Naming Animals</td>
<td>65</td>
<td>41</td>
<td>24</td>
</tr>
<tr>
<td>32</td>
<td>Gates VI-2</td>
<td>92</td>
<td>70</td>
<td>22</td>
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<td>38</td>
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<td>48</td>
<td>20</td>
</tr>
<tr>
<td>50</td>
<td>ITPA 3-Vcr. Exp.</td>
<td>49</td>
<td>30</td>
<td>19</td>
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<tr>
<td>6</td>
<td>Frostig-4</td>
<td>73</td>
<td>54</td>
<td>19</td>
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<tr>
<td>20</td>
<td>ITPA 10-Man. Exp.</td>
<td>87</td>
<td>69</td>
<td>18</td>
</tr>
<tr>
<td>5B-2</td>
<td>Halstead -b-2</td>
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<td>28</td>
<td>18</td>
</tr>
<tr>
<td>47</td>
<td>ITPA 12-Sound Blending</td>
<td>87</td>
<td>70</td>
<td>17</td>
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<td>21</td>
<td>Strauss Figure-Ground</td>
<td>54</td>
<td>37</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>ITPA 2-Vis. Reception</td>
<td>65</td>
<td>48</td>
<td>17</td>
</tr>
<tr>
<td>40</td>
<td>Writing Name (Ilg&amp;Ames)</td>
<td>97</td>
<td>82</td>
<td>15</td>
</tr>
<tr>
<td>36</td>
<td>ITPA Mod. Closure</td>
<td>50</td>
<td>64</td>
<td>-14</td>
</tr>
<tr>
<td>5B-1</td>
<td>Halstead 5-b-1</td>
<td>70</td>
<td>56</td>
<td>14</td>
</tr>
<tr>
<td>8</td>
<td>Frostig-2</td>
<td>65</td>
<td>52</td>
<td>13</td>
</tr>
<tr>
<td>24</td>
<td>Detroit Picture</td>
<td>43</td>
<td>31</td>
<td>12</td>
</tr>
<tr>
<td>45</td>
<td>Eisenson Aud. Ag.</td>
<td>92</td>
<td>80</td>
<td>12</td>
</tr>
<tr>
<td>26</td>
<td>Goldstein Scheerer</td>
<td>60</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>Informal Puzzle</td>
<td>100</td>
<td>89</td>
<td>11</td>
</tr>
<tr>
<td>28</td>
<td>Buzzer III</td>
<td>92</td>
<td>85</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Eisenson Tactile Ag.</td>
<td>97</td>
<td>91</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>Halstead a-1</td>
<td>97</td>
<td>91</td>
<td>6</td>
</tr>
<tr>
<td>19</td>
<td>Benton</td>
<td>89</td>
<td>85</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Hal. Tact. Form Rec.</td>
<td>97</td>
<td>94</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Inf Seg. God. Fr Ed.</td>
<td>100</td>
<td>98</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Halstead a-2</td>
<td>84</td>
<td>89</td>
<td>-5</td>
</tr>
<tr>
<td>37</td>
<td>ITPA-Mod. Blending</td>
<td>57</td>
<td>68</td>
<td>-11</td>
</tr>
</tbody>
</table>
On the basis of the above table, it is clear that there was a wide range of differences in the percentage performance on the tests and also a wide range of differences in the ability of the tests to discriminate between the high and low achievers.

The next sections of this paper will address itself to rationalizing, applying, and analyzing a series of statistical tests designed to evaluate, reduce and indicate specific areas that need improvement in the battery. Before we engage in this activity several cautions should be made explicit.

First, although it was stated on page 151 above that there was a significant difference between the IQ of the high and low achievers, the sample was selected from a fairly homogemeous IQ population. One would expect that on the basis of potential there would be no significant difference between the high and low achievers' performance on the tests administered. Logically, if each low achiever has a small number of Specific Learning Disabilities in terms of cognitive processes, then the low achievers would be expected to do as well on the average as the high achievers on many of the tests. If the low achievers are failing to achieve in school due to a diversity of different combinations of disabilities, then we would expect to find many of the low achievers passing a greater percentage of the tests than if they were, for example, failing from gross process deficiencies.

Secondly, it is conceivable, that many high achievers may have Specific Learning Disability problems. In fact, the scanning of individual profiles indicates that most high
achievers did fail some tests in the battery. This group may be achieving at a higher than average level because they do have fewer problems on the average and because they are better able to compensate for their deficiencies. Effective remediation of the deficient area may even allow this group to achieve at a higher level. The implication in terms of interpretation of the data is that the percentage of the high group passing the test would tend to be reduced to the extent that the high achievers have Specific Learning Disability problems dispersed throughout the cognitive functions being tested.

A third problem with the data concerns the question of what each of the tests is measuring. A determined effort was made in Chapters Three and Four to select and develop tests that are valid measures of specific cognitive processes. In some cases, particularly in the case of the informal tests, a test may not be measuring the cognitive function it is purported to test. In other cases a test may be testing several functions at once.

A fourth problem concerns tests that might be testing the appropriate function but which a very high percentage of both high and low achievers have passed. This may mean that the test is not sophisticated enough or that children with Specific Learning Disabilities are not deficient in these areas.

A fifth problem deals with the establishment of cut-off points. In many of the informal tests, particularly, cut-off
points were established by averaging the medians of the high and low groups. This procedure produced only a rough estimate of the actual norms. 1

A sixth problem concerns tests twenty-four, thirty-six, and thirty-seven. These tests were administered only if the subject qualified by failing another test. The result was that the sample populations in these tests were very small. Another test, number forty-one was only administered to the nine to eleven year old group.

Rationalization. Implementation and Results of Various Statistical Procedures Developed to Evaluate, Reduce and Point Out Areas Needing Improvement in the SLD Battery.

The first statistical procedure that will be dealt with is the coefficient of multiple correlation. The multiple correlation coefficient for the tests in the battery is \(0.9584\) which means that there is an extremely high correlation between the independent variables taken together and the dependent variable, reading success. This estimate was gained through the program EMD03R Multiple Regression with Case Combinations, Version of August 13, 1964, Health Sciences Computing Facility, UCLA. The program was processed at the University of Massachusetts Computer Center, May 2, 1970.

The second statistical procedure that was utilized is the coefficient of multiple determination. The coefficient of multiple determination indicates the proportion of variance in the dependent variable, reading ability, that is explained by the independent variables, the cognitive functions

1This norming technique was used because the limited size of the sample did not allow the use of other more sophisticated techniques.
tested, combined with the regression weights used. As would be expected, the coefficient of multiple determination, which is the square of the multiple correlation multiplied by 100 and stated in percentage terms, is also very high at 91.85%. This means that only 8.15% of the variance is unexplained.

The third statistical measure used to analyze the data is a step-wise regression technique. The step-wise regression formula used in this study is entitled BMD02R Step-Wise Regression, June, 1966, Health Sciences Computing Facility, UCLA. A description of the program will follow:

This program computes a sequence of multiple linear regression equations in a step-wise manner. At each step one variable is added to the regression equation. The variable added is the one which makes the greatest reduction in the error sum of squares. Equivalently it is the variable which has highest partial correlation with the dependent variable partialed on the variables which have already been added; and equivalently it is the variable which, if it were added, would have the highest F value. In addition, variables can be forced into the regression equation. Non-forced variables are automatically removed when their F values become too low.

A multiple correlation increases as the size of the correlations between dependent and independent variables increases and a multiple correlation increases as the size of intercorrelations of independent variables decreases. It is possible for an independent variable to have a very low correlation with the dependent variable but a very high


2Ibid., p. 403.
intercorrelation with other dependent variables. Such a test would have a low value when used as a direct predictive device but high intercorrelation may allow the test to add substantially to the predictivity of other independent variables that are valid.  

When assembling a large number of tests that are validated singly for the prediction of a criterion, such as reading, into a regression equation only four or five tests, when combined, often seem sufficient as a predictive device. Adding tests beyond the point at which all the factors that the tests measure in common with the criterion are covered often merely contributes error variance to the composite. Even before this point has been reached where there is no apparent improvement in prediction, errors have entered the picture to help determine the regression weights.

The Step-wise multiple regression formula used in this study is similar to the Wherry-Doolittle Method for establishment of regression weights.

"In the Wherry-Doolittle Method one starts with the single test that seems to offer most in prediction on the criterion. The method then aids in selection of a second test that will have more to add to prediction when combined with the first. A third can be selected which will add most by way of prediction when combined with the first two, and so on. At each step a shrinkage formula is applied in order to determine whether the shrunken $R$ is appreciably larger than the previous $R$. At the point where no further gain according to these standards is apparent, no more tests are added."

The reason why only five or six tests have seemed to be the limit in a useful battery is because only a limited number of human abilities and other traits that are

1 Ibid., p. 403.
2 Ibid., p. 411.
involved in practical criterion have been represented in the test. Although many tests may have been tried out, the same limited number of fundamental factors have been measured by them and the measurement is duplicated several times over. If a careful study of criterion is made, revealing all the factors that are worth trying to predict, and if there is sufficient variety in the test to take care of all the factors, it will be found that more than four or five tests will be needed. If one knows that there are then traits in the criterion that are worth covering with tests, and if it takes ten tests to do it, then one could put ten tests in a battery and expect that every one would have something to contribute toward prediction. 1

Table 5.6 below, presents the revised battery which resulted from the application of the Step-wise regression technique to the test battery.

Amazingly, the result of this procedure was to retain forty-five of the forty-nine independent variables fed into the program. 2 One possible explanation for the program's failure to substantially shrink the battery is offered by Guilford above. The tests are measuring different functions and have been carefully selected to try to eliminate overlap in the testing of the cognitive functions. The writer believes this to be the appropriate explanation.

The next subject that will be discussed concerns the relationship between reading and the individual tests in the battery. The tests eliminated from the battery presented in Table 5.7 will be examined first. Examination of the simple

---

1 Ibid., p. 412.
2 The ITPA-8 Verbal Expression was accidentally deleted from the program by the Computer Research Center when the data was processed. The Detroit Picture Sub-test was deleted from the program because the size of the sample was too limited to produce valid information in the program.
The authenticity of the individual researcher's interpretation of the data is called into question, and the data from IBM's research is presented here.

**Table 5.6**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t Value</th>
<th>df</th>
<th>Partial Correlation</th>
<th>Stepwise Tolerance</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t Value</th>
<th>df</th>
<th>Partial Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ANALYSIS OF VARIANCE**

- Step 1: Error df 16, Error mean square 69.02949
- Step 2: Error df 15, Error mean square 83.02949
- Step 3: Error df 14, Error mean square 100.02949
- Step 4: Error df 13, Error mean square 112.02949

**Residual**

- Step 1: Error df 16, Error mean square 69.02949
- Step 2: Error df 15, Error mean square 83.02949
- Step 3: Error df 14, Error mean square 100.02949
- Step 4: Error df 13, Error mean square 112.02949

**Multiple R**

- Step 1: Error df 16, Error mean square 69.02949
- Step 2: Error df 15, Error mean square 83.02949
- Step 3: Error df 14, Error mean square 100.02949
- Step 4: Error df 13, Error mean square 112.02949

**Multiple R**

- Step 1: Error df 16, Error mean square 69.02949
- Step 2: Error df 15, Error mean square 83.02949
- Step 3: Error df 14, Error mean square 100.02949
- Step 4: Error df 13, Error mean square 112.02949
correlation relationship between the individual independent variables and the dependent variable reveals that tests twenty-eight, thirty-three, and forty-three have significant correlations with the dependent variable at the one percent level.

**TABLE 5.7**

<table>
<thead>
<tr>
<th>Name of Test</th>
<th>Correlation</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>28, Smith Buzzer Test #2</td>
<td>.281</td>
<td>1% Level</td>
</tr>
<tr>
<td>33, Gates VI-2</td>
<td>.379</td>
<td>1% Level</td>
</tr>
<tr>
<td>43, Smith Buzzer Test #6</td>
<td>.464</td>
<td>1% Level</td>
</tr>
<tr>
<td>27, Goldstein-Scheerer Color Form Sorting Test</td>
<td>.256</td>
<td>5% Level</td>
</tr>
</tbody>
</table>

1. Test of significance was found by use of values of smaller r at the 5% and 1% levels of significance, Table D, page 231 Benton J. Underwood Elementary Statistics.

Included in the revised battery were eleven tests that did not have significant simple correlation with the dependent variable at the 5% level. Discussion of these tests will be reserved until Chapter Six. These tests may make good predictive devices because, as indicated earlier, they add to the predictivity of other independent variables. However, common sense dictates that if these tests are to be used in a diagnostic battery designed to identify Specific Learning Disabilities, then they need substantial improvement. Common sense also indicates that the excluded tests should be included in the battery because they are significantly
correlated with reading and because the step-wise regression was unsuccessful in reducing the battery sufficiently to make the revised process useful as a predictive tool.

The next objective of statistical presentation and analysis is 1) to identify any patterns of success or failure exhibited by the high and low achievers in reading by age groups and 2) to identify patterns of success or failure exhibited by the high and low achievers in reading with high and low IQ's. First the data will be presented in graphic form by score point differences between high and low achievers in each group.

For example, Graph 5.1 presents the score point differential in performance on sub-tests in the SLD Battery for the high and low reading achievement groups in the seven year age range. Population norms are presented as starred points on these graphs. After a brief discussion of the score point differences, the differences will be highlighted by presenting percentage differentials in performance on sub-tests in the SLD Battery.

The differential percentages were found by use of the following formula:

\[
\text{Formula 5.1 Differential Percentage} = \frac{(\text{High} - \text{Low})}{(\text{High} + \text{Low})/2}
\]

The high represents the high group being tested and the low represents the low group being tested whether for reading performance or IQ.

The following criteria will be used in discussing the percentage differential tables by age groups for high and low
achievers: 1) Any test that discriminates above the 75th percentile level for two or more age groups and shows a fairly consistent pattern of ability to discriminate between high and low achievers will be judged as a good discriminator. Inconsistencies in performance by age groups will be noted. 2) Any test that discriminates for two or more age groups at the 50th percentile level and shows a reasonably consistent pattern (For example, see test sixteen, The Frostig Five, Table 5.10) will be judged to be a moderate discriminator. 3) A test, such as test number two on Table 5.8, which falls below the 50 percent level and/or has negative correlations will be judged to be a poor discriminator. Tests that perform well for one age group but show no or negative discrimination ability for the other groups will be judged to be poor discriminators.

The cutoff points at the 75 percent and 50 percent levels are as follows:

TABLE 5.7a

<table>
<thead>
<tr>
<th>Age</th>
<th>Seven</th>
<th>Eight</th>
<th>Nine-plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 percent or better</td>
<td>18</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>50 percent or better</td>
<td>9</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

Graphs 5.1 to 5.3 present score point differentials in performance on the sub-tests in the SLD Battery based on

1See Appendix G for an explanation of the procedure for determining the 75th percentile and 50th percentile discrimination levels.
Score Differential in Performance on Sub-Tests in the SLD Battery Based on Reading Achievement by Age (Age Seven)
Score Differential in Performance on Sub-Tests in the SLD Battery Based on Reading Achievement by Age (Age Eight)
Score Differential in Performance on Sub-Tests in the SLD Battery Based on Reading Achievement by Age (Age Nine-plus)

|---------|--------|--------------|--------------|-----------------|----------|----------------|----------------|-------|

Number in high group - 8
Number in low group - 16

TEST NUMBER

--- High Achievers
--- Low Achievers

# Cut-off
reading achievement for each age group.\textsuperscript{1} The stars by age
age group denote the cut-off points.\textsuperscript{2} Performance above the
cut-off point indicates that, on the average, the group
represented (i.e., high or low achievers in reading by age
group) did better than the average performance expected for
that age group. Performance below the cut-off point indicates
that the group being tested performed below the expected
average performance. The cut-off points were based on popu-
lation data when norms were available.

One observation that can be made on the basis of the score
point differences for low achievers in relation to standardized
norms is that the seven year old group scored below the norms
on eleven of the thirty standardized tests in the SLD Battery.
The low readers in the eight year old range fell below the
norms on nineteen of the thirty standardized tests, whereas
the low readers in the nine-plus age range fell below the
expected performance on twenty-six of the thirty standardized
tests.

In general, the high achievers tended to perform better
on the tests than the low achievers. Further observations
concerning the differences between the high and low reading
achievement groups for ages seven, eight, and nine-plus will
be presented in terms of differential percentages on graphs
5.4 to 5.6 below:

\textsuperscript{1}Due to space limitations actual score points are not
presented on these graphs. See Pages 256b-256d for actual
score points for each test in the battery.

\textsuperscript{2}See p. 256 below for a discussion of cut-off points.
Graph 5.4

Percentage Differential in Performance on Sub-tests on the SLD Battery
Based on Variations in Reading Achievement by Age (Ages Seven)
Graph 5.6

Percentage Differential in Performance on Sub-Tests of the SLD Battery

Based on Variations in Reading Achievement by Age (Age-Number)
In order to facilitate analysis of graphs 5.4 to 5.6 above, it will be useful to consider patterns in each modality area and variances that have been exhibited in the data by each age group. Table 5.8 below presents the percentage differentials for each test in the tactile modality by age group. Average differential percentages by age groups are also presented.

**TABLE 5.8**

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Halstead Tactual Performance a-1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Halstead Tactual Performance a-2</td>
<td>-5</td>
<td>3</td>
<td>-7</td>
</tr>
<tr>
<td>3</td>
<td>Halstead Tactual Form Recog.</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Eisenson Tactual Agnosia</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5a</td>
<td>Halstead Tactual Performance b-1</td>
<td>16</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>5b</td>
<td>Halstead Tactual Performance b-2</td>
<td>61</td>
<td>25</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Average Percentage Differential</td>
<td>12</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

1 For full titles of tests see Chapter Three pp. 71-72.

Observation of tests one through four indicates that these tests are poor discriminators. Test five-a discriminated moderately for the seven and eight group but not for the nine year old group. Test five-b discriminates above the 75 percentile level and, thus, can be considered a good discriminator for all the age groups. This test, which measures sequential tactile memory, is nearly twice as effective in differentiating between high and low achievers for the seven year old group. The average percentile differences tended to decrease with increase in age.
It is clear that most of the tests in this area need revision or replacement.  

Table 5.9 below presents the percentage differentials for each age group and the average differential percentages by age groups in the visual modality.

TABLE 5.9

Percentage Differentials by Age Group for High and Low Achievers in the Visual Modality

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>Age Group</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Frostig Four</td>
<td>7</td>
<td>8</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Frostig Three</td>
<td>5</td>
<td>37</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Frostig Two</td>
<td>11</td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>9</td>
<td>PMA Spatial Relationship</td>
<td>25</td>
<td>34</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Informal Puzzle Test</td>
<td>6</td>
<td>6</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>ITPA Visual Sequential Memory</td>
<td>5</td>
<td>9</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ITPA Visual Reception</td>
<td>0</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>ITPA Visual Association</td>
<td>0</td>
<td>21</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Percentage Differential</td>
<td></td>
<td>8</td>
<td>17</td>
<td>11</td>
</tr>
</tbody>
</table>

Observation of tests six, eight, ten, and twelve indicates that they appear to be poor discriminators in terms of reading achievement. Test eleven, The ITPA Visual Sequential Memory Test, would be judged to be a poor discriminator on the basis of the criteria outlined above. The performance for the nine-plus group is interesting because it discriminates above the 75 percent level. The performance on test eleven suggests that persons with more pervasive learning problems may experience difficulties in areas measured by this test. Further discussion

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1A more detailed discussion of battery revision will be reserved until Chapter Six.
of this point will be presented on page 182 below. Frostig Three, which measures perceptual constancy, demonstrated differentiation above the 75 percent level for the eight and nine year old groups but proved to a poor discriminator for the younger group. This is a surprising result as one would expect less mature students with reading problems to perform poorly, on the average, on this test. The ITPA Visual Association Subtest has a pattern similar to that of Frostig Three. This is a difficult test which measures concept formation. Again, one would expect the younger students to exhibit the same or greater differentiation in comparison with the older groups. The results of these two tests imply that the problems associated with reading in the visual area differ with the age groups tested and that the reading problems experienced by the seven year old group in the visual area are less pervasive than at the older levels.

Test nine, the PMA Spatial Relationship Subtest, tests visual closure. Inspection of graphs 5.1 to 5.3 reveals that the lower differential in the nine-plus group was the result of failure of the high achievers in reading to do better than the high achievers in the seven year old group, while the differences in the eight year old category were the result of high achievers doing very well relative to the low group. For this reason caution should be utilized when classifying test nine as a good discriminator.
Further inspection of Table 5.9 indicates that, in terms of overall patterns, the older students seem to be experiencing considerably more problems than the seven year old group in the visual area. The older groups' process deficiencies are in the perceptual and concept formation areas.

Table 5.10 below presents the percentage differentials for each age group and the average differential percentages by age groups in the visual-motor modality.

TABLE 5.10

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>7</th>
<th>8</th>
<th>9+</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Modified Seguin-Goddard Form Board Test</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>Bender</td>
<td>67</td>
<td>90</td>
<td>83</td>
</tr>
<tr>
<td>16</td>
<td>Frostig Five</td>
<td>12</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Slingerland Copying Test</td>
<td>23</td>
<td>8</td>
<td>39</td>
</tr>
<tr>
<td>18</td>
<td>WISC Coding Sub-test</td>
<td>7</td>
<td>33</td>
<td>49</td>
</tr>
<tr>
<td>19</td>
<td>Benton</td>
<td>10</td>
<td>35</td>
<td>11</td>
</tr>
<tr>
<td>20</td>
<td>ITPA Manual Expression</td>
<td>3</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Average Percentage Differential: 17 28 29

The data on Table 5.10 suggest that test fourteen is a poor discriminator in terms of reading achievement and ought to be replaced or revised. Tests sixteen, nineteen, and twenty appear, on the basis of the above evidence, to be discriminating only moderately well. Tests seventeen, eighteen, and fifteen proved to be good discriminators on the basis of the criteria established above. More detailed discussion based on graphs 5.3 to 5.3 for tests seventeen, eighteen, and fifteen will be discussed below.
The high achievers in the seven year old group scored better than the high achievers in the eight and nine year old groups on the Slingerland Copying Test (test seventeen). For the low achievers, the eight year old group scored best while the seven year old group scored lower, and the nine year old group scored nearly 25 percent lower than the low achievers in the eight year old group. The high achievers in the eight year old group scored best on test eighteen while the seven year old group ranked second and the nine-plus group scored lowest. The performance of the low group on test eighteen is of interest. The seven year old group scored highest with the nine-plus group scoring 37 percent lower than the low scores in the seven year old group. The best test in this series and in the whole battery in terms of discrimination was the Bender, test fifteen, which is a test of visual motor, part-whole perception.

