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A VALIDATION STUDY
OF THE TEST OF LANGUAGE DEVELOPMENT (TOLD)

by

Audrey Jane Roadhouse
B.Ed., University of Regina, 1971

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS (EDUCATION)

in the Faculty

of

Education

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Abstract

The contribution of language problems to reading disability is receiving increasing attention in the field of learning disabilities. This focus stems from empirical evidence indicating that reading disability is associated with language difficulties. Within the field of learning disabilities three major theories have been generated to explain reading disability; perceptual deficit, inadequate sensory integration and verbal deficits. Recent research has provided evidence that both perceptual deficits and inadequate sensory integration are not sufficiently related to reading disability to warrant the educational intervention programs directed to those deficits. Rather, the literature suggests that disabled readers differ from normal readers in the three major components of language; semantics, syntax and phonology.

Because of this relationship between language and reading, it is important to have tests with which the professionals in the field of learning disabilities can identify those children whose reading difficulties may be language-based. Current diagnostic instruments of language abilities tend to be time consuming, fraught with measurement and interpretational problems. Recently, Newcomer and Hammill (1977) devised a tool for measuring language skills, The Test of Language Development, (TOLD). A close examination of the subtests of the TOLD suggests that it can serve as an initial diagnostic tool for language abilities. However, such potential use of the TOLD must be empirically documented, otherwise its proliferation in Learning Assistance Centres would be a function of faith.

This study was a validation study of The Test of Language Development, (TOLD). The specific question asked was: Does the TOLD discriminate among

three groups of children; normal readers (devoid of a history of language problems and reading problems), disabled readers (devoid of a history of language problems) and language-delayed children?

Normal and disabled readers were selected on the basis of their comprehension scores on the Gates-MacGinitie Reading Test. The language delayed group was formed by children who had been formally diagnosed as having a language delay problem. General criteria for sample inclusion was: average intelligence, monolingual background, no evidence of emotional disturbance, good sensory acuity and physical health. The entire battery of the TOLD, consisting of five principal and two supplementary subtests, was administered to all subjects.

To answer the specific question, does the TOLD discriminate among the three groups of children, a one-way analysis of variance on total score by group was performed and yielded a significant difference among the three groups. Separate analyses of variance on each subtest found that the Sentence Imitation Subtest and the Grammatic Completion Subtest also discriminated among the three groups. The subtests of Picture Vocabulary, Oral Vocabulary and Grammatic Understanding discriminated normal readers from the other two groups. Discriminant function analysis on the entire battery was 72% successful in discriminating normal readers from reading disabled from language-delayed children.

The results provide two significant educational implications. The first is that the TOLD appears to be an effective initial diagnostic tool of language abilities. The initial diagnostic results pinpoint areas for further formal and informal assessment. Secondly, it is hoped that realization of the

possibility of language-based reading problems will lead to appropriate remedial strategies in Learning Assistance Centre teachers and remedial reading teachers.

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I. Introduction

The contribution of language problems to reading disability is receiving increasing attention in the field of learning disabilities (Semel and Wiig, 1976; Wallach and Goldsmith, 1977). This focus stems from evidence indicating that reading retardation is associated with language difficulties. Studies which investigate the developmental histories of retarded readers report a very high incidence of linguistic developmental difficulties and delays in the acquisition of language. (Owen, Adams, Forest, Stolz, and Fisher, 1971; Bryan and Bryan, 1975). Moreover, the evidence pertaining to the association between language problems and reading difficulties is not limited to studies of the young child. The relationship holds for older children as well (Blank, Weider and Bridger, 1968; Vellutino, 1974). Thus the relationship between verbal disabilities and reading retardation appears substantiated.

The empirical evidence on the relation between language abilities and reading acquisition provides support for a clinical awareness of the same relation in professionals working with learning disabled children. Various researchers have developed tests specifically designed to measure language abilities among young children (Illerbrun, 1977). De Hirsch, Jansky and Langford (1966) developed a battery of tests, many of which contained items tapping language skills, in order to predict which children might have reading difficulties. The test, given to kindergarten children, did have some success in prediction, although the test yielded many false positives and false negatives. Kirk and Kirk (1971) developed the Illinois Test of

Psycholinguistic Abilities (ITPA) to measure the child's language abilities. The test purports to yield a performance profile which would provide diagnostic information leading directly to remedial programming. Although routinely used (Larsen, Rogers and Sowell, 1976) the test suffers from many and serious construct validity problems (Smith and Marx, 1971; Hammill, 1972; Hammill and Larsen, 1974a, 1974b).

Because of the relation between language problems and reading problems, it is important to have tests with which the professional in the field of learning disabilities can assess thoroughly the language abilities of learning disabled pupils. Recently, Newcomer and Hammill (1977) devised a test for measuring language skills, The Test of Language Development, (TOLD). A close examination of the subtests of the TOLD suggests that it can serve as an initial diagnostic tool for language skills. However, such potential use of the TOLD must be empirically documented, otherwise its proliferation in Learning Assistance Centres would be a function of faith. At present, only the authors of TOLD have provided studies indicating the power of the test in discriminating between language delayed children and normal children. We therefore need independent studies validating the discriminative power and reliability of the TOLD.

This study proposed to investigate the validity of the TOLD for Learning Assistance Centre teachers and reading teachers. Specifically, the question posed was: Does the TOLD discriminate reliably among three groups of children; normal readers (devoid of a history of delayed language development and reading problems), disabled readers (devoid of a history of delayed

language development) and children with delayed language development?

Definition of Terms

The following definitions are written for the benefit of the general reader. Readers interested in a detailed description of the structure of language should consult sources such as Berko (1961), Chomsky (1969), Cairns and Cairns (1976).