Table 5.11 below presents the percentage differentials for each age group and the average differential percentage by age groups in the visual-vocal modality.
TABLE 5.11

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Strauss &amp; Lehtinen Fig.-Ground Perception Test</td>
<td>7  13  13</td>
</tr>
<tr>
<td>22</td>
<td>ITTPA Visual Closure Test</td>
<td>7  19  13</td>
</tr>
<tr>
<td>23</td>
<td>Wide Range Achievement Test</td>
<td>57  51  40</td>
</tr>
<tr>
<td>25</td>
<td>Detroit Letter Sub-test</td>
<td>24  17  27</td>
</tr>
<tr>
<td>26</td>
<td>Goldstein-Scheerer Color-Form Sorting Test</td>
<td>11  14  6</td>
</tr>
</tbody>
</table>

Average Percentage Differential: 22  23  20

On the basis of the data presented in Table 5.11 above one can assert that tests twenty-one, twenty-two, and twenty-six are discriminating moderately well in terms of reading achievement. Tests twenty-three and twenty-five are discriminating at or above the 75 percent level for all the tests in the SLD Battery. The Wide Range Achievement Test appears to be a particularly good performer. The tests in this modality appear to be good performers.

Table 5.12 presents the percentage differentials for each age group and the average differential percentages by age groups in the visual-auditory modality.
TABLE 5.12

Percentage Differentials by Age Groups for High and Low Achievers in the Visual-Auditory Modality

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>Age Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Buzzer Two</td>
<td>11  8  11</td>
</tr>
<tr>
<td>28</td>
<td>Buzzer Three</td>
<td>4    0   4</td>
</tr>
<tr>
<td>29</td>
<td>Buzzer Four</td>
<td>17  31  14</td>
</tr>
<tr>
<td>30</td>
<td>ITPA Grammatic Closure</td>
<td>17  23  14</td>
</tr>
<tr>
<td>31</td>
<td>Gates V-2</td>
<td>20  9    8</td>
</tr>
<tr>
<td>32</td>
<td>Gates VI-2</td>
<td>13  12   7</td>
</tr>
<tr>
<td>33</td>
<td>Buzzer Five</td>
<td>33  33   24</td>
</tr>
<tr>
<td>34</td>
<td>Peabody Picture Vocabulary Test</td>
<td>5     13  11</td>
</tr>
</tbody>
</table>

Average Percentage Differentials 15  13  12

The data on Table 5.12 indicate that test twenty-eight is not a good discriminator. Tests twenty-seven, twenty-nine, thirty, thirty-one, thirty-two, and thirty-four appear to be discriminating moderately well. Test thirty-three discriminates above the 75 percent level for all the tests in the SLD Battery. In general, with the exception of Buzzer Three, the tests in this area appear to be doing a moderate to a good job of discriminating between high and low achievers in reading.

Table 5.13 presents the percentage differentials for each age group and the average differential percentages by age groups in the auditory modality.
TABLE 5.13

Percentage Differentials by Age Groups for High and Low Achievers in the Auditory Modality

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Wepman</td>
<td>9 10 11</td>
</tr>
<tr>
<td>36</td>
<td>Modification of ITPA Auditory Closure Sub-test</td>
<td>5 11 2</td>
</tr>
<tr>
<td>37</td>
<td>Modification of ITPA Auditory Sequential Memory Test</td>
<td>0 -6 4</td>
</tr>
<tr>
<td>38</td>
<td>Buzzer I</td>
<td>0 9 12</td>
</tr>
<tr>
<td>39</td>
<td>ITPA Auditory Reception</td>
<td>12 7 26</td>
</tr>
</tbody>
</table>

Average Percentage Differentials

The data on Table 5.13 suggest that tests thirty-six, thirty-seven and thirty-eight are poor discriminators in terms of reading. Test thirty-five, the Wepman, appears to be a borderline-moderate discriminator because of its reasonably consistent performance. Test thirty-nine, the ITPA Auditory Reception, is interesting because the test discriminated above the 75 percent level for the nine-plus age group while exhibiting only moderate to poor performance at the seven and eight year old levels. This suggests that the disabled readers in the nine-plus group seem to be experiencing more difficulty in understanding the meaning of questions presented to them through the auditory modality.
In general, the performance in this modality indicates that the seven and eight year old students, on the average, do not seem to have clear patterns of differentiation while the nine-plus groups exhibits a pattern of differentiation that suggests some problems are the result of failures in these areas.

Table 5.14 presents the percentage differentials for each age group and the average differential percentages by age groups in the auditory-motor modality.

**TABLE 5.14**

Percentage Differentials by Age Groups for High and Low Achievers in the Auditory-Motor Modality

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Ilg. &amp; Ames Writing Name Sub-test</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Ilg. &amp; Ames Writing Address Sub-test</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Buzzer Test Six</td>
<td></td>
</tr>
</tbody>
</table>

Average Percentage Differentials ---- 16 27 45

(-- ) Test not administered to this group

Test forty-one is a good discriminator for the nine-plus group but was too advanced to be administered to the younger age groups. Test forty is a good discriminator. Test forty, in which the subject writes his name, proved to be interesting because all the high groups did well on this measure. The scores for the low group were .84 for the seven year old group, .83 for the eight year old group, and .75 for the nine year
old group. These scores indicate that the older retarded readers were having more difficulty than the younger group. Buzzer Test Six is definitely discriminating at above the 75 percent level in the battery for the seven and eight age groups. However, the nine-plus groups seemed to exhibit less difficulty in this area.

In general, it seems that auditory-motor functions are closely linked with reading achievement and that the low achievers experience more disability in this modality at the older age levels.

Table 5.15 presents the percentage differentials for each age groups and the average differential percentages by age groups in the auditory-vocal modality.

**TABLE 5.15**

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Informal Sound Identification Test ------</td>
<td>39  35   15</td>
</tr>
<tr>
<td>44</td>
<td>ITPA Auditory Closure --------------------</td>
<td>11  7    20</td>
</tr>
<tr>
<td>45</td>
<td>Eisenson Auditory Agnosia Sub-test ------</td>
<td>3   3    3</td>
</tr>
<tr>
<td>46</td>
<td>ITPA Auditory Sequential Memory --------</td>
<td>19  18   9</td>
</tr>
<tr>
<td>47</td>
<td>ITPA Sound Blending --------------------</td>
<td>10  10   -6</td>
</tr>
<tr>
<td>48</td>
<td>ITPA Auditory Association ---------------</td>
<td>15  18   1</td>
</tr>
</tbody>
</table>

Average Percentage Differentials 16  15   7

Tests forty-five and forty-seven can be judged to be poor discriminators in overall performance by age groups. Test forty-eight can be judged moderate for the seven and eight
year old groups but definitely is a poor discriminator for the nine-plus groups. Tests forty-four and forty-six can be judged to be discriminating moderately well. Test forty-three can be judged to be a good discriminator at the seven and eight year old level but not at the nine-plus level.

The tests in this modality tended to discriminate better in the lower age levels than in the nine-plus age group. This consistency of performance suggests that older disabled readers have very much less difficulty in this modality than the younger groups.

Table 5.16 presents the percentage differentials for each age group and the average differential percentages by age groups in the vocal modality.

TABLE 5.16

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>49</td>
<td>Ilg. &amp; Ames Naming Animals Sub-test</td>
<td>15</td>
</tr>
<tr>
<td>50</td>
<td>ITPA Verbal Expression</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Average Percentage Differentials</td>
<td>20</td>
</tr>
</tbody>
</table>

Observation of the data on Table 5.16 indicates that test forty-nine is a poor discriminator because of the negative finding in the eight year old group. Test fifty is a good
discriminator for the age seven group but a poor discriminator for the eight and nine year old group. In general, the vocal modality seems to be a better discriminator for the younger rather than for the older age groups.

The foregoing analysis has been based on averages and was a basic exercise to identify patterns of failure through descriptive statistical differential techniques. Differential percentages that were recorded may be the result of reading achievement or IQ differences. A test's failure to record differences may not be a failure in the test but may be due to the fact that children with Specific Learning Disabilities, on the average, do not suffer from failures in the function being tested.
Again, it should be emphasized that the individual performance on the SLD Battery is important because it allows the remedial teacher insight into the student's specific pattern of failure even if the student does not conform to average patterns.

Keeping these cautions in mind, a few general comments will be offered below concerning patterns in differential performance for the three age groups based on high and low achievement in reading.

The seven year old group experiencing Specific Learning Disabilities is likely to have a different pattern of errors than, for example, the nine-plus group. The reason for this is that subjects in the seven year old group could be failing due to immaturity of functions. As one advances through the age groups, some of these disabled students are likely to overcome their Specific Learning Disabilities through maturation. The nine-plus group is more likely to be composed of children with deep-rooted and stubborn learning failures. In addition, by this time secondary psychological failures may be blocking the channels of communication.

The evidence presented above in tables 5.8 to 5.16 points to the conclusion that failures in the tactual, auditory-vocal, and vocal areas may be linked to problems of maturation. The more select older group experienced more difficulty in the visual sequential memory, visual-motor, and auditory areas. All age ranges exhibited
differentials based on reading achievement in the areas of visual-vocal, visual-auditory and auditory-motor channels.

One possible use of this information is in early identification of children who are likely to represent the most persistent learning problem cases. For example, seven year old students who suffer specific failings in the modalities in which older students experience the most difficulties may be likely candidates for long range serious problems. This is not to imply that students experiencing other patterns of failure should not be aided but it does suggest an area for further investigation.

Graphs 5.7 and 5.8 present the score point differential in performance on sub-tests in the SLD Battery based on variations in IQ for high and low reading achievement groups. Here the attempt was made to allow the IQ to vary while holding reading achievement constant. Graphs 5.9 and 5.10 present the percentage differentials for high and low IQ groups for both the high and low achievers in reading. It would have been useful to also separate this set of data by age groups but sufficient data for each class was not available to allow this breakdown.

Inspection of Graphs 5.7 and 5.8 reveals several interesting points. First, it is obvious that in the case of both high and low achievers in reading, IQ in a quantitative sense seems to make little difference. Differences in IQ seemed to, on the average, differentiate better for high achievers than for low
Score Differential in Performance on Sub-Tests in the SLD Battery Based on Variations in IQ for High Achievement in Reading Group.

- **Tactile**
- **Visual**
- **Visual-Motor**
- **Visual-Vocal**
- **Visual-Auditory**
- **Auditory**
- **Auditory-Motor**
- **Auditory-Vocal**
- **Vocal**

Number high IQ = 7
Number low IQ = 29
Mean high IQ = 111
Mean low IQ = 102

*High IQ
*Low IQ
*Cut-off
Graph 5.8

Score Differential in Performance in Sub-Tests on the SLD Battery based on Variations in IQ for Low Achievement in Reading Group

<table>
<thead>
<tr>
<th>TACTILE</th>
<th>VISUAL</th>
<th>VISUAL-MOTOR</th>
<th>VISUAL-VOCAL</th>
<th>VISUAL-AUDITORY</th>
<th>AUDITORY</th>
<th>AUDITORY-MOTOR</th>
<th>AUDITORY-VOCAL</th>
<th>VOCAL</th>
</tr>
</thead>
</table>

Number in high IQ Group - 19
Number in low IQ Group - 31
Mean high IQ = 100
Mean low IQ = 11.5

---

High IQ
Low IQ
Cut-off
Graph 5.9

Percentage Differential in Performance on Sub-tests on the SLD Battery Based on Variations in IQ for Low Achievement in Reading Group.
Graph 5.10

Percentage Differential in Performance on Sub-Tests on the SLD battery
based on Variations in IQ for High Achievement in Reading Group.
achievers. Second, review of the graphs indicates that the scores on the sub-tests lie very close to the norms established for the tests.

Inspection of graphs 5.9 and 5.10 reveals a very interesting variation in patterns of percentage differentials for high and low achievers in reading. In the low groups almost all differences are very low even with this dramatic technique. The data on 5.9 also indicate that test 5.b, one of the important discriminators in terms of age and reading achievement, was dramatically negatively linked to IQ. This negative linkage was also present for the high achievers as demonstrated on Graph 5.10. The data on Graph 5.9 also reveal that the general failure in the visual-vocal area by the low achievers is negatively related to IQ. Graph 5.10 indicates that there is a moderate difference between the high and low IQ levels in the visual-vocal area for the high reading achievement group.

The relationships on Graph 5.10 indicate that in the high IQ group there are moderate differences exhibited on many of the tests based on IQ.

The variation in patterns for high achievers and low achievers is extremely important because this SLD Battery would normally be administered to low achievers in reading and the evidence indicates that IQ has an extremely insignificant effect on performance for this group. Therefore, one can tentatively conclude that the battery is effective in terms of identifying specific learning failures in the low reading achievement group.
The results of the statistical analysis presented on page 150 above indicated that there was a significant difference between high and low reading achievement groups on the basis of IQ at the one percent level. It is possible to develop a shortened battery of tests which would differentiate at the 75 percent level in terms of reading achievement, holding IQ constant.

Such a refined battery should not be used to replace the SLD Battery for, as pointed out earlier in this chapter, if we are to discover specific learning difficulties, an extended battery is necessary.

A shortened predictive battery might still prove useful for the purpose of screening out the dependent and independent relationships between specific learning difficulties and related emotional disorders. The object of such a battery is to select those tests that tend to differentiate best between high and low achievers in reading when IQ is factored out. If a student experiencing reading difficulties did poorly on such a battery, then the cause of the reading failure would be assumed to be a combination of Specific Learning Disabilities and the related emotional problems would be assumed to be a dependent variable. If a student experiencing reading difficulty performed well on the tests in the shortened predictive battery, then the emotional problems would be assumed to be an independent variable and the Specific Learning Disabilities would be assumed to be the dependent variable.
Graphs 5.11 and 5.12 present percentage differentials based on high and low achievement in reading for high and low IQ groups for all age groups. Using this data, the tests were selected for the low IQ group which differentiated above the 75 percent level for all the tests in the SLD Battery. A battery was also developed for the high IQ group using the 75 percent or better criteria for differentiation. From these two batteries common tests were selected and are presented below in Table 5.17.

**TABLE 5.17**

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>5b</td>
<td>Halstead Tactual Performance b-2</td>
</tr>
<tr>
<td>15</td>
<td>Bender</td>
</tr>
<tr>
<td>17</td>
<td>Slingerland Copying Test</td>
</tr>
<tr>
<td>18</td>
<td>WISC Coding Sub-test</td>
</tr>
<tr>
<td>23</td>
<td>Wide Range Achievement Test</td>
</tr>
<tr>
<td>33</td>
<td>Buzzer Five</td>
</tr>
<tr>
<td>41</td>
<td>Ilg. &amp; Ames Writing Address*</td>
</tr>
<tr>
<td>42</td>
<td>Buzzer Six</td>
</tr>
<tr>
<td>43</td>
<td>Informal Sound Identification Test</td>
</tr>
</tbody>
</table>

* Administered to only the nine-plus group.

If a child experiencing reading difficulties does poorly on the above battery, then the cause of his difficulty should be assumed to be the pattern of Specific Learning Disabilities exhibited by his performance on the SLD Battery. Treatment would concentrate remediation on those areas that were deficient.
Graph 5.11
Percentage Differential in Performance on Sub-Tests on the SLD Battery based on Variations in Reading Achievement for the Low IQ Group.
If a child experiencing reading difficulties does well on the tests in the above battery listed in table 5.17, it might be assumed that the child is experiencing emotional problems that are at least partially causing the reading disability. In this case a detailed psychological examination and program of therapy, where needed, should be provided concurrently with the remedial program.

It should be stressed that in both cases remedial treatment of the SLD problems, when identified, should be provided. If a child who exhibits the expected failures on the predictive battery fails to respond to extended remedial techniques, a detailed psychological examination is advised.

Discussion of Results

Based on the EMD02R procedure, it was found that all but eleven of the tests in the SLD Battery were significantly correlated with reading achievement. Suggested revision of the tests that were not significantly correlated with reading, as well as discussion of four tests that were rejected under the EM02R procedure will be the subject of Chapter Six below. Evidence, based on the EM02R procedure, also indicates that the tests in the battery are measuring separate functions as only four tests were rejected.

Examination of age, sex, grade and IQ parameters in relation to reading achievement revealed that only IQ was significantly correlated with reading success at the .01 level.
Next, patterns of test performance were examined on the basis of reading performance by age groups. It was found that failures in the tactual, auditory-vocal and vocal modalities were linked to problems of maturation. Failures in the visual sequential memory, visual-motor and auditory areas were exhibited by students in the nine-plus range. All students with reading disabilities experienced difficulty in the visual-vocal, visual-auditory and auditory-motor areas.

Since there was a statistically significant difference between high and low reading achievement groups on the basis of IQ, differential percentages on the tests for high and low IQ groups were examined, holding reading constant. It was found that IQ made almost no difference for the low achievers in reading but that it made moderate differences in performance for the high achievers in reading. The observation was considered to be extremely important as the SLD Battery was designed for administration to children experiencing reading problems. The implication was that the study results are more reliable than suggested by quantitative statistical analysis.

Finally, an attempt was made to develop a shortened predictive battery by holding IQ constant while examining differential performance by high and low achievers in reading. The battery was developed to aid in screening out students that were experiencing reading problems caused by emotional problems from those in which the basic cause of reading failure was a pattern of Specific Learning Disabilities. It was suggested
that persons experiencing reading difficulty who did well on this battery should be subjected to detailed psychological examination and that a program of psychological therapy, when needed, should be administered concurrently with the remedial program based on the results of the SLD Battery.
CHAPTER VI

PROPOSED RECONSTITUTION OF THE BATTERY ON THE BASIS OF
THE STATISTICAL EVIDENCE PRESENTED IN CHAPTER FIVE.

The evidence presented in Chapter Five indicates that
the method of approach that was used to develop this battery
is a useful method and should provide a very powerful set of
tools to aid in understanding persons exhibiting Specific
Learning Disabilities.

It is the object of this chapter to investigate some
ways that the battery can be strengthened to further improve
its performance.

Computer Program BMDO2R was a very useful statistical
technique because it has highlighted not only the areas where
the tests contribute to diagnosis but it has also provided
valuable clues as to the tests that ought to be altered. Some
of the tests, such as those included in the revised program,
that did not significantly correlate with reading success need
to be re-examined and revised or replaced with superior tests.
The tests rejected through the step-wise regression process
need to be re-examined to see if the high intercorrelations
can be substantially reduced by the revision of these tests
or, conceivably, by the alteration of the tests with which
they are intercorrelated.
TABLE VI.1

Correlations Between Independent Variables
(Tests of Cognitive Functions)
And Dependent Variable
(Reading Scores on Slosson Oral Reading Test)

<table>
<thead>
<tr>
<th>Name of Test</th>
<th>Correlation of Independent Variables with Slosston Oral Reading Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halstead Tactual Performance a-1</td>
<td>.129</td>
</tr>
<tr>
<td>Halstead Tactual Performance a-2</td>
<td>.123</td>
</tr>
<tr>
<td>Halstead Tactile Form Recognition Test</td>
<td>.010</td>
</tr>
<tr>
<td>Eisenson Tactile Agnosia Test</td>
<td>.002</td>
</tr>
<tr>
<td>Halstead Tactual Performance b-1</td>
<td>.191</td>
</tr>
<tr>
<td>Halstead Tactual Performance b-2</td>
<td>.237**</td>
</tr>
<tr>
<td>Frostig IV</td>
<td>.183</td>
</tr>
<tr>
<td>Frostig III</td>
<td>.406*</td>
</tr>
<tr>
<td>Frostig II</td>
<td>.218**</td>
</tr>
<tr>
<td>PMA-Spatial Relations Sub-test</td>
<td>.396*</td>
</tr>
<tr>
<td>Informal Puzzle</td>
<td>.088</td>
</tr>
<tr>
<td>ITPA-3-Visual Sequential Memory</td>
<td>.249**</td>
</tr>
<tr>
<td>ITPA-2-Visual Reception</td>
<td>.093</td>
</tr>
<tr>
<td>ITPA-6-Visual Association</td>
<td>.360*</td>
</tr>
<tr>
<td>Modified Seguin-Goddard Form Board Test</td>
<td>.142</td>
</tr>
<tr>
<td>Bender</td>
<td>.547*</td>
</tr>
<tr>
<td>Frostig V</td>
<td>.387*</td>
</tr>
<tr>
<td>Slingerland Copying Test</td>
<td>.272*</td>
</tr>
<tr>
<td>WISC Coding</td>
<td>.306*</td>
</tr>
<tr>
<td>Benton</td>
<td>.341*</td>
</tr>
<tr>
<td>ITPA-10 Manual Expression</td>
<td>.218**</td>
</tr>
<tr>
<td>Strauss &amp; Lehtinen Fig.,-Ground Perception Test</td>
<td>.151</td>
</tr>
<tr>
<td>ITPA-7 Visual Closure</td>
<td>.274*</td>
</tr>
<tr>
<td>Wide Range Achievement Test-Reading Sub-test</td>
<td>.907*</td>
</tr>
<tr>
<td>Detroit Letter Sub-test</td>
<td>.451*</td>
</tr>
<tr>
<td>Goldstein-Scheerer Color-Form Sorting Test</td>
<td>.256**</td>
</tr>
<tr>
<td>Buzzer Test-2</td>
<td>.281*</td>
</tr>
<tr>
<td>Buzzer Test-3</td>
<td>.125</td>
</tr>
<tr>
<td>Buzzer Test-4</td>
<td>.352*</td>
</tr>
<tr>
<td>ITPA-9 Grammatic Closure</td>
<td>.385*</td>
</tr>
<tr>
<td>Gates V-2</td>
<td>.457*</td>
</tr>
<tr>
<td>Gates VI-2</td>
<td>.379*</td>
</tr>
<tr>
<td>Buzzer Test-5</td>
<td>.496*</td>
</tr>
<tr>
<td>Peabody Picture Vocabulary Test</td>
<td>.492*</td>
</tr>
<tr>
<td>Wepman</td>
<td>.314*</td>
</tr>
<tr>
<td>Modification of ITPA Auditory Closure Sub-test</td>
<td>.205**</td>
</tr>
<tr>
<td>Modification of ITPA Auditory Sequential Memory</td>
<td>.235**</td>
</tr>
<tr>
<td>Sub-test</td>
<td></td>
</tr>
</tbody>
</table>
Table VI.I Continued

<table>
<thead>
<tr>
<th>Tests of Cognitive Functions</th>
<th>Correlation of Independent Variables with Slosson Oral Reading Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buzzer Test-1</td>
<td>.26**</td>
</tr>
<tr>
<td>ITPA-1 Auditory Reception</td>
<td>.301*</td>
</tr>
<tr>
<td>Ilg &amp; Ames Writing Name Sub-test</td>
<td>.222**</td>
</tr>
<tr>
<td>Ilg &amp; Ames Writing Address Sub-test</td>
<td>.416*</td>
</tr>
<tr>
<td>Buzzer Test-6</td>
<td>.464*</td>
</tr>
<tr>
<td>Informal Sound Identification Test</td>
<td>.471*</td>
</tr>
<tr>
<td>ITPA-11 Auditory Closure</td>
<td>.316*</td>
</tr>
<tr>
<td>Elsenson Auditory Agnosia Sub-test</td>
<td>.216**</td>
</tr>
<tr>
<td>ITPA-5 Auditory Sequential Memory</td>
<td>.440*</td>
</tr>
<tr>
<td>ITPA-12-Sound Blending</td>
<td>.260**</td>
</tr>
<tr>
<td>ITPA-4 Auditory Association</td>
<td>.338*</td>
</tr>
<tr>
<td>Ilg &amp; Ames Naming Animals Sub-test</td>
<td>.314*</td>
</tr>
</tbody>
</table>

* Significant at the 1% Level
** Significant at the 5% Level

Eleven of the forty-nine tests included in the computer programs discussed in Chapter Five above, and presented in Table VI.I above, are not significantly correlated with reading success at the five percent level.

Some suggested modifications and comments on the procedures needed to gain information that will facilitate the modification process will be presented below.

A. Test Review

The Halstead Tactual Performance Tests (a-1 and a-2) both involve the placement of geometric shapes into a form-board. Most of the high and low achievers in reading passed this test indicating that the test tasks are relatively simple.
These tests can be strengthened by utilizing a time limit when administering the tests. These time limits should be determined by administering the tests to a large, random sample of elementary school children and by computing the average time utilized by this group to complete the tasks.

**The Halstead Tactile Form Recognition Test** involves the matching of visual with tactual stimuli. This test must be strengthened as most of the high and low achievers in reading passed the test. This strengthening process could involve the introduction of more difficult test material and/or the introduction of time limits.

**The Eisenson Tactual Agnosia Test** involves tactual recognition of familiar objects. This test is too easy and should be revised to include more difficult recognition tasks. Such tasks might include tactual recognition of three-dimensional wooden or plastic letters.

**The Halstead Tactual Performance Test** (Part b-1) requires the subject to reproduce geometric forms on paper. These forms were introduced in part-a of this test. The statistical information gathered does not give us information which will allow a sensible judgment about why the test does not correlate with reading scores. The percentage data, presented in Chapter Five, suggest that the test did appear to discriminate between high and low achievers in reading. Some suggested procedures to re-evaluate this test will be suggested below in Section B. This test
will be retained in the battery since it is automatically administered as part of Halstead Test b-2.

The Frostig IV is a test of visual discrimination. This test appeared to discriminate between high and low achievers in reading. The statistical information gathered does not point out why the test does not correlate significantly with reading scores. The test should be retained in the battery until a more useful test which more closely resembles reading tasks can be developed.

The Informal Puzzle Test evaluates the subject's ability to assemble visually, separate puzzle parts into a unified whole. This test failed to show a significant correlation with reading because it was too easy. The test should be strengthened by substitution of a more difficult puzzle for the original puzzle used in the study.

The ITFA Visual Reception Sub-test involves abstract matching of pictures on the basis of analogy. Observation of results of this test in percentage terms in Chapter Five indicates that a slightly higher percentage of high achievers passed the test. More information is needed to determine why the test is not significantly correlated with reading. The usefulness of this test in the battery as presently constituted should definitely be questioned. For the present, it will be retained in the battery because of its low intercorrelations with other independent variables.
The Strauss and Lehtinen Figure-Ground Perception Test involves the identification of simple figures embedded in a complex background. There is no evidence as to why the low correlation with reading has occurred. More testing is needed to discover why this low correlation exists. The test will be retained in the battery until it can be replaced with a superior test.

The Buzzer Test-3 involves the tapping out of a morse-code pattern on a buzzer set. This proved to be a relatively easy task for both high and low achievers. This test should be deleted from the battery since another measure of this function is included in the battery.

The Modified Sequin-Goddard Formboard Test was an easy test for both high and low achievers in reading. This test can be strengthened by substituting more complex forms for the simple geometric forms used in the test.

The results of the step-wise regression program indicated that four tests should be deleted from the final battery as they provided no additional predictive value to the total battery. The tests which the program deleted were the Gates VI-2, The Buzzer Tests 2 & 6, and The Goldstein-Scheerer Color-Form Sorting Test.

As pointed out in Chapter Five, the SLD Battery was not reduced sufficiently to be an economical screening device and, thus, the battery's chief function is as a micro-diagnostic tool to pinpoint specific areas of weaknesses in individual
learning disability cases. These tests will not be deleted from the battery for the following reasons:

1. These tests scores were significantly correlated with reading scores.

2. Inspection of the table of intercorrelations on computer program EMD02R, shows a low correlation between each variable deleted by the step-wise regression and other independent variables in the test.

In all probability several similar independent variables in the battery incorporate some of the functions measured by each deleted test. It is difficult to be absolutely sure that the individual subject has failed all the test which include functions measured by a deleted variable.

B. Suggested Activities for Further Refinement

The present constitution of the SLD Battery should be considered as a first approximation of a final battery that will incorporate the procedures and processes discussed above.

The next step that should be followed in the process of developing this battery will be to administer each one of the tests in the battery to a large random sample of elementary school children and to develop standard score norms based on the same population for each of the tests so that accurate comparisons can be made between tests in the battery. Secondly, alternative structures for informal tests should be developed and tested to determine which structure provides the most valid measure of the functions being measured. An attempt should be made to reduce the intercorrelations between the independent
variables and to increase the correlation within the dependent variables. Each of the empty grid segments ought to be re-examined to see if tests can be developed for these functions. Finally, the battery should always be subjected to restructuring on the basis of new test material.
CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary and Conclusions

The objective of this thesis was to develop a battery of diagnostic tests for the purpose of identifying Specific Learning Disabilities which are contributing to reading failure.

The rationale for developing this battery was that better diagnostic tools are needed if the problems of the Specific Learning Disability group are to be treated successfully. Existing techniques for diagnosing these failures apparently are not working adequately for an important percentage of the school population is failing to obtain functional literacy.

The SLD Battery is unique because, before the battery was developed, a grid system was established cross-correlating specific cognitive functions that are related to the reading process and the receptive and expressive channels of communication required in the learning process.

After the grid was established and rationalized, tests were reviewed and placed into the appropriate grid sections depending on the cognitive process-modality combinations that the tests purported to measure.
A review of the available tests left many of the grid sections empty. Other grid sections contained one or more tests that were rejected for inclusion in the final battery based on the criteria set up in Chapter Four. In some cases informal tests were developed to insert into the empty grid segments. Informal tests were also developed to replace tests which were impractical because of time, cost or availability. Some of the grid segments were left empty because it was difficult to describe what tasks should be used to test the function identified in each grid compartment.

Chapter Four addressed itself to the selection of the tests for inclusion in the final battery.

Once the battery was finalized, the next task was to field test the battery to determine its effectiveness in identifying Specific Learning Disabilities in students with persistent learning problems. The sample group used in the study was selected from among children with average or above intelligence and without gross sensory, psychological, or neurological defects. From this sample population two stratified groups were selected on the basis of high and low achievement in reading. The criteria for this selection were stated in Chapter Five above.

The persons administering the battery were, for the most part, highly qualified teachers specializing in the area of learning disabilities. The submitted to careful

1See pages 143-144 for a discussion of the qualifications of the individual researchers.
training in the administration procedures to control tester error. The research team tested students in the fall and winter of 1969 and 1970. The results were placed on a profile designed for the SLD Battery.

The results of the field test were analyzed utilizing appropriate statistical techniques discussed in Chapter Five above. The results of the statistical analysis tended to confirm that the test battery was a very useful tool in the diagnosis of SLD problems. A detailed examination of patterns of differential performance based on reading achievement, age, and IQ was undertaken. Evidence was uncovered which suggested that certain failures in cognitive processes within specific modalities could be linked to maturation while others seemed to be more strongly linked to persistent SLD problems. Finally, in Chapter Five a predictive battery was developed to be used in isolating the dependent and independent variables between Specific Learning Disabilities and related emotional problems.

Chapter Six addressed itself to reconstituting the battery on the basis of the statistical evaluation in Chapter Five. It was found that while the battery apparently had very important overall usefulness as an approach to dealing with persistent reading problems, a great deal of refinement of tests could conceivably strengthen the battery and make it more useful than presently constituted. The important contribution may not
be the battery as now constituted so much as the systematic approach to designing the battery for diagnostic purposes. For example, there is a strong possibility that in the future new and better tests of some of the cognitive processes will be developed and that the tests of cognitive processes in the present battery will be replaced by these superior measures.

Implications for Further Research

This author has spent many years in the elementary school classroom as both a classroom and demonstration teacher in three widely different school systems and in five different schools. These schools were located in a variety of settings such as 1) rural schools with the first three grades in one classroom, 2) suburban schools in white collar neighborhoods, and 3) city schools in lower socio-economic impact settings. Dealing with students in all three settings has awakened this writer to the heart-break of children from many different walks of life who physically occupy the classroom but who fail to achieve academically.

Working in her present position in the college situation, this writer has had a chance to visit and talk with educators dealing with all levels of education. Most of these educators are also aware and deeply concerned about the problems of the persistent learning problem population. Again, persistent learning problems respect no socio-economic
class or ethnic grouping. These cases are found in rich suburban areas and the ghetto of the core cities.

Much work and great amounts of public and private funds have been expended, particularly in the past decade, in an attempt to help these children obtain functional literacy. However, many of these children continue to proceed through the school systems without learning the basic reading skills. They finally drop out of school or graduate as hostile, rejected, young adults lacking the tools necessary for survival in our highly technical society beyond the subsistence level.

The battery that has been developed in this thesis is a step towards dealing with these problems. The problem of dealing with the reading disability cases has been identified as one of the problems of the 1970's. The federal government has set the tone.

Former U. S. Commissioner of Education, James E. Allen, Jr., reporting before the General Subcommittee on Education of the U. S. House of Representatives, Committee on Education and Labor in October 1962, set the target for reading for the 1970's. He said:

We should immediately set for ourselves the goal of assuring that by the end of the 1970's the right to read shall be a reality for all—that no one shall be leaving our schools without the skill and desire necessary to read to the full limits of his capacity. I am calling for a total national commitment to and involvement in the achievement of the right to read goal.
In his address he brought out the following shocking facts:

a. One out of every four students nationwide has significant reading deficiencies.

b. In large school systems up to half of the students read below expectation.

c. There are more than 3 million illiterates in our adult population.

d. About half of the unemployed youth, ages 16-21, are functionally illiterate.

e. Three-quarters of the juvenile offenders in New York are two or more years retarded in reading.

f. In a recent U. S. Armed Forces program called Project 100,000, 68.2% of the young men fell below grade seven in reading and academic ability.

According to Allen:

The tragedy of these statistics is that they represent a barrier to success that for many young adults produces the misery of life marked by poverty, unemployment, alienation, and in many cases, crime. ¹

One of Allen's objects is to target research dollars toward a greater understanding of the reading process.

On March 2, 1970, the U. S. Office of Education was reported to have released a request for research and development sources as follows:

The Department of Health, Education and Welfare has announced that it intends to support phase program

---
of Research and Development on Reading to reach
the following objective: 100% of all persons not
in permanent care institutions must pass, by
age ten, a criterion-referenced test which is
predictive of competent performance on a set of
adult reading tasks selected to have favorable
returns to the individual.¹

The above comments and information from the Depart-
ment of Health, Education and Welfare have pointed the way.
The SLD Battery has been developed for the purpose of
identifying deficiencies in the cognitive processes
related to reading. What is needed now is more research
utilizing the organization and structure of the research
conducted in this thesis project as a basis for developing
better diagnostic and remedial techniques in the area of
Specific Learning Disabilities.

Apparently, the U. S. Government has made a firm
commitment that they are willing to back up with research
dollars. The aims of the research are almost identical to
the aims sought to be achieved by this battery.

The test battery development and the field testing
represented a pilot study that was conducted under several
serious handicaps. First, it was conducted with no research
budget, which necessitated the enormous voluntary contri-
bution of many highly qualified and busy specialists that
made up the research team. Even with the co-operation of

¹International Reading Association Memorandum to
IRA Members, (See Appendix F).
this group, the number of samples that could be collected was limited. If these persons had been paid for their efforts and if other costs had been covered, the total cost of the study would have reached the five figure category. To adequately test just the existing battery would require an expenditure of three to four times this figure.

Secondly, the battery was designed and developed exclusively by this researcher. Her area of specialization is in the field of elementary education and, in particular, reading and learning disabilities.

Third, the informal tests were developed by this researcher to fill a void discovered in testing programs. Fortunately, many of these tests had a high correlation with reading and low inter-correlations with other tests in the battery but these tests ought to be tested further to see if they are measuring the cognitive functions and process modalities they purport to test. Many of the formal tests in the battery also need to be examined individually and redesigned to save time and to improve validity and reliability data.

Fourth, the test battery is not the only component of an effective program designed to aid persistent learning disabilities cases. Assuming that the battery, as now constituted or as revised through intensive research effort, does screen out the specific combination of learning difficulties facing the student, then a set of systematic
techniques are needed that will effectively remediate the problem areas in the most efficient and interesting manner possible.

Fifth, the results of the research in Chapter Five seemed to suggest that the goals of remediation were micro and different from the goals of a screening battery which tended to identify groups of problem areas. This does not mean that the SLD Battery will not offer valuable clues and organizational discipline which will allow the future development and testing of a predictive screening battery.

What is needed at this point in order to proceed further with the development of the battery is a research team composed of well-qualified persons from the fields of education, psychology, and statistics. Each of the team members ought to be well-qualified in the area of learning disabilities.

The research team should be divided into three sub-groups. The first sub-group would work on the refinement of the SLD Battery. Each member of the team that is working with the SLD Battery refinement ought to be willing to accept the concept of the micro-approach concerning the testing of individual cognitive processes and channels of communication as put forth in the two-dimensional grid system developed in Chapter Two above.

The second research sub-team should concentrate its efforts on the development of a predictive battery that
can be used as a screening device. This team will work closely with the first sub-team.

The third sub-team should work closely with the first sub-team but its duties should be to develop a systematic array of program units designed to aid in the effective remediation of the learners' problems.

At the risk of being presumptuous, and at the slight urgings of informed persons, this writer suggests that such a research team be formed and that a proposal be submitted to the appropriate organizational agency in keeping with the above organization or some other even more suitable program.
Appendix A

Published Tests of Cognitive Processes
Incorporated into Grid A

Pertinent information about each test will be presented in Appendix A. A separate footnote will not be provided for each test because the footnote information is given within the format of each test description. When information is provided from another source, such as a review from the Mental Measurements Yearbook, credit to the author will be given in a footnote.

The tests will be presented in alphabetical order by test name. When information is not available, the category heading will be deleted from the review data in order to make the presentation as brief as possible.
Title: Auditory Discrimination Test

Author: Joseph M. Wepman

Publisher: University of Chicago (Language Research Associates)

Date of Publication: 1953

Ages: 5-8 and children with speech and reading problems

Cost: $5.00 per 50

Number of Forms: Two

Administration Time: 7 minutes

Purpose: To measure a child's ability to discriminate between speech sounds

Description:

Each form consists of 30 pairs of words differing in terms of one different phoneme in each word and 10 pairs of words which do not differ. Children must discriminate between initial and final consonants and vowel sounds. The child is asked to respond "same" when two words pronounced by the examiner are alike and "different" when two words pronounced by the examiner are different.

Statistical Data:

Norms: Cut off points are presented in the manual to indicate when children at different ages (ages 5-8) have failed the tests. The norming population consisted of 533 unselected 1st, 2nd, & 3rd grade children in rural and urban communities.

Scoring: Scoring is based on number of errors. Cut off points concerning the maximum number of errors allowed at each age level are presented in the manual.

Reliability: Test - retest administration yielded a reliability coefficient of .91 (N=109)

Validity: The author indicates that children with speech and reading disorders often exhibit poor auditory discrimination. Several studies are presented to indicate that failure to develop adequate speech and to learn to read are related to poor auditory discrimination.
The mean differences in auditory discrimination and in reading presented in the studies were significant at the 1% level.

**Modality:** Auditory

**Process:** Discrimination

**Title:** Arthur Point Scale (9 Subtests)

**Author:** Grace Arthur

**Publisher:** Psychological Corporation

**Date of Publication:** 1933-47

**Ages:** 4.5 to adult

**Cost:**
- Knox Cube Test (Arthur revision) $3.60
- Seguin Form Board 22.00
- Arthur Stencil Design Test 3.00
- Porteus Maze Test I 11.50
- Healy Pictoral Completion Test II 22.50

Total Test $60.00

**Purpose:** This is a non-verbal test of general intelligence

**Description:**

1. **Knox Cubes:** The examiner taps four cubes in a specified sequence, and the subject must reproduce the sequence.

2. **Seguin Form Board:** Ten geometric figures are to be placed into the corresponding holes in the board as rapidly as possible.

3. **Two-figu. Form Board:** Cut-up pieces are to be fitted into a square and cross cut out of the board.

4. **Casuist Form Board:** Similar to the above, only four figures.

5. **Manikin or Feature Profile (depending on level):** Cut-up figure of man or cut-up face is to be assembled.

6. **Mare and Foal:** Picture has cut-outs that are to be fitted into place.

7. **Healy Picture Completion I & II:** Picture has square cut-outs, and subject must select the appropriate block to make the most meaningful picture.
(8) Porteus Mazes: Simple pencil mazes are to be traced without retracing or crossing a line.

(9) Kohs Block Design: Designs are to be reproduced using colored cubical blocks, like those in sets for children.

(10) Arthur Stencil Design

Form II of the test also uses the Knox Cube, Seguin Form Board, Healy Picture Completion and Porteus Mazes, presenting a different form or a different set of tasks from Form I. In place of the other tests, however, it substitutes the Arthur Stencil Design Test. In this test, the subject is supplied with a set of colored cards and a set of cut-outs of different designs and colors. The subject is shown a design that can be produced by superimposing certain ones of the cards provided to him. He must select the right cut-outs and background and put them together in the right order to produce the master design.

Statistical Data:

Norms: Each subtest is separately standardized and then combined into a single score. A large random sample of middle class Americans was used in standardization population.

Reliability: The reliability data in the manual is adequate.

Validity: Arthur relies for evidence of validity upon the discriminative value of each subtest at successive age levels and upon the agreement of ratings obtained from revised form II with those obtained from form I and from the Binet Scale.

Scoring: A point score is allowed the subject for his performance on each subtest of the Arthur Scale. The score depends upon some subtests upon the speed with which the task was completed, in others upon the correctness of the solution, or the number of graded tasks solved. The point credits for the subtests are summed up to give a total point score and this is converted to a MA equivalent. IQ is found by dividing mental age by chronological age. IQ's seem to have the same distribution as the Binet.

Modality:
(1) Visual - motor
(2) Visual - motor
(3) Visual - motor
(4) Visual - motor

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1 Thorndike and Hagen, p: 203.
Title: Bannatyne Visuo-Spatial Memory Test (Experimental Edition)

Author: Bannatyne, Alex A.

Purpose: This was constructed to evaluate visuo-spatial memory for designs without involving motor activity.

Description: Each of 15 stimulus designs is presented for four seconds in succession. After the presentation of each design, a blank page is turned. This uncovers a page of eight designs from which the subject selects the one design considered to be identical to the original design. All except one of the eight designs are slight variants of the stimulus design.

Statistical Data: No data are available presently for this test.

Modality: Visual

Process: Memory
Title: The Basic Concept Inventory

Author: Siegfried Engelmann

Publisher: Follett Publishing Co.

Date of Publication: 1967

Ages: Designed for culturally disadvantaged preschoolers and kindergarten children, slow learners, emotionally disturbed children and mentally retarded children. It should not be administered to children older than 10 years.

Cost:

Administration Time: 20 minutes

Purpose: The function of this inventory is to evaluate the extent to which a child, or a group of children, has developed certain academically-related concepts.

Description:

There are three parts to this test which will be described below:

Part I: Basic Concepts - The subject is asked to follow directions and to find the objects that are described by the examiner.

Modality -- Auditory-visual

Process -- This is a test of basic concepts such as object names and time and space relationships. The subject must also be able to sense relationships between concepts when full statements are presented.

Part II: Statement Repetition and Comprehension - This test, the subject's ability to repeat statements and answer literal questions implied by these statements.

Modality -- Auditory-vocal

Process -- Auditory memory, ability to understand simple concepts and sense relationships between the concepts.

Part III: Pattern Awareness - This section tests the child's understanding of the kind of patterning on which analogies are based. There are three kinds of items:

1. An auditory sequencing test, involving the identification of a pattern of clapping executed previously by the examiner.
2. An auditory memory test involving the repetition of digits presented by the examiner and the recognition of principles governing the expansion of the numerical series. The purpose of these items is to determine whether or not the child can identify the expansion principle.

3. An auditory blending test.

Modality -- Section 1--Auditory-motor
Section 2--Auditory-vocal
Section 3--Auditory-vocal

Processes-- Section 1--Auditory, memory, sequencing.
Section 2--Auditory memory and ability to formulate principles.
Section 3--Sequential memory

Statistical Information:

This is an experimental edition. Thus, no statistical data are available for this inventory.

Title: The Bender Motor Gestalt Test

Author: L. Bender

Publisher: The American Orthopsychiat Assoc., Inc.

Date of Publication: 1946

Ages: 5-10 years

Cost: $5.00

Administration Time: Average time is 6 min. 30 sec.

Purpose: This is a test of visual-motor perception. It is also a projective test.

Description:

The Bender Gestalt is composed of 9 figures which are presented one at a time and which the subject is requested to copy on a blank piece of paper.

Modality: Visual-motor

Processes: Part-whole perception
Statistical Data:

Norms: The Koppitz scoring system will be used in this study as this system was evaluated through empirical research. 1

(1) Normative data were derived from 1,104 public school children representing 46 entire classes in 12 different schools located in rural, small town, suburban and urban areas of Mid-West and Eastern States.

(2) A table is provided so that a child's score can be interpreted in three different ways:
   A child's score on the Developmental Bender Scoring System can be compared with that of
   1. Other children of the same chronological age.
   2. Other children with the same level of maturation in visual-motor perception.
   3. Other children at a given grade level.