LANGUAGE ABILITY includes the three major components of language structure; semantics, syntax and phonology. Phonology is the sound system of language. Syntax is the term which designates sentence formation, that is, the correct sequencing of words and inflections in sentences. Morphology which is often included as a part of syntax, refers to the study of the smallest meaningful units of language. Semantics is the linguistic term which designates meaning. Knowledge of semantics involves the manner in which meaning is associated with morphological and phonological forms, as well as rules which determine the manner in which meaning is conveyed within a sentence.
(from the Test of Language Development (TOLD) Test Manual, pp. 9, 10)

READING DISABILITY refers to reading performance that is not commensurate with expected performance according to a child's age in spite of average or above intellectual ability, good physical health and no evidence of emotional disturbance. Reading disability is also referred to in this paper as reading retardation and poor reading.

II. Related Literature

Within the field of learning disabilities, three major theories have been generated to explain reading disability; perceptual deficits, inadequate sensory integration and verbal deficits (Bryan and Bryan, 1975; Vellutino, Steger, Moyer, Harding and Niles, 1977).

Perceptual Deficit Theory

Of the three theories in learning disabilities, the perceptual deficit theory is the most popular and widely accepted. It originated from Orton's (1937) theory of reading disability. Orton (1937) postulated that errors of orientation and sequencing (e.g. b/d, was/saw) commonly observed in the reading and written spelling of poor readers were the result of delayed development of hemispheric dominance. This delayed development causes failure to suppress mirror images of visual events (b/d) believed to be stored in each hemisphere. Although Orton himself did not believe that perceptual training was useful to correct reading disabilities, his theory gave rise to widespread use of this technique (Hallahan and Cruickshank, 1973).

Recent research has questioned the efficacy of training visual perceptual skills (Hammill, 1972; Seaton, 1977). In reviewing a large portion of the literature, Hammill (1972) concluded that little correlation exists between measures of visual perception and tests of reading comprehension. Moreover, training in visual perceptual skills appeared to have little effect on reading.

In a similar vein, Vellutino et al (1977) stated that:

> There is increasing evidence indicating that a visual perceptual disorder is not attributable to perceptual deficiency in the strict sense. Recent research suggests that disabled readers can perceive letter and word symbols accurately, but mislabels them in oral reading because of a basic difficulty in associating symbols with verbal counterparts. (p.57)

In two separate experiments (Vellutino, Steger and Kandel, 1972, Vellutino, Smith, Steger and Kaman, 1975) poor and normal readers were presented with brief tachistoscopic exposures of non-verbal and verbal stimuli and were required to both copy and read items from memory. The poor readers performed as well as the normals in all but one aspect of the visual recall task. The exception was the reproduction of five letter words, which normally tax short term memory. However, the poor readers pronounced and spelled all the stimulus words less accurately than the normals.

Vellutino, Pruzek, Steger and Meshoulam (1973); Vellutino, Steger, De Setto and Philips (1975) and Vellutino, Steger, Kaman, and De Setto (1975) performed a series of studies involving good and poor readers in the learning of Hebrew letters and words, where the symbols were unfamiliar to both groups. The following findings were noted: (1) scanning tendencies in both groups were identical, questioning the belief that poor readers have not yet developed a firm directional set and (2) poor readers performed as well as normals in short and long term memory of these letters and words. Research done elsewhere also indicates that a visual perceptual disorder is an unlikely cause of reading disability and such research suggests that reader disorders may be more attributable to a variety of

linguistic deficits. (Rabinovitch, 1968; Lyle and Goyen, 1968; Shankweiler and Liberman, 1972; Allington, Gormley and Truex, 1976).

Similarly, Rees (1973) has challenged the notion that most reading disorders reflect deficits in auditory perception, involving, for example, auditory discrimination, auditory memory span, or auditory sequencing. Hammill and Larsen (1974a) support this challenge in their review of studies using correlation statistical procedures to examine the relationships of reading to auditory perceptual skills. They conclude that auditory perceptual skills are not sufficiently related to reading to be particularly useful for school practices. In summary then, the perceptual deficit theory of reading disability appears questionable.

Inadequate Sensory Integration

Birch (1962) proposed deficient integration in the sensory systems as a cause of reading disability. There is some supportive empirical evidence for his notion (Birch and Belmont, 1964; Beery, 1967). However, a better view of this theory reveals that auditory-visual matching deficiencies are more likely due to verbal labeling problems rather than cross-modal transfer problems (Blank and Bridger, 1966; Blank, Weider and Bridger, 1968; Vellutino, Steger and Kandel, 1972). The main criticism of studies supporting cross-modal transfer problems is that many have failed to control for the intrasensory processing or for the verbal demands placed upon the child (Freides, 1972). In discussing this, Bryan and Bryan (1975) explain that "cross-modal integration is likely to be facilitated by the linguistic

development of the child" (p.225). The child who can better match rhythmic patterns with their visual equivalents is likely the child who can connect the signals through labels and thus make an accurate response. In a paired-associate learning task where an attempt was made to remove the verbal component, differences between good and poor readers was not found (Vellutino, Steger, and Pruzek, 1973).

Another closely related theory is that of preferred modality. The assumption being that individual children learn better in one modality than another. This theory is manifested in the sight word versus phonics method of teaching reading. Johnson and Myklebust (1967) employ modality isolation for teaching auditorily or visually impaired children. Tests such as the ITPA also include this rationale (Kirk and Kirk, 1971). Results are explained in terms of strengths and weaknesses in sensory processes. However, research on the effectiveness of instruction based on the concept of sensory preference has provided little support for this idea (Bateman, 1968). The main weakness of the modality preference concept is the presumed transfer from the modality trained to tasks that involve the integration and information from both modalities (preferred and non-preferred). To illustrate the point at issue, the following example is chosen from Vellutino, Steger, Moyer, Harding and Niles (1977). A child may learn to spell the word cat auditorially and relate the letter sequence to the animal. Independent of this, the child may also learn to recognize the printed word cat. These are both examples of intramodality learning. This becomes an intermodality task when the child is required to relate

the printed word to both its sound and object counterparts (i.e. reading). "These two categories of learning do not necessarily transfer to one another in ways suggested by the concept of modality deficit" (p.56). Thus, the research in support of deficient integration in the sensory system or preferred modality as an explanation of reading disability is at best, equivocal.

Verbal Deficits

A third explanation for reading disability is that poor readers have a deficit in verbal skills. Some evidence emerges from studies of the developmental histories of disabled readers. Studies which have involved the following of speech delayed children into primary schools have found that these children are likely also to be delayed in reading (Rutter and Martin, 1972). Similarily, numerous studies have shown that older children with severe reading difficulties frequently have a history of speech delay and many still show language impairment and verbal deficiencies in abstract thinking (Blank, Weider and Bridger, 1968; Owen, Adams, Forest, Stolz, and Fisher, 1971). Furthermore, there is some evidence that within a group of children with reading disability those with language impairment may have a worse prognosis (Lytton, 1968). In their discussion of the relationships of language to reading Rutter and Martin (1972) state:

> Because most children who are late in talking ultimately speak normally, there is a tendency to assume that speech delay is of no consequence in most cases. Although most children catch up in their speaking, many are left with subtle handicaps which may continue to impede their educational progress (p.181).

Historically, adequacy of vocabulary has been seen by many as a prerequisite for success in learning to read (Anderson and Fairbanks, 1937; Schonell, 1952; Vernon, 1958). In addition to vocabulary, the importance of syntax in reading is recognized (Vogel, 1975). Recently, there is a new theory of reading which shows the influence of theories of information-processing. According to this theory, reading is considered a psycholinguistic process whereby reading is dependent upon knowledge of the semantic, syntactic and graphophonic rules of the language. Goodman (1970) refers to reading as a psycholinguistic guessing game in which the reader selects the cues and then predicts the message. The fluent reader can employ a variety of linguistic devices for sampling the text selectively in order to predict and reconstruct the information contained within it. The more efficient the reader is, the fewer number of cues necessary for him to make the correct responses. The degree of efficiency a reader develops is directly related to the degree of competence the child has acquired in each of the three basic kinds of information.

Based on a psycholinguistic model of the reading process, many pertinent studies have attempted to determine the contribution of each type of information, semantic, syntactic and graphophonic, and the interrelationship among them. Britain (1970) investigated the relationship between the morphological abilities of first and second grade children and reading achievement. She states that independent of intelligence, there is a significant relationship between knowledge of word-formulation rules and reading achievement.

Ruddell (1965) studied the effects of similarity between structural patterns in oral and written language on the reading comprehension of fourth graders. The findings indicated that reading comprehension scores on written materials that used structural patterns of high frequency in the oral language of fourth graders were significantly higher than reading scores on materials using low frequency patterns. The author concluded that reading comprehension is a function of the similarity of the patterns of the language structure in the reading material to oral patterns of language structure used by children.

Semel and Wiig (1975) found that "measures of linguistic abilities relate most closely to measures of reading comprehension and that deficits in language processing may be associated with reductions in reading comprehension" (p.15). Miller (1962) provided evidence in support of this finding. The understanding of sentence structure enables the child to narrow down the number of alternative word meanings, thus facilitating comprehension.

In an experiment using structured and unstructured sentences Weinstein and Rabinovitch (1971) found that good and poor readers differed in their learning of the sentences. Unstructured sentences were formed by randomly rearranging the order of the items in the structured list (e.g. structured - when they sivoled the veg they hanashed zalfly/ unstructured - zalfly they when, veg the hanashed, sivoled they). Good readers learned structured sentences faster than poor readers, and good readers learned the structured sentences faster that the unstructured sentences. Poor readers learned the

structured and unstructured sentences with the same degree of difficulty. The results suggested that for normal readers, appropriate syntax either facilitated the learning or bad syntax disrupted it. For the poor readers, syntax apparently failed to make any difference in their learning, they learned as if they were unaware of it. Along the same vein, Friedlander and Cohen de Lara (1973) found that children encountering moderate to severe language learning problems were more likely to prefer distorted and relatively unintelligible speech than children with good linguistic skills. Moreover children with poor language skills may be less likely to attend to meaningful language inputs. Research from Clay (1969) suggests that children with a language delay experience:

> difficulty in predicting constructions likely to occur and in noticing the redundant cues which signal that errors have occurred. There is good reason to believe that the very complexity that provides rich sources for the child who is able to discover the regularities of the code may present confusion to the child of limited language skills (p.55).

In an analysis of the oral language production of poor and normal readers Fry, Johnson and Muehl (1970) found the normal readers to be linguistically more sophisticated as manifested in greater verbal fluency, larger speaking vocabularies, better organizational and integrative skills, more abstract usages, and syntactical differences in sentence structures. Moreover, two studies by Vogel (1975, 1977) found reading disabled children inferior to normal readers in syntactic ability. She explains that, "poor readers may not be utilizing to the fullest extent the semantic and syntactic information provided in the morphology of written language because of immature or

deficient development in this aspect of language" (1977, p.41). Fry, Johnson and Muehl (1970) infer no cause-effect relationship between oral language patterns and reading disability. However, they speculate that such deficiencies as those observed could impair both word recognition and comprehension by limiting the number and variety of verbal labels and mediators available for learning grapheme-phoneme associations, and for abstracting meaning from connected text. The research by Blank and her associates mentioned earlier (Blank, Weider, and Bridger, 1968) supports this suggestion, in that poor readers were differentiated from normal readers in integrating spatial and temporal patterns as a result of verbal labeling problems.

Shankweiler and Liberman (1972), found that poor readers made more errors in reading given words than they did in repeating the same words read to them. Of significance is that the types of errors differed in each context. The authors suggest, on the basis of these findings, that phonemic segmentation in speech perception is quite different from phonemic segmentation in decoding written language, and that poor readers may not have developed a conscious awareness of this distinction. In a study of first grade children, by Weber (1970) oral reading errors were analyzed for grammatical acceptability. In the total population 91 percent of errors were grammatically appropriate to the context, implying that even beginning readers bring their knowledge of grammatical structure to bear on their performance. This was also interpreted to mean that the reader expects sentences he reads to conform to the rules of his oral language.