Scoring: Each Bender scoring item is scored as one or zero. Zero indicates that the child has no error present on an item. Age Norms are provided for ages 5-9 ½.

Reliability: Scorer reliability ranged from .88 - .96. Test-retest reliability with a four month interval between the first and second testing showed correlations ranging from .54-.65. These correlations are significant at the .001 level.

Validity: From a study of 77 school children, seven scoring categories were identified by Koppitz which differentiated between high and low achievers. The seven categories are: Distortion of shape, rotation, substitution of circles or dashes for dots, perseveration, failure to integrate the parts of a figure, substitution of angles for curves, and extra or missing angles.


Title: Berea Visual Motor Gestalt Test

Author: The test was developed at Berea College,

Publisher: Berea, Kentucky.

Ages: Children 8 or above and young adults
Purpose:

This is a test of perceptual motor functioning and was developed for use with children and young adults who performed well on the Bender, but who, nevertheless, showed some symptoms of a perceptual-motor handicap.

Description:

The subject is asked to reproduce from memory designs displayed on cards. He begins drawing as soon as the card is displayed. However, the card is removed in five seconds. There is no time limit for drawing the figure. After the subject has completed the first drawing tasks, he must draw all the figures from memory.

Statistical Data:

Norms: If the score equals the subject's age minus two, then normal memory seems to be present. For example, a 10-year-old should score at least 8 on the test. A lower score would normally mean a defective visual memory.

(NB: The above norm is based on samples in which the subjects are not informed before or during the first part of the test that they will have to remember the figures. If subjects are informed, the memory score may be changed.)

Scoring:

0 - If the remembered figure cannot be related to the original stimulus figure by the examiner, no point is scored.
1 - If the remembered figure can be related to the original stimulus figure, but if there are obvious errors in the figure, then one point is given.
2 - If the remembered figure is like the original in each particular, then two points are given.

Modality Evaluated: Visual-motor

Process Evaluated: Memory

Title: Blending Subtest from Stanford Diagnostic Reading Test

Author: Bjorn Karlsen, Richard Madden, Eric Gardner
Publisher: Harcourt, Brace and World
Date of Publication: 1964

Ages: Two forms at each level. Level I - Grades 2-4
     Level II - Grades 4-8.

Purpose: This is a test of auditory blending.

Description:
Blending refers to the ability to blend the sounds of a word after the word has been divided into meaningful elements and the sound of each element has been determined. The subject is asked to place a cross in the circle next to the sound in the word pronounced by the examiner.

Statistical Data:

Norms: Norms are presented in terms of stanine scores and percentile norms for this subtest.

Reliability: A split-half reliability co-efficient and standard error of measurement for each subtest are presented in the manual. The split-half correlations ranged from .79-.95 and the standard error of measurement score points ranged from 1.7-2.5

Validity: Information is provided in the manual concerning content, construct and concurrent validity. Intercorrelations of the various subtests range from .59-.85. Generally, statistical data supported the fact that each test is evaluating, to some extent, different cognitive processes than those measured by the other subtests in the battery. Concurrent validity was assessed by correlating SDR subtests and the Stanford Achievement Test. Correlations ranged from .40-.72.

Modality: Visual-auditory

Process: Blending

Title: Closure Flexibility (Revision of Gottschaldt Figures)

Author: L. L. Thurston, T. E. Jeffrey and Measurement Research Division, Industrial Relations Center (Manual)
Publisher: Education-Industry Service

Date of Publication: 1963

Ages: For adult males

Cost: $5 per 20 tests

Time required for administration: 10-15 minutes

Purpose: This test measures the subject's ability to hold a configuration despite distraction.

Description: A simple geometric figure followed by four complex ones is presented on each line. The subject places a check mark under a complex figure if it contains a simple figure.

Statistical Data:

Norms: Standard score norms based on 1,105 people are presented.

Reliability: Split-half correlations of .78 and .94 are reported.

Validity: More evidence is needed concerning what this test measures.1

Modality Evaluated: Visual

Process Evaluated: Figure-ground perception


Title: Closure Speed (Adapted from Street: Stalt Completion)

Author: L. L. Thurston, T. E. Jeffrey, Measurement Research Division, Industrial Relations Center, Univ. of Chicago

Publisher: Education-Industry Service, 1225 East 60th Street, Chicago, Illinois 60637

Ages: Adult males

Cost: $3 per 20 tests

Administration Time: 3-8 minutes
**Purpose:** To evaluate subjects ability to perceive a disorganized whole.

**Description:** Subject is required to identify a picture from incomplete material.

**Statistical Data:**

**Norms:** Standard score norms were presented.

**Reliability:** Reliability coefficients ranging from .67 to .70 were reported.

**Validity:** No information is provided about what is being measured.

**Modality:** visual-vocal

**Process:** Perceptual closure

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**Title:** Detroit Tests of Learning Aptitude

**Author:** Harry J. Baker & Bernice Leland

**Publisher:** Bobbs-Merrill Co., Inc.

**Date of Publication:** Revised 1969

**Ages:** 3 - Adult year

**Cost:** $10.00/set

**Forms:** One

**Purpose:**

To provide information about the child's general aptitude as well as specific information about strength and weakness in the following mental facilities:

1. Reasoning & Comprehension
2. Practical Judgment
3. Verbal Ability (Pertains to good vocabulary)
4. Time & Space Relationship
5. Number Ability
6. Auditory Attentive Ability
7. Visual Attentive Ability
8. Motor Ability
Description:

The Detroit Tests consist of 19 subtests which will be described below in terms of the modalities and process which are evaluated.

1. **Pictorial Absurdities** - The subject is asked to identify absurdities in pictures which are presented to him by the examiner.
   - **Modalities:** Visual - Vocal
   - **Process:** Reasoning, comprehension and visual attentive ability are the processes being evaluated.

2. **Verbal Absurdities** - The subject must identify absurdities in statements present to him orally by the examiner.
   - **Modality:** Auditory - Vocal
   - **Process:** Reasoning, comprehension and verbal ability are the processes being evaluated.

3. **Pictorial Opposites** - The subject must identify from several alternatives, the picture which depicts a concept which is just the opposite of the concept presented in the stimulus picture.
   - **Modality:** Visual
   - **Process:** Conceptual

4. **Verbal Opposites** - The subject must say the word which is just the opposite of the stimulus word which is presented orally by the examiner.
   - **Modalities:** Auditory - Vocal
   - **Process:** This test involves the ability to formulate concepts.

5. **Motor Speed** - The subject's performance in placing X's inside a series of circles of grade sizes is scored in terms of accuracy and time.
   - **Modality:** Motor
   - **Process:** Basically, this is a test of motor facility.

6. **Auditory Attention Span for Unrelated Words** - The subject repeats groups of unrelated words in the order that they were pronounced by the examiner.
   - **Modalities:** Auditory - Vocal
   - **Process:** Memory

7. **Oral Commissions** - The subject must follow oral commission in correct sequence after they are presented by the examiner.
   - **Modalities:** Auditory - Motor
   - **Process:** The process involves sequential memory, and comprehension of basic concepts such as sit, walk, stand, etc.

8. **Social Judgment** - The subject must answer questions involving social and moral judgments.
   - **Modalities:** Auditory - Vocal
   - **Process:** Judgment and comprehension are involved in this act.
9. Visual Attention Span for Objects - The subject must repeat from memory and in sequence the names of objects represented by pictures of common objects that were previously displayed by the examiner.
   Modality: Visual - Vocal
   Process: Short term memory

10. Orientation: The subject is asked to answer questions pertaining to spatial and temporal relationships. (i.e., 'Can you touch the moon?)
    Modalities: Auditory - Vocal
    Process: The processes are understanding of spatial and temporal relationships on the conceptual level, involving reasoning and comprehension as well as verbal ability.

11. Designs - There are three parts to this test. In Part A the subject must copy geometric shapes. In Parts B and C the subject must reproduce geometric shapes from memory.
    Modality: Visual - Motor
    Process: Part A - Part-Whole perception
             Part B - Short term memory
             Part C - Short term memory

12. Auditory Attention Span for Related Syllables - The subject is asked to repeat from memory sentences presented orally by the examiner.
    Modality: Auditory - Vocal
    Process: Auditory - Memory

13. Number Ability - The subject responds to questions pertaining to basic mathematical skills such as counting, adding and subtracting.
    Modalities: Auditory - Vocal
    Process: Number abilities

14. Social Adjustment B: The subject responds to questions pertaining to the understanding of basic social concepts. (For example, What is a jail, a fireman, money, a party, etc.?)
    Modality: Auditory - Vocal
    Process: Concept Formation

15. Visual Attention Span For Letters - The subject is to repeat from memory, and in correct sequence, groups of letters which were displayed by the examiner.
    Modality: Visual - Vocal
    Process: Short-term memory

16. Disarranged Pictures - This test consists of a series of ten pictures. Each picture is broken into a number of disarranged sections.
    The subject is asked to number the various sections to indicate which correct sequential arrangement of pieces will produce the correct picture.
    Modality: Visual - Motor
    Process: Sensing relationships between concepts.
17. **Oral Questions** - The subject is asked to follow directions presented by the examiner. A sample question will follow:

"Draw a line under the letter F, cross out the letter K and draw a line above the O."

**Modality:** Auditory - Visual

**Process:** Auditory Memory and concept formation

18. **Likenesses and Differences** - The subject is asked to specify how two words are alike and how they are different.

**Modality:** Auditory - Vocal

**Process:** Conceptual

**Statistical Data:**

**Norms:** Standardization was made on pupils from the Detroit Public Schools whose school population was typical of large metropolitan cities as measured on surveys by the use of standardized tests of educational achievement and group intelligence examination.

**Scoring:** Age norms have been developed for the 19 subtests at each age level, uniformly at three month intervals, and a general mental age is derived from the median ages of whatever series of subtests have been administered.

**Reliability:** Test reliability was sampled first on 48 cases with a correlation of .959 ± .01 after an interval of 5 months between 1st and 2nd testing. A second correlation of .675 ± .01 was found for a group of 792 pupils ranging in chronological ages from 7-12 years. The latter report was based on mentally retarded, delinquent, and emotionally unstable children.

**Validity:** When over 4,000 cases were compared with a similar number that had been examined a few months earlier with a well known individual examination, there was agreement within one point of I.Q. in the first quartile, the median and the third quartile of the two distributions. This indicated that the Detroit Tests of Learning Aptitude were a sensitive instrument for the examination of mentally retarded as well as average pupils.

**Title:** Developmental Examination Tests

**Author:** I. G., F. W. and Ames L. B.
Purpose: This is an evaluation which provides information concerning the developmental level of a school age child and will indicate instances of gross misplacement of the child in school.

Description: The various subtests will be described below:

1. The Initial Interview: Questions about age, birth date, and birthday party, including favorite activity and presents received.
   Modalities: Auditory-vocal
   Process: Conceptual and relationship between concepts.

2. Pencil and Paper Tests:
   a. Writing name or letters and address: If child can't write his name he is asked to write letters dictated to him.
   b. Writing number 1-20.
   c. Copying six basic forms: (circle, cross, square, triangle, divided rectangle, diamond in 2 orientations), and two three dimensional forms (cylinder and cube in two different orientations).
   d. Completing Incomplete men figures and giving his facial expression.

Modalities:
   a. Auditory - motor
   b. Auditory - motor
   c. Visual - motor
   d. Visual - motor

Processes:
   a. Memory
   b. Memory
   c. Part-whole perception
   d. Closure

3. Right and Left (Adaptation of Jacobson's Right and Left Tests)
   a. Naming parts and sides of body
   b. Carrying out single and double commands
   c. Responding to a series of pictures of a pair of hands in which two fingers are touching. Response
is first verbal and then motor (age 8 and over).

Modalities:
   a. Auditory - vocal; auditory-motor (when
      child is asked to show right or left hand.)
   b. Auditory - motor
   c. Visual - vocal or visual-motor

Processes:
   a. Memory for names of body parts.
   b. Name of body parts, right and left
      orientation, memory and comprehension of
      verbal directions.
   c. Spatial relationships, name of fingers,
      right and left orientation.

4. Form Tests (From Marion Monroe's Reading Readiness Test)
   a. Visual One (Monroe) - matching forms
   b. Visual Three (Monroe) - memory for designs
   c. Projection into forms - The forms used in visual
      three are presented once again and the subject is
      asked to describe what each word reminds him of.

Modalities:
   a. Visual
   b. Visual - motor
   c. Visual - vocal

Processes:
   a. Visual discrimination
   b. Visual memory
   c. Test of language facility

5. Naming Animals: Subject is asked to name animals for
   60 seconds.

   Modality: Vocal
   Process: Long term memory

6. Concluding Interview: Reporting on what child likes
   to do best, at school, indoors and outdoors, and, at
   home, indoors and outdoors.

7. Examination of teeth

8. Supplementary Test: Lowenfeld Mosaic Test Material:
   Box of 456 plastic pieces: in 6 colors and 5 shapes:
   Publisher: Badger Tests Co. Ltd., Liverpool House,
   1518 Eldon St., London E.C.2 Price: $5.00

Description: Patterns are to be made on white paper
10½" x 12 3/8". Directions are to take geometric
shapes and make anything the subject wishes. After
finishing the design, the subject is asked to tell
the examiner about what he has made. The chief
difficulty is that there is no generally accepted
formal scoring system. Examiner must evaluate
child's response rather than score it. Ilg and Ames
provide data as to performance of children 5-10 years
of age upon which examiner can base his evaluation.

Modality: Motor-visual (some auditory)
Process: Conceptual relationships
Scoring: Based on data representing the longitudinal or age flow and the direction in which age changes, the examiner must determine the age placement of each individual response and the developmental age around which all the responses seem to cluster.

A description of the way children in each age group from age 5-10 typically respond to each item is also provided.

This data was obtained by administering the trial battery to 100 subjects (50 boys - 50 girls) on each age level from 5 - 10 years, including 5%.

Reliability: 78% of Kindergarten, 95% of 1st grade and 79% of 2nd grade subjects rated the same on first and final examinations.

Validity:
Predictive:
Correlated with teacher ratings:
Kindergarten: 83% agreement
1st Grade: 68%
2nd Grade: 59%

The correlation between kindergarten predictions and actual school performance of 6th grade children (20-30 children) was .74.

How Tests Were Chosen:
The authors chose the tests on the basis of years of experience in examining children which have provided them with information regarding what evaluation approaches tell most about the child.

Title: Embedded Figures Test

Author: Herman A. Witkin, Ph. D.

Publisher: Consulting Psychologists Press, Inc.

Date of Publication: 1969

Ages: 10 year old children up through geriatric groups

Time: Approx. 45 min.

Purpose: This is a test of figure-ground perception

Description: Materials: The test material consists of three sets of cards: two sets of 12 cards with Complex Figures, numbered consecutively in order of test presentation, and a set of 6 cards with Simple Forms, designated by letters A to H.
The test is administered as follows:
1. Subject is asked to describe a complex colored design.
2. Next, the subject is shown a Simple Form which is contained in that larger design.
3. Finally, the examiner again presents the first design and asks the subject to locate and trace the Simple Form which is embedded in the complex colored design.

Statistical Data:

Norms: Age level norms are provided in the test manual.¹

Scoring: The subject's score for the test is the sum of the solution times for all 12 items.

Reliability: Spearman Brown reliability coefficients for ages 10-13 ranged from .61 -.86.

Validity:
1. The author refers to five studies (correlational and factor analytic) which provide evidence that performance in the EFT is related to performance in a variety of other perceptual tests which involve ability to overcome an embedding context and to performance in a variety of intellectual tasks which involve the same ability.
2. The author indicates that a number of studies demonstrate that ability to overcome an embedding context in the EFT, is associated with more differentiated functioning in a variety of other psychological areas. These include:
   a. Studies relating EFT performance to social behavior.
   b. Studies relating EFT performance to nature of body concept.
   c. Studies relating EFT performance to nature of defenses.
   d. Studies relating EFT performance to forms of pathology.
   e. Studies relating EFT performance to differences in family and cultural experiences.

Modality: Visual - motor

Process: Figure ground perception

¹For children between the ages of 5 and 9, a special children's version of the EFT (CEFT), developed by Karp and Konstadt (1963), is recommended.
Title: Examining for Aphasia

Author: Jon Eisenson

Publisher: The Psychological Corporation

Date of Publication: 1954

Cost: $6.50

Purpose: This test was designed for adolescents and adults whose language abilities became impaired after normal language functioning was established.

Description:

Designed to test for levels of ability in receptive and expressive spheres.

1. **Receptive Spheres**
   a. Agnosia - Simple recognition without interpretation; i.e., pictures, colors, forms, sounds, numbers, letters, words, and sentences.
   
   Modality - Visual, auditory and tactile
   
   Process - Memory

   b. Aphasia
      1. Auditory Comprehension
      2. Reading Comprehension
      
      Modality - 1. Auditory
      
      2. Visual
      
      Process - Conceptual relationships

2. **Expressive Spheres**
   a. Apraxias - Inability to use tools including parts of body and speech mechanisms.
      1. Non-verbal Apraxias - Test items include performance with body parts, simple speeches and pretended action.
      
      2. Verbal Apraxias - Test items include repetition of words, numbers, and simple sentences.

   b. Aphasia
      1. Automatic Speech is tested through recitation of days of weeks, letter of alphabet, months of years, and through counting.
      
      2. Spelling, writing from dictation, naming, word finding, arithmetic calculations, oral reading and clock setting are tested.

   Modalities:
   
   Automatic Speech - Vocal
   Spelling and Writing - Auditory - motor (from dictation)
   
   Naming - Visual - Vocal
   Word Finding - Auditory - vocal
Word Finding - Auditory - vocal
Arithmetic - Visual - motor and vocal
Clock Setting - Auditory motor

Processes:
Automatic Speech - long term memory
Spelling & writing from Dictation - Long term memory
Naming - Long term memory
Word Finding - Conceptual
Arithmetic - Long term memory (calculation) and conceptual (problems)
Clock Setting - Long term memory

Statistical Data:

Scoring
1. A plus (+) is entered on the scoring sheet if answer is correct.
2. A check mark (✓) is entered on scoring sheet if the subject was able to respond correctly after the examiner offered some assistance.
3. A minus (-) is entered on the scoring sheet if the response is incorrect.

Standardization - The author indicates that aphasias are characteristically too inconsistent in their responses to permit formal scoring standards to be developed and meaningfully applied.

Title: Figure-Ground Perception Test

Author: A. A. Strauss & L. Lehtinen

Publisher: Grune and Stratton

Date of Publication: 1947

Cost:

Time: 5 minutes

Purpose: This is a test of figure ground perception

Description:
This test consists of a series of a card with black and white drawings of objects such as a hat, a teacup, milk bottles, a knife, a chicken, etc. These pictures are embedded in clearly structural homogeneous background
consisting of jagged and wavy lines, squares, crosses, etc.

Procedure:

The pictures are tachistoscopically exposed for 1/5 of a second, and the child is asked: "What do you see?" To make sure that the child can perceive the short exposure, each card is presented twice in succession.

Statistical Data:

Norms: No data available

Scoring: Four different reactions to cards were distinguished by the author of the test under experimental conditions which will be discussed below in the Validity section.

The four reactions are:
1. Child correctly named the object with no reference to the background.
2. The child noted the presence of the object but in a vague and imprecise manner.
3. The child described only the background, not mentioning the object. (Scoring in terms of background responses)
4. The child mentioned both object and background but imprecisely.

Reliability: No data available.

Validity: A study was conducted with normal, mentally defective and brain injured retarded children ranging in age from 7-11 years. The percentage of background responses made by normal, familial retarded and brain injured retarded were 9%, 14% and 75%, respectively. This study seems to validate this test for identifying brain damaged children who were retarded.

Modality: Visual

Process: Figure-ground perception

Title: Full Range Picture Vocabulary Test

Author: Robert B. Ammons and Helen S. Ammons

Publisher: Southern University Press
Date of Publication: 1948

Ages: 2 and over

Administration Time: 10-15 minutes

Purpose: A vocal test to measure the same factor or factors underlying WISC and Binet Vocabulary Tests.

Description: The testee is asked to indicate by word or gesture which of the form pictures best illustrates the meaning of a given word.

Statistical Data:

Reliability: Adequate. Median odd-even reliability for various age groups was .81.

Validity: Concurrent Validity was reported as follows: (44 in sample population)
.95 correlation with Stanford Binet Vocabulary
.90 correlation with Stanford Binet Bilingual group
.98 with Wechsler Vocabulary Subtest

Modality Evaluated: Visual

Process Evaluated: Conceptual

Title: The Gates-McKillop Reading Diagnostic Tests

Author: Gates, McKillop

Publisher: Bureau of Publications, Teachers College, Columbia University

Date of Publication: 1962

Ages: Grades 1 - 8

Cost: $2.50/ specimen set

Time: 60-90 minutes for total battery

Purpose: To diagnose reading disabilities

Description: Four subtests are included in the grid system. These tests will be discussed below:
Description: (Continued)

1. Test V-2 Giving Letter Sounds: The subject is asked to pronounce letter sounds represented by letters printed in the test form.
   Modality: Visual - Auditory
   Process: Memory - (Long term)

2. Test VI-2 Initial Letters - The examiner pronounces a series of 19 words while the subject points to the letter in the test booklet which represents the sound.
   Modality: Visual - Auditory
   Process: Long Term Memory

3. Test VII - Auditory Blending - The examiner pronounces, by parts, each of 15 words. The subject must identify and pronounce the word.
   Modality: Auditory - Vocal
   Process: Short Term Memory

4. Test VIII-4 The subject must identify whether word pairs which are pronounced by the examiner are the same or different.
   Modality: Auditory
   Process: Perceptual discrimination

Statistical Data:

Norms: All the tests were standardized using the same population. Grade equivalent norms are provided for tests VII, V-2, VI-2. No norms are provided for test VIII-4.

Reliability: No data available in manual

Validity: No data available in manual

Title: Goldstein - Scheerer Tests of Abstract and Concrete Thinking

Author: Goldstein, Kurt and Scheerer, Martin

Publisher: The Psychological Corporation

Date of Publication: 1941-51

Ages: Adults
Cost: $64.00 for complete set of material

Purpose and Description:

1. Weige - Goldstein - Scheerer. Color Form Sorting Test ($10.05/set). This test consists of four small plastic squares, four triangles, four circles, each reproduced in one of four colors. The subject is asked to sort them into groups (form a concept-color), and then to resort them in a different way, (form a second concept-form). All types of cases (emotionally disturbed, brain damaged, normals) can pass this test. Modality: Visual-motor Process: Conceptual

2. Goldstein-Scheerer Object Sorting Test - (Approx. $20.00/set). This test consists of a number of every day objects which must be sorted into groups according to as many different principles as possible. This test seems to differentiate between brain damaged, schizophrenic and normal subjects. Modality: Visual-motor Process: Conceptual

3. Gelb - Goldstein. Color Sorting Test (Approx. $17.) This test consists of a large number of skeins of wool of varying hues, brightness and saturations. The subjects are required to sort the skeins into groups according to different principles. This is not a valid or reliable test as it is difficult for subjects to perform consistently on these "abstract items."
Modality: Visual-motor Process: Conceptual

4. Goldstein - Scheerer. Cube Test - Modified Version of Kohs Test. Modification consists of standard sets of aides given to subjects who cannot complete the designs. (e.g. Subject is given an opportunity to copy from a life size picture, from a picture divided up, or from a model). No objective scoring system has been set up by the authors. This test tends to differentiate between brain damaged and normal subjects with a great deal of overlap between the two groups. Modality: Visual-motor Process: Part-whole perception

5. Goldstein - Scheerer Stick Test - This test requires the subject to copy patterns with small plastic sticks and to reproduce them from memory. No norms or scoring system are available. Little research has been done to associate this task with brain damage in a specific cortical area.
Modality: Visual-motor  
Process: Part-whole perception and memory  

Statistical Data:

Norms: The authors indicate that "the usual scoring method based on scale of difficulty which has been standardized on a statistical basis offers no adequate instrument for determining the degree or nature of impairment. Unless one takes into account the entire procedure, the specific reasons for the difficulty the patient encounters, one cannot simply read off from a score which task represents a greater difficulty and which is lesser. Any statistical evaluation has to be based upon a qualitative analysis of test results; qualitative has to precede statistical analysis."  


Title: Illinois Test of Psycholinguistic Abilities  
Author: Kirk, Samuel A., McCarthy, James J. and Kirk, Winifred D.  
Publisher: University of Illinois Press  
Ages: 5-9 years  
Cost: Approximately $40.00  
Administration Time: 1 - 1½ hours  

Purpose: These 12 tests are designed to isolate defects in: (a) three processes of communication, (b) two levels of language organization, and/or (c) two channels of language input and output.  

The purpose of the sub-tests is as follows:

THE RECEPTIVE PROCESS  
Ability to comprehend visual and auditory symbols.  

Sub-test 1 Auditory Reception: ability to gain meaning from verbally presented material.  

Modality: auditory  
Process: conceptual
Sub-test 2  Visual Reception: ability to gain meaning visual symbols.
Modality: visual
Process: conceptual

THE ORGANIZING PROCESS
Ability to relate, organize, and manipulate visual or auditory symbols in a meaningful way.

Sub-test 3  Visual Sequential Memory: ability to reproduce sequences of nonmeaningful figures from memory.
Modality: visual
Process: memory (short term)

Sub-test 4  Auditory-Vocal Association: ability to relate concepts presented orally.
Modality: auditory-vocal
Process: conceptual

Sub-test 5  Auditory Sequential Memory: ability to reproduce from memory sequences of digits.
Modality: auditory-vocal
Process: memory (short term)

Sub-test 6  Visual-Motor Association: ability to relate concepts presented visually.
Modality: visual
Process: conceptual

Sub-test 7  Visual Closure: ability to identify a common object from an incomplete visual presentation.
Modality: visual-vocal
Process: perceptual closure

Sub-test 9  Grammatic Closure: ability to make use of the redundancies of oral language in acquiring automatic habits for handling syntax and grammatic inflections.
Modality: auditory-visual-vocal
Process: long term memory

Sub-test 11  Auditory Closure: organizing process at the automatic level.
Modality: auditory-vocal
Process: perceptual closure

Sub-test 12  Sound Blending: organizing process at the automatic level in auditory-vocal channel.
Modality: auditory-vocal
Process: short term memory

THE EXPRESSIVE PROCESS
Ability to use verbal or manual symbols to transmit an idea.
Sub-test 8  Verbal Expression: ability of the child to express his own concepts vocally.
   Modality: motor
   Process: conceptual

Sub-test 10 Manual Expression: ability to express ideas manually.
   Modality: motor
   Process: conceptual

Description:

Sub-test 1 Auditory Reception: Questions are presented orally by the examiner to the subject. Any discriminable indication of "yes" or "no" is acceptable.

Sub-test 2 Visual Reception: A stimulus picture is presented to subject for 3 seconds. A response page with four pictures is then presented. Subject is to point to response picture.

Sub-test 3 Visual Sequential Memory: A sequence card in the test booklet is exposed for 5 seconds. Subject is to then reproduce the sequence with corresponding chips.

Sub-test 4 Auditory-Vocal Association: The examiner reads an incomplete analogy, allowing subject to supply the final term.

Sub-test 5 Auditory Sequential Memory: Subject is asked to repeat increasingly longer sequences of digits presented at a uniform rate of 2 per second.

Sub-test 6 Visual Motor Association: On each item, the subject must point to the one of four peripheral pictures which is most closely associated with a central picture.

Sub-test 7 Visual Closure: A sample picture is shown and labeled by the examiner. Then a picture strip is exposed and the subject is asked to point to all of the specified objects he can find in 30 seconds. There are 4 strips.

Sub-test 8 Verbal Expression: The subject is asked to describe each of 4 objects with the instruction "Tell me all about this."
Sub-test 9 Grammatic Closure: Incomplete statements presented verbally are accompanied by pictures which portray the content of the verbal expressions. The subject is to supply the missing words.

Sub-test 10 Manual Expression: The subject is asked to demonstrate the use of the pictured objects.

Sub-test 11 Auditory Closure: The examiner presents a series of words with sounds omitted. The subject is asked to supply the completed word.

Sub-test 12 Sound Blending: Auditorily presented words and nonsense words divided into successive sounds are given by the examiner. The subject is asked to blend.

Statistical Data:

Norms and Scoring: Over 1,100 linguistically normal children between the ages of 2-0 to 9-0 were tested, 700 of which were included in the final battery. A complete description of selection procedures is presented in the technical manual. Psycholinguistic age norms were derived from a Composite Raw Score for the ten basic tests. Standard Scaled Scores with a mean of 36 and standard deviation of 6 are also available. Standard scores are plotted on a profile and disabilities in the specific area are identified based on the size of discrepancy between the subject's mean standard score and the subtest scaled score.

Reliability:

1. Internal consistency coefficients for the ITPA by age and test were computed. Overall coefficients ranged from .89 - .95.

2. Test-retest stability coefficients for a restricted age range with full range estimates were provided. Full range estimates for each test ranged from .73 to .96. The total test full range estimate was .97.

3. Split-half Reliability coefficients were computed for each age group on each subtest. Overall coefficients ranged from .90 - .99.

Validity: A collection of several studies on the concurrent, predictive, content, construct and diagnostic
validities of the ITPA are presented in a report by McCarthy & Olson: "It is difficult, indeed, to make an overall judgement about the validity of the ITPA battery and subtests, for the qualitative-quantitative studies reported herein are not subject to simple summation. Generally, the data suggest the concurrent, construct, and predictive validities to be adequate, followed by the content and diagnostic. The chief cautions to the test users would be these:

1. Our data suggest that the Encoding subtests and especially, the Auditory-Vocal Automatic subtest, may deviate from the definition in the Examiner's Manual. It is particularly critical that, when a diagnosis or a prescription for remediation is based on the results of these subtests, ad hoc tests and clinical observation be used to confirm performance on them. Of the three, the Vocal Encoding subtest appears to be the most valid.

2. In the diagnosis of children with linguistic defects, particularly dyslexia, it is recommended that auxiliary tests accompany the use of the ITPA.

If the above cautions are observed, the clinician will find the ITPA to be an adequately valid test."

1 McCarthy, James J., Osson, James L. Validity Studies On the Illinois Test Of Psycholinguistic Abilities: Ch. VI Pp. 66-1964

Title: John Hopkin's Perceptual Test (Experimental Edition)

Author: Rosenberg, Leon A

Publisher: See ERIC 014754 for reference

Ages: 3-0 to 7-11

Administration Time: 20 minutes

Purpose: A test of child's ability to discriminate between forms

Description: The test items include photographs depicting a black figure on a white background.

1. Child is presented with five designs lying upright on a board.

2. Designs which match one of the five are presented one at a time and placed upright on a stand.
3. The child is asked to identify the one card in a display of five which correctly matches the stimulus figure.

**Statistical Data:**

**Norms:** No norms have been published

**Reliability:** The test-retest reliability coefficient for JHPT was .90.

**Validity:** A validity coefficient of .572 -- .697 was reported between Stanford Binet Test and JHPT. Small samples of Borderline, "dull normal and institutionalized retarded children" were used in the validity studies.

**Modality:** Visual

**Process:** Perceptual Discrimination

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**Title:** Kuhlmann-Finch Tests

**Author:** Finch, Frank H.

**Publisher:** American Guidance Service, Inc.

**Date of Publication:** 1951-1957

**Ages:** Grades 1-12

**Cost:** $2.95 per 25 tests

**Purpose:** According to the authors, this is a test of general intelligence.

**Description of Test I -- Grades 1-2** (Other grade level available but not reviewed here)

**Subtest 1:** Subject must identify a figure which is identical to the stimulus picture in all aspects except its position in space.

Modality: visual

Processes: perceptual constancy

**Subtest 2:** The subject is asked to cross out the picture in a series of pictures which does not belong.

Modality: visual

Process: visual discrimination
Subtest 3: Two stimulus figures are presented; the second being an incomplete representation of the first figure. The subject must select from among five alternatives, the part which completes the second stimulus figure.

Modality: visual
Process: closure

Subtest 4: Picture analogies are presented. The subject must select from among five alternatives the related picture.

Modality: visual
Process: conceptual

Subtest 5: The subject is asked to identify from among five alternative domino pictures the picture which is the same as the stimulus domino picture.

Modality: visual
Process: visual discrimination

Statistical Data:

Norms: Norms are presented in terms of median mental ages and deviation intelligence quotients. Percentile ranks are provided.

Reliability: Split-half within age range reliability coefficients of .86 to .92 are reported.

Validity: Validity data is presented in terms of low subtest intercorrelations and high criterion correlations. The subtests show gains in scores through age ranges where growth is expected.

Title: Leiter International Performance Scale

Publisher: Psychological Service Center Press

Date of Publication: 1936-48

Ages: 2 - 18

Cost: Three trays are available. The cost is $27.50 per tray.

Purpose: The Leiter is a non-language measure of general intelligence. It tests the subject's abilities to cope with new situations.
Description: The test uses the technique of matching, ranging from simple pairing of like colors and objects, to more complex relationships of designs, genus, analogies, etc. Below is a description of tests incorporated into the grid:

5 year tests

V-1 Genus: Pictures of objects representing the same genus are matched.  
Modality: Visual-motor  
Process: Conceptual

6 year tests

VI-1 Analogous Progression: Subject is asked to place squares in ascending order, analogous to the arrangement of circles.  
Modality: Visual-motor  
Process: Conceptual

VI-2 Pattern Completion: Subject must determine the sequential pattern of circles and crosses and then complete this pattern; i.e. X O X O X _  
Modality: Visual-motor  
Process: Conceptual

VI-3 Matching on Basis of Use: The subject is asked to match pictures of objects which have a similar function. i.e. motor-cycle and car are both means of transportation.  
Modality: Visual-motor  
Process: Conceptual

7 year tests

VII-2 Circle Series: (Must be preceeded by VI-1) The subject is presented with blocks containing pictures of varying numbers of concentric circle. The subject is asked to place these blocks in ascending order ranging from the block with the least number of circles to the block with the greatest number of circles.  
Modality: Visual-motor  
Process: Conceptual

VII-3 Circumference Series: The subject is presented with blocks containing pictures of incomplete circles differing in terms of their degree of completion. The subject must arrange the circles in ascending order ranging from the least complete to the most completed circles.  
Modality: Visual-motor  
Process: Closure and sensing part-whole relationships.
8 year tests

VIII-4 (Must be preceded by VII-3) Series of Radii: Subject is presented with pictures of circles with varying numbers of radii projecting out from their circumferences (♂). Subject must arrange pictures in ascending order based on number of radii extending from each circle.
Modality: Visual-motor
Process: Conceptual (must see relationship)

2 year tests

IX-1 Dot Estimation: (VIII-4) Subject must place cards containing varying numbers of dots in ascending order based on the estimated number of dots on each card.
Modality: Visual-motor
Process: Conceptual

IX-2 Analogous Designs: Subject must match analogous designs.
Modality: Visual-motor
Process: Conceptual

10 year tests

X-4 Line Completion: Subject must place seven blocks in ordered positions to complete a series of lines.
Modality: Visual-motor
Process: Closure (perception)

12 year tests

XII-2 Similarity: Subject must match 8 series of two pictures in terms of their similarities.
Modality: Visual-motor
Process: Conceptual

XII-4 Matching Animals: Subject must match animals in terms of similarities.
Modality: Visual-motor
Process: Conceptual

14 year tests

XIV-2 Analogous Designs: Subject must match analogous designs.
Modality: Visual-motor
Process: Conceptual
XIV-3 Memory for a Series: Subject is presented with a series of figures differing only in terms of their orientation in space. After a lapse of time he must duplicate this arrangement from memory.
Modality: Visual
Process: Short-term memory

XIV-4 Form Completion Test: Subject is presented with a geometric form which is divided into two sections. The subject must identify a picture of each completed geometric form.
Modality: Visual
Process: Part whole and closure perception

16 year test

XVI-3 Dot Estimation: Similar to IX-1

18 year test

XVIII-2 Dot Estimation: Similar to XVI-3

XVIII-3 Form Completion Test: Blocks must be placed in notches where they will complete a geometric form.
Modality: Visual-motor
Process: Closure

Statistical Data:

Norms: The M.A. is total number of months of credit earned. Cumulative credit is recorded as Subject proceeds from level to level.
I.Q. = MA x 100. The subject must complete the entire test item for credit.

Reliability: Standard deviations, in terms of MA score made on four well accepted intelligence scales, compared favorably with the Leiter.

Validity: Intercorrelations between the Revised Binet (L), the Arthur Point Scale - Form 1, The Leiter, and the Arthur adaptations of the Leiter Scale, based on IQ and MA, ranged from .66 - .81.
Title: Letter Naming Test From the Durrell Analysis of Reading Difficulty - New Edition

Author: Durrell, Donald

Publisher: Harcourt, Brace and World

Date of Publication: 1955

Ages: Non-reader or child who is on 1st grade reading level or any child suspected of not knowing his letters.

Purpose: To assess the subject's ability to name letters

Description: Child is asked to name upper and lower case letters.

Statistical Data:

Norms: According to Durrell, by the middle of 1st grade, the average child knows the names of all the capital and lower case letters.

Reliability and Validity data are not available.

Title: The Marble Board Test

Author: Werner, H. and Strauss, A.


Date: 1947

Purpose: This is a test of visuo-motor performance

Description: "This test consists of two identical cardboards, eleven inch squares, each containing ten rows of ten holes. The cardboard is light gray and the holes are dark gray. This distance from the center of one hole to the center of another is one inch. Some 50 black marbles and some 30 red marbles are used. One board is the examiners board, on which he constructs the mosaic patterns. The other is
subject's board on which he copies the patterns constructed by the examiner.

While the subject is occupied so that he cannot observe the examiner's moves, the examiner constructs the first pattern on one board. There is no time limit. As the subject copies the pattern, the examiner records each move in numerical sequence in the appropriate space of a squared paper record blank. When the subject has finished copying the marble pattern, his board is removed. He is then requested to "draw a picture" of the pattern on the examiner's board. The examiner records on subject's drawing the direction in which lines were drawn after picture is completed. The same procedure is used for each of 6 patterns.¹

Statistical Data:

Validity: The marble board pattern copying by brain-injured children is characteristically incoherent, disorganized and disconnected. Whereas nonbrain-damaged subjects do not exhibit these characteristics.

Scoring: Less than two incoherent placements are not considered significant—Two or more incoherent moves on more than two patterns gives strong indication of a disturbed visuo-motor perception.

Part I:
Modality: Visual-motor
Process: Part-whole perception

Part II:
Modality: Motor
Process: Memory (short term)

¹ Strauss and Lehtinen, Psychopathology and Education, p. 32.

Title: The Marianne Frostig Developmental Test of Visual Perception

Authors: Marianne Frostig, Phyllis Maslow, D. Welty Lefever, and John R. B. Whittlesey

Publisher: Consulting Psychologists Press, Palo Alto, California
Date of Publication: Revised 1966
Ages: Ages 3-8 and children with learning disabilities
Cost: $10.00 for examination kit
Administration Time: Approximately 20 minutes

Purpose:

According to the authors, this test is designed to measure certain operationally defined perceptual processes and to identify the age at which they usually develop.

Description: Developmental Test of Visual Perception

TEST I Eye-Motor Coordination: This is a test of eye-hand coordination, involving the drawing of continuous straight, curved, or angled lines between boundaries of various widths, or from point to point without guide lines.

Modality: Measure of motor co-ordination

TEST II Figure-Ground: This test involves shifts in perception of figures against increasingly complex grounds. Intersecting and "hidden" geometric forms are used.

Modality: Visual
Process: Figure-ground perception

TEST III Constancy of Shape: This test involves the recognition of certain geometric figures presented in a variety of sizes, shadings, textures, and positions in space, and their discrimination from similar geometric figures. Circles, squares, rectangles, ellipses, and parallelograms are used.

Modality: Visual
Process: Perceptual constancy

TEST IV Position in Space: This test involves the discrimination of reversals and rotations of figures presented in series. Schematic drawings representing common objects are used.

Modality: Visual
Process: Discrimination

TEST V Spatial relationships: This test involves the analysis of simple forms and patterns. These consist of lines of various lengths and angles which the child is required to copy, using dots as guide points.

Modality: Visual
Process: Part-whole perception
Statistical Data:

Norms: Scaled scores and age equivalent scores are provided for each subtest. A perceptual quotient can be computed for the entire test by referring to tables in the manual. The perceptual quotient is not a ratio but is defined in terms of constant percentiles for each age group, with a median of 100 and upper and lower quantities of 110 and 90, respectively. Children who are aged 10 and over are expected to pass the maximum Perceptual Age Equivalent for any subtest.

Scoring: The authors provide clear criteria for scoring each test. The testee receives a point or points for each correct response. Point scores are converted through use of tables into scaled scores, age norms and perceptual quotients.

Reliability:

1. Test-retest Reliability
   a. A reliability study on a small sample was made in 1960 and reported in a paper by Frostig, Lefever and Whittlesey (1961). Test-retest reliability coefficients were computed for 50 children with learning difficulties. The average interval between test administrations was approximately 3 weeks. Tests were administered individually by the same trained psychologist. Based on the PQ, the product-moment coefficient of retest reliability was .98 using the full range in ages.
   b. In a reliability study conducted in the Spring of 1961, the Frostig test was administered 2 weeks apart to 2 groups of 35 first grades and 2 groups of 37 second graders. The test-retest reliability estimate, a product-moment correlation coefficient for the perceptual quotient for the entire sample, was .80. Subtest scale score test-retest correlation ranged from .42 (Subtest II) to .80 (Subtest III).
   c. To determine test-retest reliability when the instrument is used by people trained in giving the Frostig test, but who are not psychologists or psychometrists, a further reliability study was conducted in the Spring of 1962. The Test-retest product-moment coefficients were .69 for K. and 1st grade groups.

2. Split-half Reliability

Split-half reliability coefficients for various age groups will follow:
2. Split-half Reliability - (Continued)

<table>
<thead>
<tr>
<th>Age</th>
<th>Total Score Split-Half Reliability Correlation Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 6</td>
<td>.89</td>
</tr>
<tr>
<td>6 - 7</td>
<td>.88</td>
</tr>
<tr>
<td>7 - 8</td>
<td>.82</td>
</tr>
<tr>
<td>8 - 9</td>
<td>.78</td>
</tr>
</tbody>
</table>

Validity:

1. Correlation Studies
   a. Classroom adjustment - The correlation between teacher ratings of classroom adjustment and scores on the Frostig Test are .46 - .50.
   b. Correlations between scores on the Frostig Test and the Goodenough Test were as follows:
      Kindergarten - .46
      First Grade - .32
      Second Grade - .37
   c. Factor analytic Studies - The reader is referred to other sources as the authors have not conducted factor-analysis.
   d. University Elementary School Study - One study with children ages 4½ - 6½ indicated that children with perceptual quotients below 90 had not begun to read.
   e. Another study in the area of beginning reading produced results which showed a correlation of between .4 and .5 between visual perception and reading scores.
   f. Clinical school sample - A large proportion of learning disability cases, age 9 or younger, referred to the Frostig School exhibited poor visual perception.
   g. Neurologically handicapped samples - Authors indicate that research in this area has pointed out impressive correlations between perceptual disabilities and neurological handicaps.
Administration Time: 45 minutes

Purpose: To analyze defects in auditory blending

Description: This is a test of auditory blending, which is the ability to fuse sounds pronounced separately into a word

Statistical Data:

Norms: Grade equivalent norms are provided.

Scoring: The score is the number of words correctly given.

Reliability: No data are provided in manual.

Validity: No data are provided in manual.

Modality: Auditory

Process: Short term memory

Title: The Minnesota Percepto-Diagnostic Test

Author: Fuller, G. and Laird, J.

Publication: Journal of Clinical Psychology, 16 (1963), 1-33 (Monograph Supplement)

Date: 1963

Purpose: Measure of perceptual distortion due to emotional factors or organic disorders.

Description: Authors used Wertheimer's gestalt designs used in Bender. They used 2 of the designs in 3 different contexts emphasizing position of figure and the framework into which figure is placed.

Statistical Data:

Norms: Fuller et. al. conducted a three phase study to provide new revised age norms on 4,000 5-20 year old subjects. Age norms, I. Q. adjustment, and tables are provided. This information was
located after the final battery was established and, thus, was not included in Chapter Four when the test selection was rationalized.