Lastly, one further point deserves attention; the comparison of disabled and normal readers on measures of verbal and non verbal "intelligence". It has been consistently found that, on the Weschler Intelligence Scale for Children(WISC) and the Weschler Intelligence Scale for Children-Revised (WISC-R), disabled readers perform significantly below the normal readers on the verbal subtests. In contrast, the groups were comparable on the non-verbal (Performance) subtests (Warrington 1967; Vellutino, 1974; Smith, Coleman, Dokecki and Davis, 1977a; Smith, Coleman, Dokecki and Davis, 1977b). That these results were not simply the cumulative effect of prolonged reading disability is suggested in the finding of one study (Lyle and Goyen, 1969) that differences between reading groups at the first grade level were of the same magnitude as differences at the sixth grade level.

The preceeding literature suggests that disabled readers differ from normal readers in the three major components of language; semantics, syntax and phonology. For purposes in educational intervention, this evidence generates a need to assess children whose reading difficulties may be language-based. Currently a new test, the Test of Language Development, (TOLD) (Newcomer and Hammill, 1977) appears to be a significant improvement over two main assessment approaches: (1) the administration of a wide assortment of relatively diverse language tests (Illerbrun, 1977) and (2) the administration of tests used to measure various psychological functions which are presumed to underlie language development (i.e. ITPA). However, no independent validation studies have been done on the TOLD. The

purpose of this study was to investigate the validity of the TOLD by comparing three groups of children; normal readers, disabled readers and language delayed children.

III. Method

Sample

All subjects were drawn from Grades 2 and 3 in the school districts of Surrey and Coquitlam. These districts were chosen because of their early screening program for speech problems. On entering Kindergarten, all children are individually assessed for possible speech problems by trained personnel in the Special Services Department.

Subject Selection Criteria

General Criteria

Age. All subjects were between the ages of 7 years-0 months and 8 years-7 months.* The reasons for selecting subjects within this age range were as follows: (1) each child would have at least 1 year and 3 months of instruction in reading, (2) the measures chosen were appropriate for this age and (3) the basic morphological rules and syntactic structures have been mastered in normal children by the age of seven, although development continues beyond that age (Berko, 1961; Chomsky, 1969).

Monolingual Background. As a control for the possible effects of bilingualism on reading, children whose school records indicated a second language spoken in the home were excluded from the study.

* One subject in the language delay group was 8 years-10 months, but was included because his test scores did not reach a ceiling on the TOLD.

Emotional Adjustment. No children were included in the study who were known to be emotionally disturbed.

Intelligence. A pool of potential subjects was formed initially, based on teachers reports and school records. Subsequently, only those whose measured Performance I.Q. on the WISC-R fell into the average range, participated in the study. As mentioned previously, it has been consistently found that, disabled readers perform significantly below normal readers on the verbal subtests but comparable on the non-verbal (Performance) subtests (Warrington, 1967; Vellutino, 1974; Smith, Coleman, Dokecki and Davis, 1977a; Smith, Coleman, Dokecki and Davis, 1977b).

Socioeconomic Status. The majority of the sample was drawn from schools in a lower middle-class area. According to the 1971 census data, the socioeconomic status of the parents was estimated to be in the 10 - 49.9 percentile rating based on five variables; income, education, occupation, housing value and ethnicity (British Columbia Teacher's Association).

Sensory Acuity and Physical Health. Children whose school records indicated uncorrected visual or sensory acuity problems, or poor physical health were not included in the study.

Specific Criteria

Normal Readers. This group was comprised of children who met the criteria for all subjects, whose reading comprehension was found to be at grade level or above and whose school records did not indicate speech problems.

Reading Disabled. All children who met the criteria for all subjects, whose reading comprehension was found to be seven months or below according to grade placement and whose records did not indicate speech problems were included in this group.

Language Delayed. This group consisted of children who also met the criteria for all subjects but who had been formally diagnosed as having as a primary problem, speech delay. These children were presently receiving supportive help either from a speech therapist, and/or had been placed in classes for the language delayed.

Instruments

Test of Language Development (TOLD) (Newcomer & Hammill, 1977)

The Test of Language Development (TOLD) is an idividually administered battery comprised of five principal and two supplemental subtests, each of which taps a different component of children's spoken language. The TOLD subtests were developed on a linguistic model of language and measure selected aspects of semantics, syntax, and phonology. Three types of reliability i.e. internal consistency, stability, and standard error of measurement, have been studied. In general, the results of these investigations indicate that all but one subtest is sufficiently reliable. The Grammatic Understanding subtest reports a low reliability coefficient at the seven and eight year old age levels. Five types of validity were investigated - content, item, concurrent, construct, and diagnostic. The most convincing validity information was the substantial correlations existing between TOLD subtests and their specific criterion tests; i.e. Wepman's Auditory

Discrimation Test (r = .69), Templin and Darley's Tests of Articulation (r = .84), Dunn's Peabody Picture Vocabulary Test (r = .80), Wechsler's Vocabulary subtest from the WISC (r = .79), Lee's Northwestern Syntax Screening Test (Receptive .70; Expressive .77), Kirk, McCarthy and Kirk's Grammatic Closure from the ITPA (r = .78), and Carrow's Test of Auditory Comprehension (r = .80). It was also demonstrated that the TOLD could be used to differentiate between children who were clinically defined as having speech and/or language disorders and those who did not have such problems (Newcomer and Hammill, 1977). The following is a diagrammatic representation of the subtests in the TOLD:

Aspect of Language Ability	Subtests			Process Dimension
Semantics (the study of meaning in language)	(1)	Picture	Vocabulary	receptive skill (understanding)
	(2)	Oral	Vocabulary	expressive skill (use)
Syntax (the study of word order and inflections)	(1)	Grammatic	Understanding	receptive skill (understanding)
	(2)	Sentence	Imitation	expressive skill (use)
	(3)	Grammatic	Completion	receptive and expressive skill (understanding and use)
Phonology (the sound system of language)	(1)	Word	Discrimination	receptive skill (understanding)
	(2)	Word	Articulation	expressive skill (use)

Gates-MacGinitie Reading Tests - Primary B and C

The Gates-MacGinitie Reading Tests are a series of group administered reading tests designed to measure group and individual reading achievement from Kindergarten through Grade Twelve. Primary B is intended for use in the second grade and Primary C is intended for use in the third grade. Each consists of two parts: Vocabulary and Comprehension. The Vocabulary Test samples the child's ability to recognize or analyze isolated words. The Comprehension Test measures the child's ability to read and understand whole sentences and paragraphs. Alternate form reliability coefficients for Tests Primary B and Primary C are above .80. Split half reliability coefficients are above .89. The Gates-MacGinitie Reading Tests are routinely used in both school districts.