**Validity:** One study showed that rotated figures are indicative of pathology.

**Scoring:** Rotations are factors which are scored.

**Modality:** Visual-Motor

**Process:** Part-whole perception


**Title:** Neurological Test Battery

**Author:** C. W. Halstead

**Publisher:** Used at Indiana University Medical Center

**Publication Date:** 1953

**Ages:** 9-14 (Intermediate Battery)

**Cost:** Listed with individual test when information was available

**Purpose:** This battery is used to evaluate brain functions.

**Description:**

1. Halstead Category Test: (Cost $400.00)
   The Category Test utilizes a projection apparatus for presentation of stimulus material. The subject is required to "abstract" principles based upon variables such as size, shape, number, position, brightness, and color around which to organize his responses.
   **Modality:** Visual
   **Process:** Conceptual
2. Tactual Performance Test: Time, Memory, and Localization (Cost $70.00)
The Tactual Performance Test utilizes a modification of the Seguin-Goddard form board. The subject is blindfolded and is not permitted to see the form board or blocks at any time. He first fits the blocks into their proper spaces with his preferred hand, then repeats the procedure with his other hand, and finally performs the task a third time using both hands. After the board and blocks have been put out of sight, the blindfold is removed and the subject is required to draw a diagram of the board representing the blocks in their proper spaces. The subject is scored for the total time needed to place the blocks on the board. The Memory Component of this test is based upon the number of blocks correctly reproduced in the drawing of the board, and the localization component is based on the number of blocks correctly localized.

Modality:
   Part 1 - Kinesthetic - motor
   Part 2 - Motor

Process:
   Part 1 - Discrimination
   Part 2 - Memory

3. Rhythm Test:
The Rhythm Test is a subtest of the Seashore Test of Musical Talent. The subject is required to differentiate between 30 pairs of rhythmic beats recorded on tape recorders which are sometimes the same and sometimes different.

Modality: Auditory
Process: Discrimination

4. Speech-sounds Perception Test:
The Speech-sounds Perception Test consists of 60 spoken nonsense words which are variants of the "ee" sound presented in multiple choice form. The test is played from a tape recorder with the intensity of sound adjusted to the subject's preference. The subject's task is to select the spoken syllable from the alternatives printed on the test form.

Modality: Auditory - Visual
Process: Perception - Discrimination

5. Trail Making Test:
The Trail Making Test consists of two parts, A and B. Part A consists of 25 circles distributed over a white sheet of paper and numbered from 1 to 25. The subject is required to connect the circles with a pencil line as quickly as possible, beginning with
the number 1 and proceeding in numerical sequence. Part B consists of 25 circles numbered 1 to 13 and lettered from A to L. The subject is required to connect the circles, alternating between numbers and letters as he proceeds in ascending sequence. The score is obtained as the number of seconds needed to finish each part. The test was modified for children by deleting the last 10 circles in each section of the test.

Modality: Visual - Motor
Process: Sequential Memory

6. Aphasia Examination: (Reitan's Modification of Halstead - Wepman Test for Aphasia)

This aphasia examination is a modification of the Halstead-Wepman Aphasia Screening Test. The Halstead-Wepman Test was modified by omitting a number of items for which positive results were rarely found. Several procedures were added such as finer agnosia, finger-tip number writing recognition, and tactile, auditory, and visual suppression items.

Categories of tasks included in test will follow:

a. Drawing simple figures
   Modality: Visual - motor
   Process: Part-whole perception

b. Naming objects
   Modality: Visual - vocal
   Process: Conceptual

c. Spelling words which named objects
   Modality: Vocal
   Process: Memory (long term)

d. Reading
   Modality: Visual - vocal
   Process: Memory

e. Repeating words after they are pronounced by examiner
   Modality: Auditory - vocal
   Process: Memory, perception

f. Explaining the meaning of a simple sentence
   Modality: Auditory - vocal
   Process: Sensing relationship between concepts

g. Writing a sentence on paper which was dictated by the examiner
   Modality: Auditory - motor
   Process: Memory (short & long term)

h. Solving an arithmetic problem on paper
   Modality: Visual - motor
   Process: Conceptual or memory
1. Solving an arithmetic problem in the subject's head
   Modality: Vocal
   Process: Memory

j. Demonstrating how the subject would use simple objects
   Modality: Motor - auditory
   Process: Conceptual

k. Following written dictation
   Modality: Visual - motor
   Process: Sensing the relationship between concepts

l. Follow directions which are presented orally by the examiner
   Modality: Auditory - motor
   Process: Sensing relationships between concepts

m. Examination for perceptual disturbances
   Modality: Auditory - tactile - visual
   Process: Sensory

n. Finger Agnosia Test - Subject must identify which finger has been touched by the examiner. Subject is blindfolded.
   Modality: Tactile
   Process: Long-term memory - (Must know names of fingers)

o. Finger Tip Number Writing Test - The examiner writes some numbers on the fingertips of the subject who must identify these numbers.
   Modality: Tactile - vocal
   Process: Memory - (Must know numeral names)

p. Astereognosis - Subject must identify a familiar object (coins) through touch alone.
   Modality: Tactile - vocal
   Process: Memory

7. Tactile Form Recognition Test -
   The subject is asked to place his right hand into the hole of a box. The examiner says, "I AM GOING TO PLACE AN OBJECT IN YOUR HAND. FEEL IT CAREFULLY, THEN POINT WITH YOUR LEFT HAND TO THE FIGURE DRAWN ON THE PAPER (examiner points to the row of figures drawn on a piece of paper) WHICH IS JUST LIKE THE ONE IN YOUR HAND." Examiner places the first figure (circle) in the subject's right hand. If the subject responds correctly, he removes that figure from the subject's hand and places the next figure (square) in the subject's same hand. The test continues in the same manner with the (triangle) and then the hexagon.
There is no time limit. The subject may feel the figure as long as necessary.

**Statistical Data:**

**Scoring and Norms:** The children's norms were unavailable.

**Reliability:** No information

**Validity:** Based on studies by Vega¹, Reed, Reitan and Klove² and Reed³, the impairment index differentiates between normal and brain-damaged subjects. A study by Reed⁴ shows that certain tests in the battery differentiate between high and low achievers in reading.

**Impairment Index:**

The Impairment Index is a composite score based upon the 10 "discriminating" tests in the Halstead battery and is determined for an individual subject merely by counting the number of tests which fall above the criterion level.


**Title:** Peabody Picture Vocabulary Test

**Author:** Dunn, Lloyd M.

**Publisher:** American Guidance Service Inc.
**Ages:** 2,5 - 18

**Cost:** Approximately $10.00 for Manual & Plates

**Administration Time:** 10-15 minutes

**Purpose:** The Peabody Picture Vocabulary Test provides an estimate of a subject's verbal intelligence by measuring his listening vocabulary.

**Description:** The examiner asks the subject to identify, from among four alternative pictures, the picture which best depicts the meaning of a word pronounced by the examiner.

**Statistical Data:**

**Scoring and Norms:** Raw scores, based on the number correct, are converted into age norms, intelligence quotients, and percentile norms. The intelligence quotients are based on standard score norms with a mean of 100 and standard deviation of 15 IQ points. Substantial numbers were used in the standardization population at all age levels. However, the sample was limited because only white children in the Nashville, Tennessee area were included in the final standardization group.

**Reliability:** Alternate form reliability coefficients were calculated and the correlations ranged from a low .67 at the 6th year level to a high of .84 at the 17 and 18 year levels. The median coefficient was .77. The median standard error of measurement was 7.20. Research for a five year period is also reported in the manual.

**Validity:** Item, congruent and content validity were reported in the manual.

1. **Content Validity:** An adequate sample of words that could be illustrated were taken from Webster's New Collegiate Dictionary (1953 ed.)

2. **Item Validity:** Item validity was established by selecting the individual words which tended to discriminate between successive age groups.

3. **Congruent Validity:** Correlations with other vocabulary and intelligence tests are as follows:
   '37 Binet mental age scores & PPVT mental age scores - .60 - .87.
   '60 Binet & PPVT - .43 - .92
   WISC-F & PPVT - .30 - .84
   WISC-V & PPVT - .41 - .78
   WISC-P & PPVT - .19 - .82
4. Concurrent Validity - Validity coefficients between the PPVT & measures of scholastic achievement ranged from .04 - .91. The scholastic achievements tests used in the studies were: Sequential Tests of Educational Progress California Achievement Tests Wide Range Achievement Tests Metropolitan Achievement Tests Gray - Votaw - Rogers Achievement Tests Teacher Ratings

5. Predictive Validity - Only two slides were conducted to determine whether or not the PPVT scores predicted school achievement scores obtained some time after the PPVT was administered. The correlations obtained in these studies were .39 and .22.

Modality: Visual
Process: Concept Formation

Title: Perceptual Form Test

Author: Developed by the Sight Conservation Committee of the Winter Haven Lions Club

Publication: Revision of Children's Perceptual Achievement Forms. Winter Haven Lions Club,
Winter Haven Lions Research Foundation, Inc.

Publication Date: 1955-60

Ages: 6 - 8.5

Time required for administration: 10 minutes

Purpose: To identify those children who are likely to experience problems in general school achievement, which may be due to perceptual difficulties.

Description:

Part A: Subject is asked to copy 7 pictures on a piece of paper. Pictures are presented one at a time.
Modality: Visual - motor
Process: Part-whole perception
Part B: Incomplete forms procedure - Child is asked to complete each of 7 geometric shapes as the completed shape is displayed by the examiner. 
Modality: Visual - motor 
Process: Perceptual closure

Statistical Data:

Norms: Norming was based on a study indicating that if a child in the 5-7 age group scores below 60, using the revised "scoring scale", the odds are 6 to 1 the child will be a low achiever and will have one or more visual motor problems.

Scoring: A Scoring Scale is provided in the manual.

Reliability: No information

Validity: One validation study showed a relationship between low scores on this test and future failure in school achievement. Another study dealt with the relationship between present percentual ability and present school success. A significant relationship was found between these two factors.

Title: Predicting Reading Failure: A Preliminary Study

Authors: Katrina deHirsch, Jeanette J. Lansky and Wm. S. Langford

Publisher: Harper & Row

Publication Date: 1966

Ages: five to six

Purpose:

dehirsch et. al. have developed a battery of tests for identifying children who will experience difficulty in learning to read, write, and spell unless precautionary and remedial measures are employed early in their school career. They have compiled the best predictors of future reading success into an instrument for identifying these "high risk" youngsters. The final instrument consists of the following tests:

1. Pencil use
2. Bender Visuo - Motor Gestalt Test
3. Wepman Auditory Discrimination Test
4. Number of Words Used in a Story
5. Categories
6. Horst Reversals
7. Gates Word Matching Test
8. Word Recognition I
9. Word Recognition II
10. Word Reproduction

Since the Bender and Wepman have been discussed separately, they will be omitted from the brief description of the deHirsch Battery which will be presented below:

1. **Pencil Use:** After observing the child as he uses a pencil, the tester rates the testee along a continuous ranging from best to worst (0-2 score points) based on criteria presented in the text.
   - **Modality:** Motor
   - **Process:** This is a fine motor patterning task

2. **Number of Words Used in a Story:** The child is asked to tell the story of The Three Bears. The total number of words used constitutes the score.
   - **Modality:** Vocal
   - **Process:** Conceptual relationship

3. **Categories:** The child is asked to produce class names for three groups of words. The tester asks for example, "What are these things: Red - Green - Blue?" The score is based on the number of categories missed.
   - **Modality:** Auditory - Vocal
   - **Process:** Conceptual

4. **Horst Reversals Test:** The test consists of 10 rows of two and three letter combinations, presented in correct and reversed order, which have to be matched to a model. The score is based on number of matching errors.
   - **Modality:** Visual
   - **Process:** Discrimination

5. **Gates Word Matching Substitute Tests:** The subject is taught to recognize and say two words at the initiation of the test session. Next he is asked to write the words. Half way through the session the words are re-exposed and studied. At the termination of the session the child is asked to do the following:
   1. To say the words from memory
   2. To read the words and
   3. To write the words from memory. Scoring is based on number of errors.
   - **Modality:** Word Recognition I - Vocal
   - **Modality:** Word Recognition II - Visual - vocal
   - **Modality:** Word Reproduction - Motor
Process: Word Recognition I - Long term memory
Word Recognition II - Long term memory
Word Reproduction - Long term memory

Statistical Data:

Norms: Critical score levels are provided in the text representing the lowest a child can score. Norms represent Kindergarten level achievement.

Reliability: None reported

Validity: Predictive validity correlation coefficients for the individual tests administration in K with reading scores in 2nd grade will follow: (They are all statistically significant relationships)
Pencil use: .34
Bender: .44
Wepman: .26
Storytelling: .28
Categories: .24
Horst Reversals: .36
Word Matching: .35
Word Recognition I: .40
Word Recognition II: .48
Word Reproduction: .42

Comment: A great deal of work has to be done in validating this test battery

Title: Raven Colored Progressive Matrices

Author: J. C. Raven

Publisher: Psychological Corporation

Date: 1956

Ages: 5-11

Administration Time: 60 minutes

Purpose: It tests, with a series of increasingly difficult pattern completion problems, the intellectual capacity to form comparison and reason by analogy.
Description: Each matrix is a network of logical relationships between simple and more complex visual forms, mainly of geometric design, and each matrix has a "gap" which has to be filled in by indicating on the printed score sheet the number of the correct choice form the alternatives presented below the matrix.

Statistical Data:

Norms: Percentile norms for the total test are presented in the manual

Reliability: The reported reliability coefficients for ages six and below and age nine, respectively, are .65 and .80.

Validity: Correlation between Raven and Stanford Binet were reported for the following age groups:
- Under 7 years -- .50
- Nine years -- .65

Modality: Visual

Processes: This is a series of tests increasing in difficulty and measuring the following processes:
1. Visual discrimination
2. Spatial relationships
3. Position in space
4. Part-whole relationships
5. Analogies

Title: The Revised Visual Retention Test

Author: Arthur L. Benton

Publisher: The Psychological Corporation

Publication Date: 1963

Ages: Adults, ages 15-44; Children 8-14

Cost: Approximately $5.00 per set containing cards, 50 record blanks and manual

Administration Time: 5 minutes for each drawing form

Forms: C, D, E
Purpose: The Revised Visual Retention Test is designed to evaluate visual perceptions, visual memory visuoconstructive abilities.

Description: This test is composed of three forms, containing 10 designs each.

The various techniques for administrating the drawing forms of the tests are as follows:
Administration A: Ten seconds exposure of each design with immediate reproduction from memory on the part of the subject.
Modality: Visual - motor
Process: Short term memory

Administration B: Five seconds exposure of each design with immediate reproduction from memory on the part of the subject.
Modality: Visual - motor
Process: Short term memory

Administration C: Copying of the Design by the subject.
Modality: Visual - motor
Process: Part - whole perception

Administration D: Ten seconds exposure of each design with reproduction from memory by the subject after a delay of 15 seconds.
Modality: Visual - motor
Process: Short term memory

Statistical Data:

Norms: Normative data was based on a population of 600 children. Children's age norms are presented for Administration A only.

Reliability: Retest reliability for Administration A, as estimated by equivalent form procedures, is .85.

Validity: Validity for identifying brain damaged youngsters is not well established.

Title: Rosewell-Chall Auditory Blending Test

Author: Florence G. Roswell and Jeanne S. Chall

Publication: Essay Press

Date: 1963

Ages: Grades 1 - 4
Cost: $2.00 per 35 tests

Administration: 5 minutes or less

Purpose: Test of subject's ability to blend sounds into whole words

Description: This is a test of the testee's ability to synthesize word parts which are pronounced by the examiner into a total word. The material consists of a scoring sheet containing the thirty words which are fractionalized into word parts as they should be pronounced by the examiner. The thirty test items are subdivided into three parts, each containing ten words, as follows:

Part I - Words divided into 2 sounds—one consonant and one vowel.

Part II - Words divided into 2 parts—part one is composed of the initial consonant or consonant combination and the second part is composed of the rest of the word.

Part III - Is divided into 3 elements. The first element is a consonant, the second is a vowel, and the third is a consonant.

Statistical Data:

Norms and Scoring: By use of a table, raw scores can be interpreted as "inferior" or "adequate". The table is based on administration of test to 62 first grade children, 40 of the original 62 children who were retested in grades 2, 3, & 4, and a group of reading disability cases.

Reliability: Based on the split half procedure, reliability coefficients were reported for children tested in grades 1-4 and for severely retarded youngsters. The coefficients for the grade 1-4 ranged from .86-.93 and the coefficient for the retarded group was .94.

Validity: Correlations were computed between the Gray Oral Reading Test, The Rosewell-Chall Diagnostic Reading Test of Word Analysis Skills, and the Metropolitan Reading Test. The correlations ranged from .26 - .66

Scoring: The score is the number of correct responses made by the subject.

Modality: Auditory - vocal

Process: Short term memory
Title: Screening Tests for Identifying Children with Specific Language Disability

Author: Beth H. Slingerland

Publisher: Educators Publishing Service

Publication Date: 1964

Ages: Grades 1 through 4

Administration Time: 1 hour

Description:

TEST I - Visual -- Copying: This is a test of copying from far point.
Modality: Visual - motor
Process: Part - whole perception

TEST II - Visual -- Copying: This is a test of copying at near point.
Modality: Visual - motor
Process: Part - whole perception

TEST III - Visual -- Memory: This test is for visual perception memory of words after brief exposure and allowing for some intervening distraction. Children will need to retain this memory as they look for the right word among several requiring careful discrimination.
Modality: Visual
Process: Memory

TEST IV - Visual -- Discrimination: In this test words are to be matched, requiring careful discrimination which depends on secure visual perception of symbol and letter sequence. With recognition of the top word, inner auditory - kinesthetic associations assist in making correct visual discriminations.
Modality: Visual
Process: Discrimination

TEST V - Visual Memory: This test requires visual perception memory in association with the kinesthetic memory of the "feel" of symbols and sounds. The testee must be able to reproduce what was seen on the card before the card was withdrawn.
Modality: Visual - motor
Process: Memory
TEST VI - Auditory: This test calls for auditory perception and recall with the corresponding visual and kinesthetic associations. Children must recall the correct symbols with their "feel" to perform successfully and all recalls and associations must come from within themselves. Basically, the child must reproduce letters, numberals and phrases which are dictated to him.

Modality: Auditory (Inner auditory - visual - kinesthetic recall)

Process: Memory

TEST VIII - Auditory: This test is for auditory memory of words or number or groups of letters and their association with the correct visual patterns. It requires careful auditory-visual discrimination in making associations.

Modality: Visual - auditory

Process: Memory

Echolalia: In this test the testee repeats words or phrases pronounced by the tester.

Modality: Auditory - vocal

Process: Memory

Recalling the Right Word: First the child is told to listen carefully and to try to remember the six words that are to be pronounced. Then the tester reads some sentences, omitting one of the words that was just pronounced. The testee must fill in the missing word.

Modality: Auditory - vocal

Process: Conceptual relationship

Auditory - Story-telling

Statistical Data:

No norms, reliability or validity data are provided. Author contends this is not a standardized test, but rather one which screens out children with language disability.
Title: The Spache Diagnostic Reading Scales

Author: Spache, George

Publisher: California Test Bureau

Date of Publication: 1963

Ages: Grades 1-6 & retarded readers in H.S. (Graded passages from 1.6-8.5)

Administration Time: 45 minutes

Purpose: To determine the subject's instructional, independent & capacity levels; to evaluate word attack skills and to evaluate sight vocabulary.

Description:

The Phonics Tests are included in the grid and will be described below.

Phonics Tests -

a.) The subject is asked to pronounce sounds represented by initial consonants.

b.) The examiner pronounces words and the subject must identify letters representing sounds in these words.

c.) Blending test - The subject blends nonsense syllable together.

Statistical Data:

No statistical data is available for the Phonics Tests. Scoring is based on the number correct.

Modality: Auditory - Vocal

Process: Long Term Memory

Title: Test of Visual Motor Integration

Author: Keith E. Beery

Publisher: Pollett Publishing Co., Chicago

Date of Publication: 1967
Ages: 2-15

Purpose: This is a measure of the child's integrative functional processes. The test provides information about the child's visual-motor integration, visual perception and motor co-ordination. The author recommends that it be used with preschool children, primary school children, and retarded or other educationally handicapped children.

Description:

This test consists of 24 geometric shapes to be copied by the subject with pencil and paper. Remedial procedures are included in the manual.

Statistical Data:

Norms: Age norms are presented for each form.

Validity: The following are some of the correlations which were reported in the manual between the VMI and age, tests of intelligence, and tests of visual-motor proficiency.
   a) Chronological age and VMI - .89
   b) Mental age and VMI - .59 (1st grade), .37 (4th grade), .38 (7th grade).
   c) Frostig and VMI - .80
   d) ITFA and VMI - .55

Reliability: Interjudge reliability was .98 when two judges and a sample of 70 were utilized. Test-retest reliability (n=171) was .83 for boys and .87 for girls. Other correlations ranged from .80 - .90. Internal consistency relationships were .93.

Modality: Visual-motor, tactile, kinesthetic

Process: Part-whole perception

Title: Wechsler Intelligence Scale for Children

Author: Wechsler, David

Publisher: Psychological Corporation

Cost: $22.00

Purpose: This is a test of intellectual functioning.
Description:

The Verbal Scale: There are six verbal subtests:

1. **Information:** It is considered to be a test of memory development and functioning but not rote memory.
   
   Modality: Auditory - vocal
   Process: Memory and conceptual interrelationship

2. **Comprehension:** This subtest tests judgment. It has been called a test of "common sense" because success on this test seems to depend upon the possession of a certain amount of practical information and a general ability to evaluate past experience.

   Modality: Auditory - vocal
   Process: Conceptual relationship

3. **Arithmetical Reasoning:** The computational skills required to solve most of the problems are not beyond those taught in the grade school. Success in this subtest requires concentration and attention.

   Modality: Auditory - vocal
   Process: Memory

4. **Similarities:** This subtest relies on "verbal concept formation." It tests the ability to perceive the common elements of the terms he is asked to compare and his ability to bring them under a single concept.

   Modality: Auditory - vocal
   Process: Conceptual

5. **Digit Span:** This subtest is primarily the function of attention. It is a test of retentiveness.

   Modality: Auditory - vocal
   Process: Memory

6. **Vocabulary:** This test reflects the range of ideas, memories, and relationships that the subject has picked up and organized into verbal meanings.

   Modality: Auditory - vocal
   Process: Conceptual

The Performance Scale:

1. **Picture Completion:** This test tests the subject's basic perceptual and conceptual abilities that are
Description: (Continued)

involved in the visual recognition and identification of familiar objects and forms.

Modality: Visual - vocal
Process: Closure - perceptual

2. Block Design: It is a test of visual-motor co-ordination - spatial organization. Complex designs must be broken down by the subject into units equivalent to the faces of the blocks.

Modality: Visual - motor
Process: Part-whole perception

3. Digit Symbol: There is a learning factor involved and subjects learning the key quickly can achieve higher scores.

Modality: Visual - motor
Process: Memory

4. Picture Arrangement: This is a test of anticipation and visual organization. It measures the subject's ability to comprehend and size up a total situation.