Weschler Intelligence Scale for Children Revised (WISC-R)

The WISC-R is an individually administered measure of general intelligence. Intelligence Quotients are calculated on the basis of five Verbal and five Performance tests. Reliabilities for the Verbal, Performance, and Full Scale I.Q.'s are reported as high across the entire range of ages; the average coefficients being .94, .90, and .96, respectively. The reliabilities for the individual tests average from .77 to .86 for the Verbal Tests, and from .70 and .80 for the Performance Tests. The average Standard Errors of Measurement for the Verbal, Performance and Full Scale I.Q.'s are reported as 3.60, 4.66, and 3.19 respectively.

The revised version of the WISC, the WISC-R is highly regarded and widely used in educational settings. Smith, Coleman, Dokecki and Davis

(1977) state that:

> Since its origination in 1949, the WISC has been subjected to more rigorous empirical investigation than any other standard instrument commonly used in educational settings. In studies ranging from predictive validity to factorial analysis, the WISC has consistently demonstrated powerful psychometric properties. (p.48)

Procedure

Eight classes of students in Grades 2 and 3 were chosen for the selection of poor readers and normal readers. All students were administered the Gates-MacGinitie Reading Tests either by the classroom teacher or by the investigator.

Three groups of students; normal readers, disabled readers and language-delayed children, were formed from the pool of potential subjects who met the specific subject selection criteria. Wherever possible, an attempt was made to choose the normal and disabled readers from within the same classes. Otherwise, the groups were formed by choosing children in the same grade within each school. The language-delayed group was formed by 15 children who met the criteria (formal diagnosis) within the two districts. The number per group was 31, 28 and 15 respectively.

All children in the three groups were then administered the Test of Language Development (TOLD). This test was administered by the investigator and a graduate student in education.

Following this, all children in the study were administered the WISC-R by a trained psychometrician and the investigator. Both the Verbal

and Performance Scales were administered. However, for reasons stated previously, only the results on the Performance Scale were used for determining average intellectual ability of the three groups.

Three subjects were subsequently dropped from the study. Two males were dropped because of errors in test administration and the remaining female was dropped because of her subnormal Performance I.Q. The final pool of subjects who met all the requisite selection criteria consisted of an N of 71. These constituted the three groups of subjects for the present study. The distribution of subjects per group was as follows: Normal readers (n = 29 16 males/13 females), disabled readers (n = 27 20 males/7 females) and language-delayed (n = 15 12 males/3 females.

IV. Results and Discussion

Preliminary Analyses

Prior to answering the main question of this study; does the TOLD discriminate among the three groups of children, some preliminary analyses were necessary. Descriptive statistics and Pearson Correlations are presented (Table 1-1V) for the total sample and each group. Alpha internal consistency estimates for the TOLD subtests appear in the diagonal. For the total sample, a comparison of reported estimates of internal consistency for the principal subtests, by the tests' authors and those obtained in this study, shows them to be quite similar. These principal subtests are; Picture Vocabulary, Oral Vocabulary, Grammatic Understanding, Sentence Imitation and Grammatic Completion. Newcomer and Hammill (1977) reported a low reliability coefficient for the Grammatic Understanding subtest. In this study, this reliability dropped to extremes in separate analyses on the normal readers and reading disabled subject (Tables 11 and 111). For the two supplemental subtests (i.e. Word Discrimination and Word Articulation) the internal consistency estimates found in this study were considerably lower than those reported by Newcomer and Hammill (1977).

One-way analyses of variance and a past hoc analysis of means on the subject selection variables are presented in Table V.

Age. The one-way analysis of variance on age by groups (Table V) indicated no significant differences [$F(2,68)=0.93$, $p=.40$].

Intellectual Ability. The three groups significantly differed in Verbal [$F(2,68)=56.36$, $p<.01$] and Full Scale Intelligence [$F(2,68)=32.53$, $p<.01$]

(Table V). These findings are consistent with those of Warrington (1967), Vellutino (1974), Smith, Coleman, Dokecki and Davis (1977a, 1977b). Since Performance I.Q. was used as the criterion for selecting subjects in the average range of intellectual ability, it was expected that the three groups would not differ on this measure. A past hoc comparison of means (Table V) indicated a significant difference in Performance I.Q. between the normal readers and language delayed subjects. One explanation for this is given by Rutter and Martin (1972) in their discussion of the use of the WISC in assessing language delayed children. "The high positive correlation between these scales (Performance and Verbal) contradicts the implied assumption that the two scales measure totally unrelated abilities" (p.123). They go on to say that, "children with comprehension deficits may still be at some disadvantage on the Performance Scale because of the necessity to understand spoken instructions" (p.123).

Reading Ability. As stated previously, the language delayed subjects were not selected on the basis of their reading ability as were the normal readers and reading disabled subjects. Language-delayed subjects were selected through formal diagnostic procedures as part of an early screening program. Due to their special class placement and to avoid undue frustration they were all administered the Gates-MacGinitie Primary B Reading Test (Table VI). Consequently, as a group, they received an easier test. This may explain why their Comprehension and Vocabulary Scores did not significantly differ from the reading disabled subjects (Table V). Normal readers performed significantly better on both the Comprehension and Vocabulary Tests than the other two groups (Table V).

Of particular importance to the reading ability of the three groups, is the finding that there was a large discrepancy between the Vocabulary and Comprehension standard scores of the reading disabled subjects. Table 12 in the Gates-MacGinitie Technical Manual can be used for making comparisons between the standard scores obtained on the Vocabulary Test and on the Comprehension Test. The purpose of this is to see if a student's reading comprehension is at a level that might be expected from his reading vocabulary. Both the language delayed subjects and the normal readers obtained Comprehension scores consistent with their Vocabulary scores, but the disabled readers did not. The percent of subjects at or above the critical value for Comprehension scores when compared to Vocabulary scores for each group were as follows; normal readers - 89.9%, reading disabled - 52.9% and language delayed - 93.3%. This finding lends support to Cromer's (1970) distinction of "difference" versus "deficit" comprehenders. Oaken, Wiener and Cromer (1971) also found fifth grade poor readers to have poor comprehension despite adequate vocabulary.

Major Analyses

Our main question in this study was: Does the Test of Language Development (TOLD) discriminate among the three groups of children; normal readers, reading-disabled, and language delayed children?

To answer this question a one-way analysis of variances on total score by group were calculated (Table V11). It yielded a significant [$F(2,68) = 31.0$, $p < .01$]. Separate analyses of variance on each subtest (Table V11) found that the Sentence Imitation subtest and the Grammatic Completion subtest also discriminated among the three groups. The subtests of Picture

Vocabulary, Oral Vocabulary and Grammatic Understanding discriminated normal readers from the other two groups. The Word Articulation subtest discriminated between the language delayed children and the other two groups. The Word Discrimination subtest failed to discriminated among any of the groups.

Since the entire battery of subtests were used in the study, the question was raised as to which of these were the most sensitive and best able to differentiate among the three groups. Exploratory discriminant function analyses were performed (Table Vlll) using various predictors including the Gates-MacGinitie Comprehension and Vocabulary Reading Tests. Of the seven subtests in the TOLD battery, Sentence Imitation was identified as the best discriminator. Prediction results (Table lX) using all seven subtests were 72% accurate in discriminating normal readers from reading disabled from language delayed subjects. Prediction results (Table lX) using all seven subtests plus the Gates-MacGinitie Comprehension and Vocabulary tests were 90% accurate in discriminating normal readers from reading disabled from language delayed subjects. An examination of the various prediction results appear to suggest that most prediction errors occur between the reading disabled and language delayed subjects.

In summary then, it appears that the Test of Language Development (TOLD) can serve as an effective initial diagnostic tool of language abilities.

V. Conclusions

In general, the results of this study indicate that the main difference in the language ability of normal readers, reading disabled and language delayed children lies in syntactic ability, as measured by the TOLD. Three of the five principal subtests of the battery were designed to measure syntactic ability. Two of these principal subtests, Sentence Imitation and Grammatic Completion, discriminated among the three groups. The third, the Grammatic Understanding subtest discriminated normal readers from the other two groups.

Of the seven subtests in the battery, discriminant function analysis found the Sentence Imitation subtest to be the most powerful discriminator. Newcomer and Hammill (1977) claim that since imitation of a sentence is an easier task than producing the same sentence in free speech, it represents a baseline measure of a child's syntactic productiveness. Using a similar task, Vogel (1975) also found sentence imitation to be a powerful discriminator between normal readers and reading-disabled children. Although auditory memory plays a significant role in sentence imitation, Vogel (1975) found her test continued to differentiate between the two groups after auditory memory was statistically controlled for. Thus the sentence imitation task in Vogel's (1975) study appears to measure syntactic as well as memory abilities.

The Grammatic Completion subtest of the TOLD most closely resembles the ITPA Grammatic Closure subtest and Berko's Test of Morphology (Newcomer and Hammill, 1977). Both the ITPA Grammatic Closure subtest and Berko's Test of

Morphology have been shown to discriminate between good and poor readers (Britain, 1970; Vogel, 1975, 1977). The present Grammatic Completion subtest differs from the ITPA Grammatic Closure subtest mainly in the absence of pictorial cues. Newcomer and Hammill (1977) avoided pictorial cues in an attempt to insure that the task be totally verbal as is the case in the child's ordinary use of spoken morphological forms. However, in making the test totally verbal, Newcomer and Hammill might have inadvertently increased the role of auditory memory in the Sentence Imitation subtest. Some evidence for this comes in a factor analysis on the TOLD subtests and their criterion referenced tests reported by Newcomer and Hammill (1977). The Grammatic Completion subtest did not load on the same factor as its criterion referenced test, the ITPA Grammatic Closure subtest. The Grammatic Completion subtest loaded on the same factor as the TOLD Sentence Imitation subtest, along with other tests such as the Detroit - Memory for Related Syllables test. Nevertheless, the preceeding finding cannot be taken to suggest that the Grammatic Completion subtest measures nothing but an auditory memory factor. As noted by Newcomer and Hammill (1977):

> Linguistic abilities are highly interrelated. Therefore, subtests that measure various aspects of language will tend to load on a common factor. This merely means that the subtests measure components of linguistics. That the subtests load on a single factor cannot be interpreted to mean that they measure identical aspects of language or that they measure them in the same way. (p.33)

The Grammatic Understanding subtest discriminated normal readers from the other two groups. This subtest differs from the other two syntactic measures in that it is purely a receptive language measure, no expressive ability is

required.

The two semantic measures of the TOLD, the Picture Vocabulary subtest and the Oral Vocabulary subtest also differentiated the normal readers from the other two groups. Considering the initial differences in reading vocabulary, as measured by the Gates-MacGinitie Reading Tests, this is not surprising. Also, as previously mentioned, oral vocabulary has long been known to be related to reading performance (Schonnel, 1952; Vernon, 1958; Fry, Johnson and Muehl, 1970).

The two supplemental measures of the TOLD also included in this study were the Word Discrimination and Word Articulation subtests. The Word Discrimination subtest failed to discriminate among any of the groups. This further substantiates the previously mentioned findings of Rees (1973), Hammill and Larsen (1974a) and Larsen, Rogers and Sowell (1976). In summary, these studies concluded that auditory perceptual skills are not sufficiently related to reading to be particularly useful for school practices. The Word Articulation subtest separated the language-delayed subjects from the other two groups. Considering the initial selection criteria of the three groups and the developmental aspects of articulation skills, this result was to be expected.