Modality: Visual
Process: Conceptual relationship

5. Object Assembly: This test also involves visual-motor co-ordination and adequate anticipations since the subject is given no information of what the end product will be.

Modality: Visual - motor
Process: Part-whole perception

Statistical Data:

The data reported below by no means covers the number of studies conducted to validate this test.

Reliability: Test-retest reliability coefficients will follow.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Age</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Scale</td>
<td>7 1/2</td>
<td>.88</td>
</tr>
<tr>
<td></td>
<td>10 1/2</td>
<td>.96</td>
</tr>
<tr>
<td></td>
<td>13 1/2</td>
<td>.96</td>
</tr>
<tr>
<td>Performance Scale</td>
<td>7 1/2</td>
<td>.86</td>
</tr>
<tr>
<td></td>
<td>10 1/2</td>
<td>.89</td>
</tr>
<tr>
<td></td>
<td>13 1/2</td>
<td>.90</td>
</tr>
</tbody>
</table>
Validity: Correlation of .80 was found between the Binet and WISC.

Scoring: Interpretation of the Wechsler Scales depends upon an understanding of standard scores. The subject's raw score on each of the subtests is converted to a standard score with a mean of 10 and a standard deviation of 3. The sums of the standard (scaled) scores on the Verbal Scale, the Performance Scale, and the Full Scale are then converted into IQ's. These IQ's, known as deviation IQ's, are based on a standard score mean of 100 and a standard deviation of 15.

Norms: IQ's are reported in the manual based on the mean and standard deviation at each age level.

Title: The Wide Range Achievement Test

Author: J. F. Jastak, S. R. Jastak

Publisher: Guidance Associates

Date of Publication: Revised 1965

Ages: Age 5 - Adulthood - Level 1 - Age 5.0-11-11
      Level 2 - Age 12-0 - Adult

Cost: $3.50 per 50 tests

Administration Time: 20 - 45 minutes

Purpose: The Author lists eleven uses for the test. Some of these uses include diagnosis of spelling, math, reading disabilities, determination of instructional level, grouping and research. These tests do not measure comprehension, reasoning or generalization but rather provide information about the sensory - motor skills involved in learning to read, write, spell, and figure.

Description:

Level 1 - Spelling

Subtest 1: This test involves copying 18 marks presented on the first page of the test blank.

Subtest 2: This test involves printing or writing the subject's name.
Description: (Continued)

Subtest 3: This test involves writing 45 words to dictation.

Modalities: Subtest 1 - Visual-motor
           Subtest 2 - Motor
           Subtest 3 - Motor

Processes: Subtest 1 - Visual part-whole perception
           Subtest 2 - Automatic long term memory
           Subtest 3 - Long term memory

Level 1 - Reading

The reading subtests consists of the following parts:

At the prereading level: Recognizing and naming letters.
At the reading level: Naming words

Modalities: Visual-vocal
Processes: Long term memory

Level 1 - Arithmetic

Rational counting reproduction of number of fingers, reading digits, identifying more or less, oral addition and substraction problems. A written part consists of 43 computation problems.

Modalities: Auditory-visual-motor
Processes: Rote memory

Level 2 - Spelling

Writing words which are dictated by the examiner.

Modalities: Same as in Spelling Level 1.
Processes: Same as in Spelling Level 1.

Level 2 - Reading

Reading words.

Modalities: Same as in Reading Level 1.
Processes: Same as in Reading Level 1.
Level 2 - Arithmetic

Subject must complete page of computations.

Modalities: Same as in Computation part of Level 1.
Processes: Same as in Computation part of Level 1.

Statistical Data:

NORMS: The test was standardized on large population. Grade norms, percentiles and standard scores are included in manual.

Reliability: Reliability presented for each subtest at various age levels.
Reading: .98 - .99 - (Split-halves correlation)
Spelling: .96 - .98 - (Split-halves correlation)
Arithmetic: .94 - .97 - (Split-halves correlation)

Validity: Four techniques were used:
1. Correlation with outside criteria was between .78 - .88.
2. Correlation with other achievement tests was from .74 - .93.
3. Factor analysis was reported to determine the factor loadings inherent in each subtest.
4. Correlations between WRAT scores and intelligence scores were from (.60 - .77).

Scoring: Raw scores based on number of items correctly answered are converted into grade norms, percentiles and standard scores.

Title: Terman and Merrill Digit Memory Span Lists

Publisher: Houghton Mifflin Company

Purpose: To evaluate the testee's ability to remember digits in their correct sequence. This is a test of auditory memory.

Description:
The testee must repeat numbers which are pronounced by the examiner. There are two sections: digits forward and digits reversed.
Statistical Data:

Norms: Norms are provided based on 1937 revised norms.

Modality: Auditory - vocal

Process: Memory

Title: Syracuse Visual Figure - Background Test

Authors: W.M. Cruickshank, H.V. Bice, N.E. Wallen, and T.S. Lynch in Perception & Cerebral Palsey: Studies of Figure - Background Relationship. (Rev. Ed.)

Publisher: Syracuse U. Press

Date of Publication: 1966

Purpose: This is a test of figure-ground perception. According to the authors, persons with brain damage often experience difficulty in perceiving the figure rather than the background into which the figure has been embedded.

Description:

This test consists of a series of pictures which are briefly flashed on a screen by means of a projector. The pictures consist of common objects which are embedded into a structured background. The subject is asked to identify the object after exposure.

Statistical Data:

Reliability: Four judges separately scored the responses of 55 cerebral palsied children and the percentages of perfect agreement ranged from 73% to 100% agreement among the four judges. Split-half and test-retest reliability data for the number of correct identifications were .89 and .94, respectively.

Validity: Empirical data indicate that the test successfully identifies brain damaged individuals.

Scoring: Each response is categorized by judges into one of eight categories provided in the text.

Title: SRA Primary Mental Abilities Test

Author: L. L. Thurstone and Thelma Gwinn Thurstone
Publisher: Science Research Associates

Date of Publication: 1946 - 1958

Ages: 5 years to 11 years

Cost: Approximately $14.00

Administration Time: 60 - 80 minutes

Purpose: This is a test of general intelligence

Description:

A. Grades K - 2 (Ages 5-7)

1. **Space:** Subject is asked to identify the figure which completes a partially completed square.

   (a) Subject is asked to complete a simple line drawing to make it look like another drawing.

2. **Verbal:** Subject is asked to choose a picture corresponding to a word or idea presented orally by the examiner.

3. **Perceptual:** Subject is asked to find a picture exactly like the first picture.

4. **Number:** Subject is asked to mark pictures to show an understanding of quantitative relationships, i.e., Subject is asked to mark the largest figure.

5. **Motor:** Subject is asked to draw as many lines as possible within an allotted time period.

B. Grades 3 - 6 (Ages 7-11)

1. **Space:** Similar to (1. (a)) above in K-2 battery.

2. **Verbal:**
   
   (a) Similar to number two above in K-2 battery.

   (b) Printed synonyms test.
3. **Perceptual:** Similar to number three above in K-2 battery.

4. **Number:** Similar to number four above in K-2 battery.

5. **Reasoning:**
   - (a) Subject is asked to indicate which word does not belong.
   - (b) Subject is asked to indicate which picture does not belong.

**Modality:**

1. **Verbal** - Primary - visual-auditory (picture choosing)
   Intermediate - (a) Visual (picture choosing)
   (b) Visual (synonyms)

2. **Space** - Primary - (a) Visual
   (b) Visual - Motor
   Intermediate - Visual

3. **Perceptual** - Primary - Visual
   Intermediate - Visual

4. **Quantitative** - Primary - Visual
   Intermediate - Visual

5. **Motor** - Primary - motor

6. **Reasoning** - Intermediate - (a) Auditory
   (b) Visual

**Process:**

1. **Verbal** - Primary - Conceptual
   Intermediate - Conceptual

2. **Space** - Primary - Closure
   Intermediate - Closure

3. **Perceptual** - Primary - Perceptual discrimination
   Intermediate - Perceptual discrimination

4. **Quantitative** - Primary - Conceptual
   Intermediate - Conceptual

5. **Motor** - Primary - Basically motor facility involved.

6. **Reasoning** - Intermediate - (a) Conceptual
   (b) Conceptual
Statistical Data:

Norms: Norms are based on a large number of cases. Percentile IQ's are used rather than standard score IQ's with a mean and standard deviation. Profiles are provided but they don't suggest how large a deviation is meaningful.

Scoring: Raw scores based on number of items correctly answered are converted into mental age equivalents and deviation IQ's.

Reliability: In the manual are reported .77 to .96 split-half correlations for individual subtests on the 5-7 year level and .79-.95 correlations for the 7-11 year group.

Validity: The correlations of the SRA with Stanford Binet and Kuhlmann Anderson are high. In the 5-7 year level tests, correlations of .75 and .50 were found with Stanford Binet and readiness tests, respectively. In the 7-11 year level, correlation with IQ's was slightly lower. However, high correlations were found with arithmetic and reading scores.

Title: The Slosson Intelligence Test

Author: Richard L. Slosson

Publisher: Slosson Educational Publications

Date of Publication: 1963

Ages: one month and over

Cost: 33.75 per kit

Administration Time: 10 - 20 minutes

Purpose: This is an individual screening instrument designed to provide a brief assessment of a person's mental ability.

Description:

This test consists of the following types of items presented intermittently from levels 2.0 - 27.0

1. Vocabulary
2. Number problems
3. Memory items
4. Drawing geometric figures
5. General information
Statistical Data:

Norms: Mental age norms are presented and I.Q.'s are determined by using the following formula: MA/CA x 100.

Reliability: Using the test-retest interval within a period of two months technique, a reliability coefficient of .97 was obtained. (N=139)

Validity: Concurrent correlations between Stanford-Binet and SIT ranged from .90 - .98, depending on age level.

Scoring: The testee receives cumulative credit for each age level test passed.

Modality: Visual - auditory-motor

Process: Perceptual and conceptual
APPENDIX B
INFORMAL TESTS

The informal tests included in this appendix can be sub-divided into two sections: 1) informal tests included in the two-dimensional grid system which was developed for use in the *Specific Learning Disability Test Battery* and 2) informal tests included in the two-dimensional grid system which were developed for use during remedial therapy to provide additional information about areas of weakness identified when the SLD Battery was administered.

INFORMAL TESTS DEVELOPED FOR USE IN THE SPECIFIC LEARNING DISABILITY TEST BATTERY

The tests presented below are in the form that was developed for use in the field testing of the battery.

Informal Puzzle Test

**Purpose:** This is a test of visual part-whole perception

**Materials:**
Use the box of Puzzle Blocks which are in curriculum library. (Due to expense I was unable to purchase a large quantity of puzzles. You can keep the Puzzle Blocks for one week. There are 6 boxes of puzzles. Therefore, I don't think you'll have difficulty obtaining the material.) In addition to the Puzzle Blocks there are four pictures, each representing a different puzzle design.

**Directions:**
1) Place each of the blocks so that side #1 is upright.
2) Disarrange these blocks so that they are apart and in no particular order.
3) Say "Here are four pictures. If these blocks were put together in the right way they would look like one of these pictures. Which picture would these blocks look like if they were put together in the right way?"
Informal Sound Identification Test
(The subject is asked to pronounce medial vowel sounds.)

Purpose: This is a test of auditory-vocal discrimination

Directions:
The examiner says, "I am going to say a three letter word. I want you to say the middle sound in that word. Let's practice. If I say 'pat' you say /æ/;" (Pronounce the short e sound for subject). "If I say 'pat' you say /æ/;" (Let child pronounce sound.) Here are some more words. You say the medial sound in each word." Begin the test. Use the words listed below:
1) mit
2) let
3) rag
4) mob
5) tub

Scoring:
Percent Correct = \#correct = \frac{1}{5}

Remarks:

ITPA Modifications

General Directions:
Administer part A if child has failed the ITPA Sound Blending Subtest.
Administer part B if child has failed the ITPA Auditory Closure Subtest.
Listen to the record included in the ITPA test material which provides a guide as to the proper pronunciation of the items in these tests.

Materials:
Items from the ITPA Sound Blending and Auditory Closure tests with the modifications in directions.
A. ITPA Sound Blending Modification:

Purpose: this is a test of auditory part-whole perception

Directions:
Pronounce "f-o-o-t." Say, "Clap when you hear the word I just pronounced. This time I will say it faster. Did I say feet? Did I say foot? Did I say float? Yes, you are correct. The answer is foot. First I said the word slowly and the next time I said the word much faster."

If the child has difficulty, repeat procedure above until he understands that he must select the word which is the same as the first word pronounced by the examiner. Proceed as outlined above using the following test items (Items can be repeated since this is not a test of memory):

1) c-u-p  a) cat   b) cup   c) cap
2) sh-i-p  a) ship  b) push  c) shop
3) e-g-g   a) get   b) egg   c) beg
4) b-a-b-e-s a) easy  b) babe  c) babies
5) r-u-s-o-p a) rustop  b) rusop  c) soproc

Scoring:
Percentage correct = Percentage correct =

Remarks:

B. ITPA Auditory Closure Modification:

Directions:
Demonstration - Pronounce "Da/v". Then say,(Daddy)
"I just said part of a word. Now I am going to finish that word. Clap when I say the finished word."

Does Da / y say Date?
Does Da / y say Dance?
Does Da / y say Daddy?

If the child has difficulty, repeat procedure outlined above until the child understands that he must select the completed form of the 1st word pronounced by the examiner. Proceed as outlined above using the following test items:
1) tele/one
2) tricyc/
   (tricycle)
3) /uffalo
4) /ovie /tar
   (movie star)
   (tell subject
    there are two
    words)
5) /andy /ar
   (candy bar)
   (tell subject
    there are two
    words)

a) television  b) telephone  c) tone
a) triangle    b) tricky    c) tricycle
a) buffalo     b) ruffle    c) bungalow
a) moving car  b) movie star c) tea tart

a) candy bar   b) land bar   c) end start

Scoring:
Percentage correct = \frac{\text{Percentage correct}}{5}

Remarks:

Modification of
Tactual Performance Test
Tactual Form Recognition Test
from
The Neurological Test Battery
by
C. W. Halstead

1. Tactual Performance Test

Material: A six-figure formboard, patterned after the Seguin-Goddard form board was constructed out of plywood. A representation of this board is presented below.

Directions: Place two gauze pads and blind fold over eyes of child before exposing test material.
Part A-1: both hands
Say to subject, "We're going to play a touch game."
Place subject's two hands on blocks and say, "I want you to place these blocks into the matching holes in this game board." Place subjects hands on game board.

Part A-2: dominant
Repeat A except now child uses only dominant hand.

Part B
When child has finished part A, remove blocks and form board and then remove blind fold. Hand the subject a blank piece of paper and say, "Now we are going to play a drawing game. On this paper draw a picture of the game board and the places where the blocks fitted into the holes."

Scoring:
Part A-1 -- Find percentage correct
(# of correct placements) _______ __________
Part A-2 -- Find percentage correct
(# of correct placements) _______ __________
Part B -- There are 2 scores:
1) % of blocks correctly reproduced
(# reproduced) _______ __________
2) % of blocks correctly localized
(# reproduced) _______ __________

Modality: Tactual
Process: A-1
A-2 perceptual discrimination
B-1
B-2 short term memory

2. Tactile Form Recognition Test

Material: 4 geometric shapes - square, hexagon, triangle, circle (envelope A)
Mimeographed sheet containing pictures of square, hexagon, triangle, circle. (attached)
(The cross used in the Halstead test has been replaced by a hexagon).

Directions: Have subject place dominant hand into hole of box. "I am going to place an object in your
hand. Feel it carefully. Then point with your other hand to the figure drawn on the paper." Examiner points to the row of figures drawn on a piece of paper. "Which is just like the one in your hand?" Examiner places first figure (circle) in the subject's dominant hand. If the subject responds correctly, remove that figure from the hand and place the next figure (square) in the same hand. Continue in the same manner with the (triangle) and then the (hexagon). Whenever the subject's response is not correct, remove figure from hand, indicate on form subject's response, then go on to the next figure.

Proceed in order as indicated on form.

There is no time limit. The subject may feel the figure as long as necessary. Place the figure more on the finger tips than in the palm. Do not allow subject to remove the hand being used from the board. Do not let the subject see the figure being felt.

Order of Presentation:
Place a check after incorrect responses
circle  square  triangle  hexagon

Scoring:
Percentage correctly identified: \( \frac{\# \text{ correctly identified}}{4} \)

Remarks:

Modified Sequin-Goddard Form Board Test
(Test of Visual Motor Discrimination)
(Administer after Tactual Performance Test)

Purpose: this is a test of visual-motor discrimination

Material: Use formboard A

Directions:
Say, "Place these shapes into the matching holes on this board."

Scoring:
Percentage correctly placed = \( \frac{\# \text{ correctly placed}}{6} \)

Remarks:
BUZZER TESTS

Buzzer Test I - Subject must identify which buzzer patterns are the same and which buzzer patterns are different.

Purpose: This is a test of auditory-short time memory

Material: Buzzer set and score sheet (attached)

Directions:
Present the buzzer set.
Say to S: "Do you know what this is? How does it work?" (discuss dry cells, wire and buzzer connected together with power coming from battery.) "Here are some 'secret agent' games you can play with the buzzer set."

Trial 1 -- "Listen while I tap out a message." (B taps out (...) pattern, pauses 10 seconds and then repeats the (...) once again. "Was the second message the same as the first?"
"Yes, it was the same; I tapped 3 short buzzes both times. Let's try again."

Trial 2 -- Tap out (.-) and then (.-) after a 10 second pause. "Was the second message the same as the first message? No, the second message was different. First I tapped a long and then a short buzz. The second time I tapped a short and then a long buzz."

Test Procedure:
Be sure the subject understands what is expected of him. Then begin the test. Use the following format:
1) Tap pattern presented in column one.
2) Pause 10 seconds.
3) Tap pattern presented in column two.
4) Ask, "Was the second message the same as the first?"
5) Do not repeat pattern as this is a memory test.

Record errors below.

Test Patterns:
1) -- pause ten seconds --
2) -- pause ten seconds --
3) ... pause ten seconds ...
4) -- pause ten seconds --
5) -- pause ten seconds --
Scoring:
Find percentage correct
\[
\frac{\# \text{ correct}}{5} = \% \text{ age correct}
\]

Remarks:

Buzzer Test II - the subject is asked to determine whether a visual stimulus pattern is the same as an auditory stimulus.

Purpose: this is a test of visual-auditory perceptual discrimination.

Directions:
Say, "Look at this card." (Show card with dot-dash pattern printed on it (-.-).) "It has a dot and dash printed on it. I can tap out the dot-dash pattern on the buzzer set. Listen."

Tap out a short and long buzz on buzzer set.

"Now I'm going to tap out another pattern on the buzzer set." (Show card with (..) pattern but tap out dot-dash (-.) pattern instead.)

"Did I tap out the dot-dot pattern? No, I did not. I tried to fool you but I couldn't. I am going to tap out 5 more patterns which are printed on cards. You play detective and tell me whether I have tapped out the card pattern correctly. Ready?"

Test procedure:
Show a card and then tap pattern. Repeat if child has difficulty as this is not a memory test. Record errors below.

<table>
<thead>
<tr>
<th>Card Pattern</th>
<th>Buzzer Pattern</th>
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</tbody>
</table>

Scoring:
Percentage correct = \[
\frac{\# \text{ correct}}{5}
\]

Remarks:
Buzzer Test III - Subject taps messages on the buzzer set.

**Purpose:** This is a test of part-whole visual-auditory perception

**Material:** Buzzer set and cards in envelope "E"

**Directions:**
"Now I want you to tap some messages."
Present some cards and let child tap out messages. Record errors below.

**Card Pattern:**

```
- -
- -
- -
- -
- -
```

**Scoring:**
Percentage correct = \( \frac{\# \text{ correct}}{5} \)

**Remarks:**

Buzzer Test IV - Subject copies messages which the examiner taps on the buzzer set.

**Purpose:** this is a test of part-whole auditory-visual perception

**Materials:** Buzzer set

**Directions:**
"You're doing a fine job. This time I'll tap out the pattern and you copy down the message. Let's practice." Examiner taps out (---) and asks subject to copy down message. If Subject has no difficulty, proceed with test. If Subject appears uncertain as to what is expected of him, provide another practice example. Then begin test.

**Test Procedure:**
Examiner taps the following patterns and records errors below. Examiner may repeat patterns as this is not a test of memory.
1) ..
2) --
3) ...-
4) ---
5) --...-

**Scoring:**

Percentage correct = \( \frac{\# \text{ correct}}{5} \)

**Remarks:**

**Buzzer Test V** - (Buzzer test V is similar to Buzzer Test IV. However, this is a test of memory so each stimulus pattern is presented **only once**.)

**Purpose:** This is a test of auditory-visual short term memory.

**Material:** Buzzer set and white paper

**Directions:**

Say, "Let's play this game again. This time I'll tap the dot and dash pattern **only once**. Make believe you are a detective and that you are copying a secret code."

**Test Procedure:**

The dot and dash patterns which the examiner presents will follow:

Present each pattern once.

1) ...  
2) --.  
3) ...-  
4) --.-  
5) --...-

**Scoring:**

Percentage correct = \( \frac{\# \text{ correct}}{5} \)

**Remarks:**

**Buzzer Test VI** - Subject is asked to reproduce on buzzer set sound sequences that have been presented on the buzzer set by the examiner.
Purpose: auditory-motor short term memory

Material: Buzzer set

Directions:
"You have one more "secret agent" come to play. I'll tap a buzzer pattern and you tap the same pattern after me."

Test Procedure:
Present pattern once. This is a test of short term memory. The patterns which examiner should present on the buzzer set will follow:

1) .-
2) -. 
3) ..-
4) ... 
5) --.-

Scoring:
Percentage correct = \frac{\# \text{ correct}}{5}

Remarks:

INFORMAL TESTS DEVELOPED FOR USE IN REMEDIAL THERAPY

Informal Test of Auditory Long Term Memory

Purpose: to evaluate the subject's long term recall of acoustically presented stimuli.

Description:
The subject is instructed to listen carefully as the examiner pronounces each of five nonsense syllables ten times in succession. After an hour has lapsed, the same procedure is repeated once again. One week later, the examiner instructs the subject to clap each time a nonsense word introduced the preceding week is presented. Three of the five original nonsense words should be used, accompanied by two additional words which are similar to the original stimuli in terms of length of word but which are not similar in terms of sound presentation. (i.e. boz and poz would be an inappropriate combination as recognition of these nonsense words requires highly developed discrimination as well as auditory memory).
Material: Seven three and four letter nonsense words

Modality: Auditory

Process: Long term memory

Informal Test of Visual Long Term Memory

Purpose: to evaluate the subject's long term recall of visually presented stimuli

Description:
The subject is shown a series of five pictures, one at a time, and he is asked to study each picture for 30 seconds. One hour later the collection of pictures is displayed in its entirety for a second time and the subject is instructed to study the pictures once again.