The findings that the three groups differ in syntactic abilities have important educational implications. First, the results suggest that attention to syntactic growth be part of reading readiness and language arts programs for all children. Although this conclusion may appear obvious, it

is pertinent to note that syntactic development has been a sadly neglected area in reading readiness and language arts curricula (de Hirsch, Jansky and Langford, 1966; Schwartz, 1977).

Second, Learning Assistance Centre teachers and remedial reading teachers need to be alert to the fact that a reading disability may be language-based. A recent Canadian study involving 900 Kindergarten and Grade One children, (Tuomi and Ivanoff, 1977), on the incidence of speech and hearing disorders, found 6-7% of the children in each grade to have language problems. These figures agree with the 6.53% incidence of oral language disability by Marge (1972) among 4-17 year old children in the USA. Thus effective remedial strategies would appear to attend equally to the child's language problems as well as reading problems. Interestingly, recent research reflects the importance of developing remedial reading strategies with an emphasis on verbal ability (Schwartz, 1977; Tyack and Gottlesben, 1977; Wong, Wong and Froth, 1977).

In summary, the conclusions of this study imply a total and balanced approach to reading, with appropriate emphasis on activities that sensitize the reader to all the features of words and sentences (i.e. graphic, phonologic, semantic and syntactic).

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TABLE I

Descriptive Statistics and Pearson Correlations for all Variables for the Total Sample (N=71)

	$\bar{X}$	SD	AGE	PERF	VERB	FS	COMP	VOC	PV	OV	GU	SI	GC	WD	WA	TOTAL	GROUP
Age (c.a. months)	93.68	6.68	-														
I.Q. (Scaled Score)																	
Performance	54.56	8.28	-05[a]	-													
Verbal	48.32	11.07	-08	48	-												
Full Scale	102.54	16.66	-10	80	88	-											
Reading (Standard Score)																	
Comprehension	48.38	11.99	-14	33	63	59	-										
Vocabulary	52.06	9.90	-08	35	57	54	80	-									
TOLD (Scaled Score)																	
Picture Vocabulary	9.41	3.09	-05	39	46	55	43	38	88								
Oral Vocabulary	9.80	3.09	-01	34	65	60	55	52	43	88							
Grammatic Understanding	9.31	2.39	-06	48	39	52	39	43	32	40	67						
Sentence Imitation	8.41	2.80	-12	39	69	66	50	56	31	54	40	95					
Grammatic Completion[b]	8.61	2.09	05	33	53	51	55	59	23	45	26	60	98				
Word Discrimination	7.72	1.98	-04	27	27	33	37	40	18	38	26	41	22	67			
Word Articulation	10.18	1.94	-03	23	22	25	06	10	10	07	05	27	22	08	67		
Total Score	62.79	11.31	-10	56	74	79	66	68	59	77	62	76	64	56	37	-	
Group[c]	1.80	.77	-01	38	79	70	72	65	35	53	34	67	58	26	32	68	-

[a]Decimals have been omitted; alpha internal consistency estimates for the TOLD subtests appear in the diagonal. The critical values for the correlation coefficients are .23 at $p<.05$ and .30 at $p<.01$ (df=69)

[b](n=67) 4 cases dropped due to errors in administration of the subtest

[c]Groups were given dummy codes such that normal readers were coded +1, reading disabled 0 and language delayed -1

TABLE II

Descriptive Statistics and Pearson Correlations for all Variables and Normal Readers (n=29)

	$\bar{X}$	SD	AGE	PERF	VERB	FS	COMP	VOC	PV	OV	GU	SI	GC	WD	WA	TOTAL
Age (c.a. months)	93.0	6.38	-													
I.Q. (Scaled Score)																
Performance	57.59	7.93	-10[a]													
Verbal	57.79	7.87	-01	39	-											
Full Scale	115.17	12.98	-07	83	82	-										
Reading (Standard Score)																
Comprehension	60.41	4.89	-42	20	10	23	-									
Vocabulary	60.03	6.16	-35	05	10	12	60	-								
TOLD (Scaled Score)																
Picture Vocabulary	10.86	2.82	10	42	44	52	32	37	77							
Oral Vocabulary	11.79	2.80	22	16	53	46	04	09	33	93						
Grammatic Understanding	10.34	2.18	-08	51	36	57	18	39	30	16	27					
Sentence Imitation	10.24	2.15	-26	25	39	44	27	29	32	40	40	92				
Grammatic Completion	9.83	1.77	-20	09	-00	09	05	18	13	29	17	52	57			
Word Discrimination	8.24	1.79	-02	10	16	17	53	60	45	35	18	31	14	54		
Word Articulation	10.62	1.52	00	-06	-26	-20	22	-02	-04	04	-29	-06	11	31	37	
Total Score	71.62	9.03	02	37	49	56	37	47	65	70	49	65	57	65	18	-

[a]Decimals have been omitted; alpha internal consistency estimates for the TOLD subtests appear in the diagonal. The critical values for the correlation coefficients are .37 at $p<.05$ and .47 at $p<.01$ (df=27)

TABLE III

Descriptive Statistics and Pearson Correlations for all Variables and Disabled Readers (n=27)

	$\bar{X}$	SD	AGE	PERF	VERB	FS	COMP	VOC	PV	OV	GU	SI	GC	WD	WA	TOTAL
Age (c.a. months)	95.04	7.01	-													
I.Q. (Scaled Score)																
Performance	54.26	7.37	-06[a]	-												
Verbal	45.33	5.31	-22	39	-											
Full Scale	98.52	10.68	-19	83	71	-										
Reading (Standard Score)																
Comprehension	39.70	5.45	27	-04	-06	-16	-									
Vocabulary	47.70	5.95	25	14	02	02	22	-								
TOLD (Scaled Score)																
Picture Vocabulary	8.40	2.90	-06	-01	02	15	-08	-10	89							
Oral Vocabulary	8.78	2.31	-11	05	15	04	16	25	-07	80						
Grammatic Understanding	8.70	2.05	-19	26	02	20	20	12	14	41	18					
Sentence Imitation	8.22	2.10	-11	13	48	35	-00	22	-11	39	37	92				
Grammatic Completion[b]	8.30	1.87	60	26	17	18	43	49	-16	02	00	11	99			
Word Discrimination	7.63	1.98	00	14	10	16	07	-22	-35	19	21	31	-04	73		
Word Articulation	10.48	1.97	-05	47	13	42	-31	05	26	-18	16	16	01	-02	56	
Total Score	59.15	7.29	-18	46	29	48	-03	24	16	51	71	56	16	42	53	-