One week later three of the original five pictures are displayed, accompanied by two pictures not exhibited the previous week.

Material: Seven pictures having homogeneous subject matter. (i.e., farm animals, transportation) Nonsense words could be substituted for the pictures. (i.e., zid, ip, lo, zook, man)

Modality: Visual

Process: Long term memory

Informal Test of Auditory-Vocal Figure-ground Perception

Purpose: to evaluate the subject's ability to pronounce sounds against a background of noise

Description:
The examiner pronounce three letter words of the (CVC) pattern and asks the subject to pronounce the medial sound in each stimulus word. A recording of discordant sounds is played throughout his test. It is essential that the noise from the recording does not cause an accoustical acuity problem.

Material: Three letter words, containing a medial vowel surrounded by two consonants. A tape recording of discordant sounds.
Modality: Auditory-visual
Process: Figure-ground perception

Informal Test of Auditory Figure-ground Perception

Purpose: to evaluate the subject's ability to discriminate against a background of noise.

Description: The Gates Auditory Discrimination Test is administered while a recording is playing in the background. The examiner should make certain that the subject can hear before commencing the test.

Material: Gates Auditory Discrimination (See formal tests for description). Recording of discordant sounds.

Modality: Auditory
Process: Part-whole perception

Informal Test of Tactile Closure

Purpose: to evaluate the subject's ability to identify three-dimensional letters when parts of the letters are missing.

Description: The subject is blindfolded and is then presented with five incomplete three-dimensional letters to identify.

Material: The incomplete stimulus letters are made of plastic and are pasted on corrugated cardboard. Reproductions of the stimulus letters will be presented below:

\[
\begin{array}{c}
\text{C} \\
\text{E} \\
\text{S} \\
\text{N} \\
\end{array}
\]
Informal Test of Tactile Constancy

Purpose: To evaluate the subject's ability to identify through the sense of touch three-dimensional geometric shapes or letters which have been altered slightly in appearance.

Description:
The subject is blindfolded and then handed a three-dimensional form (i.e. a cube) and asked to inspect the form tactually. The subject is then instructed to locate the similar cubes from among a variety of three-dimensional geometric shapes lying on the table in front of him. The cubes lying on the table differ from the original stimulus cube in the following ways:

1) size: the cubes range from \( \frac{1}{2} \) inch to 4 inches in size
2) context: the cubes are imbedded in clay, lying on felt, in a plastic bag or on the bare table.
3) texture: some cubes have smooth surfaces whereas others have rough sandpapery surfaces

After the subject has located the cubes, three other geometric shapes are introduced as test tasks.

Material:
Shapes such as cubes, spheres, pyramids, cylinders and cones are used. The test might be modified by using three-dimensional letters to replace the geometric forms.

Modality: Tactile

Process: Constancy

Informal Test of Tactile Figure-ground Perception

Purpose: to evaluate the subject's ability to identify three-dimensional letters which are embedded in a structured background.

Description:
The subject is blindfolded and is then handed three three-dimensional letters which he is asked to identify. After the subject has identified the letters, he is handed a formboard made of correogated cardboard.
The three stimulus letters are reproduced on the formboard and are embedded in a structured background made up of nails of varying heights. The subject is asked to identify the letters embedded in the formboard.

Material:
A 15" x 15" formboard made of corrugated cardboard, containing 3 letters surrounded by nails of varying heights.

Modality: Tactile
Process: Figure-ground Perception

Informal Test of Tactile Part-Whole Perception

Purpose: to evaluate the subject's ability to assemble parts into a unified whole

Description:
The child is asked to assemble a three piece puzzle while blindfolded.

Material:
A simple three piece puzzle constructed out of wood is used for this task. Such puzzles are produced commercially and can be purchased from such supply houses as the Milton Bradley Company.

Modality: Tactile
Process: Part-whole perception

Informal Test of Auditory-Motor Part-Whole Perception

Purpose: to evaluate the subject's ability to write words which are pronounced slowly, letter by letter.

Description:
The subject is asked to write words pronounced by the examiner. These words are presented very slowly so that there is a long pause between each letter which constitutes the word. Words which the subject can ordinarily spell should be used in this test.
Material:
Since this test has been developed to be administered during therapy, words which the subject can ordinarily be used. Then the teacher should first identify words which the subject can spell and use these words in the test.

Modality: Auditory-Motor

Process: Part-whole perception

Informal Test of Visual-Vocal Part-Whole Perception

Purpose: to evaluate the subject's ability to sense relationships between parts that constitute the whole and to verbalize an understanding of these relationships.

Description:
The subject is presented with a puzzle. The puzzle pieces are unassembled and disarranged. The subject is asked to name the object that would be depicted in the puzzle if the parts were assembled. If the subject fails to identify the object represented in the disassembled puzzle, a completed picture should be presented for the subject to identify. If the subject can recognize and name the object when he sees it in the proper order, and if he fails to recognize it when it is not in the proper order, then there is a strong possibility that the subject is deficient in part-whole visual-auditory perception.

Material: four simple puzzles which represent various animals

Modality: Visual-vocal

Process: Part-whole perception
APPENDIX C
SAMPLE TEST BATTERIES

1. Hampden County Test Battery
   a. Wechsler Intelligence Scale for Children
   b. Peabody Picture Vocabulary
   c. Slosson Intelligence Test
   d. Bender Visual-Motor Gestalt
   e. Draw A Person
   f. Illinois Test of Psycholinguistic Abilities
   g. Frostig Developmental Test of Visual Perception
   h. Benton Visual Retention
   i. Children's Apperception Test
   j. Individual Reading Inventory
   k. Durrell Analysis of Reading Difficulty
   l. Wepman Auditory Discrimination
   m. Roswell Chall Auditory Blending
   n. VanWagonen Reading Readiness
   o. Riggs Physical Education
   p. Wide Range Achievement Test
   q. Arithmetic Achievement Test
   r. Dominance
   s. Detroit Test of Learning Aptitudes
   t. Telebinocular
   u. Audiometer

2. Schiffman Test Battery
   a. Social, familial, developmental, and school case histories
   b. Individual intelligence or capacity test
   c. Personality evaluation including the Rorschach and Draw-A-Person
   d. A reading battery including standardized achievement tests and informal reading skills analysis
   e. Gates Associative Learning Test
   f. Detroit Tests of Memory Span
   g. Laterality Tests to determine eye and hand dominance
   h. Physical screening
   i. Bender Visual-Motor Gestalt Test
   j. Eisenson Examination for Aphasia

---

3. Cruickshank Battery 2

a. Social history questionnaire
b. General pediatric examination
c. Pediatric neurological examination
d. Speech and hearing examination
e. Pediatric psychiatric examination
f. Pediatric clinical psychological examination 3
   - Stanford-Binet
   - Ammons Full-Range Picture Vocabulary Test
   - Goodenough Intelligence Test
   - Block Design and Coding from WISC
   - Bender-Gestalt Test
   - Syracuse Visual Figure-Background Test
   - Tactual-Motor Test
   - Marble Board Test
   - Vineland Social Maturity Scale

g. Ophthalmological and optometric examination
h. Educational evaluation

---


3 Cruickshank, pp. 83-86.
APPENDIX D

TEST BATTERY PROFILE

The profile was developed by taking the standard scoring systems provided for each of the tests in the battery and placing them on a one dimensional linear scale. Each test scale measured ten inches in length and the appropriate score range for each test is divided into equal segments on the ten inch linear scale, i.e., if there are ten items in the test, there are ten spaces provided and if there are 15 items in the test, there are 15 spaces. Cut off points have been established on the basis of the age, grade or standard score norms which are provided in the test manual. In cases where tests did not have norms, the cut off points were more arbitrary and were established by averaging the medians of the high and low reading achievement groups at each age level.

When completed, the standardized scales adapt nicely to a profile technique in which the cut off point, in terms of the normal score for children in age group, is plotted. Then, the actual testee's performance is superimposed on the scale. Using this procedure, any marked deviation from the given test norms is visually identifiable.

The profile presented on the next page is a copy of an original profile used in the study. A separate profile was used for each age level. The percentage data, presented in Section Two of Chapter V, were based upon revised cut off points for informal tests which were developed by averaging the techniques described in the text.
### Visual-Locator Profiles for Ages 9-0 to 9-11

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* cut off point
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<th>VISUAL-VOCAL</th>
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* cut off point
### Visual-Auditory Profile for Ages 9-0 to 9-11

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### Auditory Profile

- 36: Visual Closure
- 37: Visual Perception
- 38: Visual Requirements

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*Cut off point*
INTERNATIONAL READING ASSOCIATION

Memorandum to:
IRA Members Concerned with Research

From: Ralph Staiger,
Executive Secretary-Treasurer

The announcements on this page are reprinted from the Commerce Business Daily and are of great importance to reading researchers. You can see that the March 2, 1970 announcement supercedes the February 25 request for information from researchers and institutions about their interest and qualifications for becoming involved in the first stages of the "Targeted Research and Development Program on Reading." This program has evolved from the application of the "convergence technique" to reading.

We have been assured by the Office of Education personnel that the ten-day deadline is a government formality and that information mailed somewhat later will be honored.

This memorandum is being sent to all IRA members who receive the Reading Research Quarterly as a membership service.

BCS/eacl
3/4/70

The Commerce Business Daily
Issue No. PSA-5014 March 3, 1970

A. RESEARCH AND DEVELOPMENT SOURCES SOUGHT FOR THE TARGETED RESEARCH AND DEVELOPMENT PROGRAM ON READING. The U.S. Office of Education intends to support a five phase program of Research and Development on Reading to reach the following objectives: 1) of all persons not in primary care institutions must pass, by age 12, a criterion-referenced test which demonstrates comprehension of competent performance on a set of adult reading tasks selected to have favorable learning potential for each individual and to society in general. Sources are sought for the Phase I activities of this program as follows:

1. Literature Search
   A. Reading Process
   B. Learning Process
   C. Language Development related to reading

2. Status Survey: Using published test and survey data and other relevant scientific literature
   A. Determine the extent and distribution of the National "Reading Problem"
   B. Determine the use frequency and use distribution of instructional methods, approaches, procedures, materials, and equipment for reading instruction
   C. Describe the nature and extent of current practice in teacher training for (B) above

For a description of the program, see Commerce Business Daily No. PSA-5010.

Department of Health Education and Welfare, Office of Educational Planning, Research and Evaluation Branch, Room 3440, 400 Maryland Ave., N.W., Washington, D.C. 20202

A. REVISION: RESEARCH & DEVELOPMENT SOURCES SOUGHT—PRO- GRAM ON READING. appearing on page 12, column 3 carried over on page 13, column 1. Commerce Business Daily, dated February 25, 1970 (No. PSA-5010) is cancelled in full due to numerous errors. The R&D Program is reprinted in full correctly in March 2, 1970 issue of this publication on page 12, column 2. It was originally submitted by:

Department of Health Education and Welfare, Office of Educational Planning, Research and Evaluation Branch, Room 3440, 400 Maryland Ave., N.W., Washington, D.C. 20202
APPENDIX F

DESCRIPTION OF INSTRUCTIONAL SESSIONS CONSTITUTED TO
TRAIN THE FIELD RESEARCHERS IN THE ADMINISTRATION
OF THE SLD TEST BATTERY

The topics covered during the instructional sessions will be presented below.

Session One

During this session the subjects were briefed about their respective roles in the research project. They were presented with a brief description of the SLD Test Battery, including the time that would be involved in administering the battery.

Session Two

The purpose of this meeting was to present procedures for selecting the study subjects. Written instructions about selection procedures were distributed to each researcher. Each item on the instruction sheet was explained thoroughly. Techniques for administering the Slosson I.Q. and Reading Tests, to be used as selection criteria, were demonstrated. The researchers were instructed to administer these tests on a trial basis, and to record their questions pertaining to administration or scoring procedures. These questions would be answered the following week.  

Session Three

Instruction was provided in administration and scoring procedures for several tests in the SLD Test

1 Details about selection procedures are included in Chapter Four.

2 The researchers were instructed to practice administering the SLD tests during intersessions between each training period, to record questions pertaining to testing procedures, and to pose these questions at subsequent training sessions.
Battery. These tests included the Eisenson Subtests, the PMA Spatial Relations Subtest, the Informal Puzzle, the Modified Seguin-Goddard Formboard Test, the Slingerland Copying Subtest, the Strauss and Lehtinen Figure-Ground Perception Test, the Goldstein-Scheerer Color-Form Sorting Test, The Wepman Auditory Discrimination Test and the Informal Sound Identification Test. Since these tests are relatively easy to administer and score, the researchers had no difficulty digesting the material presented during this session.

Session Four

Tests introduced during this session were the Halstead Tactual Performance Tests, the WISC Coding Subtest, the Wide Range Achievement Reading Subtest, the Detroit Letter and Picture Subtests, the Gates Subtests, the Ilg and Ames Subtests, and the Peabody Picture Vocabulary Test. Again, the researchers had no difficulty grasping the administration and scoring procedures for these tests as the individual test instructions are not complex.

During this session procedures for selecting the study subjects were recapitulated and the researchers were instructed to commence selecting the subjects who would participate in the study.

Session Five

Directions for administering and scoring the Buzzer Tests and the Frostig Developmental Test of Visual Perception were presented during session five. The number of tests introduced during this session was limited due to the complexity of administering and/or scoring these measures.

Approximately one-half of this session dealt with instructions concerning administration and scoring procedures for the Frostig Tests. Each researcher was given an opportunity to score a Frostig Test under the supervision of this writer.

The researchers practiced administering the Buzzer Tests during the remaining half of this session.

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1 Detailed printed instructions were distributed for each test in the battery. Standardized test manuals were provided. Detailed procedure sheets were provided for informal tests. These procedure sheets can be found in Appendix B.
Session Six

The Bender Gestalt Test and the Benton Visual Retention Test were introduced during session six. The major instructional emphasis was on scoring procedures for each of these tests. Each researcher practiced scoring two Bender and two Benton tests under the direct supervision of this writer.

During this session, the researchers were instructed to commence administering the SLD Test Battery to the study subjects after one trial administration of the total battery.

Printed general instructions for administering the battery were presented and explained. These general instructions will be presented below:

1. The number of testing sessions for an individual subject should depend upon several factors: the fatigability of the subject, the amount of successive failures, school schedules, and the convenience of teachers, parents and others involved with the child.

2. Adhere to the printed standard procedures for each test.

3. Avoid giving help beyond repeating a question or directions as they are stated in the test manual. It is never permissible to state a question after an incorrect response has been given or when the directions in the manual state explicitly that a question is to be presented only once.

4. The tests should be administered in the following order:

   1. Ilg and Ames
   2. Wepman
   3. Bender
   4. Wide Range Achievement Test
   5. Frostig
   6. ITPA
   7. ITPA Modifications
   8. Strauss and Lehtinen Figure-Ground Perception Tests
   9. Eisenson Aphasia-Auditory and Tactile Agnosia
   10. Goldstein Scheerer Color Form Sorting Test
   11. Detroit Letter or Picture Naming Test
   12. Benton
   13. PMA Spatial Relations
14. Sound Identification Test Informal
15. Puzzle Test—Informal
16. P.P.V.T.
17. Slingerland
18. Buzzer Tests
19. WISC Coding
20. Halstead Tactual Performance
21. Gates
22. Modified Seguin-Goddard Formboard Test

5. The examiner must establish rapport with the Testee before commencing the administration of the SLD battery. The examiner must feel genuinely interested and friendly. It is essential that the child be encouraged or rapport will soon be lost. Praise should be given for effort rather than for success on a particular response. Do not exhibit distress when a response is incorrect.

6. Guard against anticipating incorrect responses from the low achievers and correct responses from high achievers. Score responses as they have been given. Do not drag out responses by high or low achievers by additional questioning.

7. The tests should be administered in surroundings familiar to the child which are free from distracting stimuli. The child should be provided with a comfortable working position and adequate lighting.

8. The SLD Test Battery should not be administered in the presence of other people.

9. The test material should be arranged in such a way that the examiner loses no time looking for stimulus cards, stopwatch, scoring sheets, etc.

Sessions Eight and Nine

These meetings were held to provide the researchers with an opportunity to discuss problems related to the study.

At this time the researchers were instructed to contact this writer immediately and report all questions and uncertainties about the study procedures so that uniform rulings could be made for all examiners to follow.
PROCEDURE FOR IDENTIFYING TESTS WITH DIFFERENTIAL
PERCENTAGES AT THE 75th AND 50th PERCENTILE LEVELS

Procedure for finding 75th percentile and 50th
percentile cutoff levels for analysis of data presented
on pages 172-82.

The percentiles were determined as follows:

A. Translate the given percent of cases into number of
cases (the nth case).

B. Find the score corresponding to the nth case:

(1) Locate by inspection of the (cum.f) column the
class interval in which the nth case lies. This
is the interval containing the percentile.

(2) Subtract from the nth case the (cum.f) of the
interval below the one which the nth case is
contained. This tells us the number of cases
we need from the interval.

(3) Divide the value found in step 2 by the number of
cases (f) in the interval containing the given
percentile.

(4) Multiply the quotient obtained in step 3 by (i).

(5) Add the number from step 4 to the lower real limit
of the class in which the percentile (the nth case)
is contained. This score is equal to the desired
percentile.

These steps can be summarized in the following formula ...

\[
\text{Score} = \text{lower real limit of int.} + \frac{(\text{nth case}) - \text{(cum.} f \text{ in int. below)}}{\text{no. of cases in int.}}
\]

where: nth case = the number of cases corresponding to 75 percent
when N=50 would be (37). 1

1 See Benton J. Underwood et. al., Elementary Statistics,
BIBLIOGRAPHY


Alshan, L. M. "Reading Readiness and Reading Achievements." Reading and Inquiry, Edited by J. A. Figueré. Newark, Delaware: International Reading Association, X (1965), 312-313.


Anglin, Raymond; Pullen, Maxwell; and Games, Paul. "Comparison of Two Tests of Brain Dysfunction." Perceptual and Motor Skills, XX (1965), 977-980.


Bakker, D. J. "Temporal Order, Meaningfulness, and Reading Ability." Perceptual and Motor Skills, XXIV (1967), 1027-1030.
Ball, T. S. and Owens, E. P. "Reading Disability, Perceptual Continuity, and Phi Thresholds." Perceptual and Motor Skills, XXVI (1968), 483-489.


Barrett, Thomas. "Visual Discrimination Tasks as Predictors of First Grade Reading Achievement." Reading Teacher, XVIII (January, 1965), 276-282.


Benger, Kathlyn. "The Relationships of Perceptions, Personality, Intelligence and Grade One Reading Achievement." Perception and Reading. Edited by Helen K. Smith. Newark, Delaware: International Reading Association, XII (1968), 112-123.


Braun, J. S. "Relation Between Concept Formation and Reading Achievement at Three Developmental Levels." Child Development, XXXIV (1963), 675.


Chall, Jeanne; Roswell, Florence G.; and Blumenthal, Susan Hahn. "Auditory Blending Ability: A Factor in Success in Beginning Reading." Reading Teacher, XVII (November, 1963), 113-118.


Cohn, R. "Delayed Acquisition of Reading and Writing Abilities in Children: A Neurological Study." Archives of Neurology, IV (1961), 153-164.


Conners, C. Keith and Barta, Frank J. "Transfer of Information from Touch to Vision in Brain-Injured and Emotionally Disturbed Children." Journal of Nervous and Mental Disease, CXLV (1967), 138-141.


Cruickshank, William M.; Rice, Henry V.; Wallen, Norman E.; and Lynch, Karen S. Perception and Cerebral Palsy: Studies in Figure-Background Relationship. Syracuse, New York: Syracuse University Press, 1965, 62-89.


Deputy, Erby C. Predicting First Grade Achievement, Teachers College Contributions to Education, No. 426, New York: Bureau of Publications, Teachers College, Columbia University, 1930.


Dolphin, J. E. and Cruickshank, William M. "The Figure Background Relationship in Children with Cerebral Palsy." Journal of Clinical Psychology, VII (1951), 228-231.


Dykstra, R. "Auditory Discrimination Abilities and Beginning Reading Achievement." Reading Research Quarterly, I (1966), 5-34.


Elkind, David; Larson, Margaret; and Van Doorninch, William. "Perceptual Decentration Learning and Performance in Slow and Average Readers." Journal of Educational Psychology, LVI (February, 1965), 50-55.


Evans, James R. "Auditory and Auditory Integration Skills As They Are Related to Reading." The Reading Teacher, 22-7 (April, 1969), 625-625. Cited study by Bruininks.


Fuller, Gerald B. "Perceptual Considerations in Children with a Reading Disability." Psychology in the Schools, X (July, 1964), 314-317.


Hanvick, L. "A Note on Rotation in the Bender Gestalt As Predictors of EEG Abnormalities in Children." *Journal of Clinical Psychology*, VI (1950), 339.


Keogh, Barbara K. "The Bender Gestalt as a Predictive and Diagnostic Test of Reading Performance." Journal of Consulting Psychology, XXIX (February, 1965), 83-84.


Cited studies by Kagener and Kosiba.


Olson, A. V. "Relation of Achievement Test Scores and Specific Reading Abilities to the Frostig Developmental Test of Visual Perception." *Perceptual and Motor Skills*, XXII (1966), 179-184.


Reitan, Ralph M. "Relationships between Neurological and Psychological Variables and their Implications for Reading Instruction." Paper presented at the 27th Annual Conference on Reading, University of Chicago, 1964, 17-24.


Rosen, Carl L. "An Experimental Study of Visual Perceptual Training and Reading Achievement in First Grade." Perceptual and Motor Skills, 22(June, 1966), 979-986.


Silvaroli, Nicholas J. "Intellectual and Emotional Factors as Predictors of Children's Success in First Grade Reading." Paper presented at 10th Annual Convention of the International Reading Association, Detroit, Michigan, May, 1965.


Silver, A. A. and Hagin, Rosa A. "Specific Reading Disability Delineation of the Syndrome and Relationship to Cerebral Dominance." Comprehensive Psychiatry, 1(1960), 126-134.


Wilson, Barbara C., and Wilson, James J. "Sensory and Perceptual Functions in the Cerebral Palsied II-Sterognosis." *Journal of Nervous and Mental Disease*, 145(1) (1967), 61-68.