[a]Decimals have been omitted; alpha internal consistency estimates for the TOLD subtests appear in the diagonal. The critical values for the correlation coefficients are .38 at $p<.05$ and .44 at $p<.01$ (df=25)

[b](n=23) 4 cases dropped due to errors in administration of the subtest

TABLE IV

Descriptive Statistics and Pearson Correlations for all Variables and Language-Delayed Subjects (n=15)

	$\bar{X}$	SD	AGE	PERF	VERB	FS	COMP	VOC	PV	OV	GU	SI	GC	WD	WA	TOTAL
Age (c.a. months)	92.53	6.71	-													
I.Q. (Scaled Score)																
Performance	49.27	8.18	02[a]	-												
Verbal	35.40	7.37	-15	10	-											
Full Scale	85.33	12.68	-15	77	68	-										
Reading (Standard Score)																
Comprehension	40.73	10.40	-25	30	26	39										
Vocabulary	44.47	10.89	-05	35	21	36	81									
TOLD (Scaled Score)																
Picture Vocabulary	8.40	2.95	-17	70	47	80	41	23	90							
Oral Vocabulary	7.80	2.78	-17	43	54	65	51	39	73	90						
Grammatic Understanding	8.40	2.75	26	49	15	41	16	28	16	25	78					
Sentence Imitation	5.20	1.94	-12	18	18	24	15	33	21	03	-11	93				
Grammatic Completion	6.73	1.33	-60	06	56	38	55	56	23	23	01	38	85			
Word Discrimination	6.87	2.13	-16	41	00	38	54	61	34	36	20	42	29	69		
Word Articulation	8.80	2.08	-20	-18	06	-10	-36	-33	-29	-14	-01	03	01	-38	70	
Total Score	52.27	8.48	-25	66	53	-82	54	53	74	75	50	45	49	60	01	-

[a]Decimals have been omitted; alpha internal consistency estimates for the TOLD subtests appear in the diagonal. The critical values for the correlation coefficients are .51 at $p<.05$ and .64 at $p<.01$ (df=13)

TABLE V

Analyses of Variance and Tukey Test on Subject Characteristics

				MS_e	F	p	Tukey[a]
Age (c.a. months)	Normal Readers	M	93.0	44.77	.93	0.40	
		SD	6.38				
	Reading Disabled	M	95.04				
		SD	7.01				
	Language Delayed	M	92.53				
		SD	6.71				
Intelligence (Scaled Scores)							
Performance	Normal Readers	M	57.59	60.43	5.70	<.01	↑
		SD	7.93				
	Reading Disabled	M	54.26				
		SD	7.37				
	Language Delayed	M	49.27				
		SD	8.18				
Verbal	Normal Readers	M	57.79	47.42	56.39	<.01	↑ ↑
		SD	7.87				
	Reading Disabled	M	45.33				
		SD	5.31				
	Language Delayed	M	35.40				
		SD	7.37				
Full Scale	Normal Readers	M	115.17	146.09	32.53	<.01	↑ ↑
		SD	12.98				
	Reading Disabled	M	98.52				
		SD	10.68				
	Language Delayed	M	85.33				
		SD	12.68				

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Table V - continued

				MS_e	F	p	Tukey[a]
Gates-MacGinitie (Standard Score)							
Vocabulary	Normal Readers	M	60.03	53.56	30.07	<.01	↑ ↑
		SD	6.16				
	Reading Disabled	M	47.70				
		SD	5.95				
	Language Delayed	M	44.47				
		SD	10.89				
Comprehension	Normal Readers	M	60.41	43.46	81.78	<.01	↑ ↑
		SD	4.89				
	Reading Disabled	M	39.70				
		SD	5.45				
	Language Delayed	M	40.73				
		SD	10.40				

[a]Arrows pair means that were statistically different at $p < .05$

TABLE VI

Administration of the Gates-MacGinitie Reading Test by Group

	Normal	Reading-Disabled	Language Delayed
Grade 2	Primary B n=15	Primary B n=11	Primary B n=15
Grade 3	Primary C n=14	Primary C n=16	

TABLE VII

Analyses of Variance and Tukey Test for the TOLD

				MS_e	F	p	Tukey[a]
Subtests (Scaled Scores)							
Picture Vocabulary	Normal Readers	M	10.86	8.29	6.25	<.01	↑ ↑
		SD	2.82				
	Reading Disabled	M	8.40				
		SD	2.90				
	Language Delayed	M	8.40				
		SD	2.95				
Oral Vocabulary	Normal Readers	M	11.79	6.85	14.85	<.01	↑ ↑
		SD	2.80				
	Reading Disabled	M	8.78				
		SD	2.31				
	Language Delayed	M	7.80				
		SD	2.78				
Grammatic Understanding	Normal Readers	M	10.34	5.11	5.22	<.01	↑ ↑
		SD	2.18				
	Reading Disabled	M	8.70				
		SD	2.05				
	Language Delayed	M	8.40				
		SD	2.75				
Sentence Imitation	Normal Readers	M	10.24	4.36	29.0	<.01	↑ ↑ ↑
		SD	2.15				
	Reading Disabled	M	8.22				
		SD	2.10				
	Language Delayed	M	5.20				
		SD	1.94				

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Table VII - continued

				MS_e	F	p	Tukey[a]
Grammatic Completion	Normal Readers	M	9.83	2.97	16.51	<.01	↑ ↑
		SD	1.77				
	Reading Disabled	M	8.30				↑
		SD	1.87				
	Language Delayed	M	6.73				
		SD	1.33				
Word Discrimination	Normal Readers	M	8.24	3.76	2.53	0.09	
		SD	1.79				
	Reading Disabled	M	7.63				
		SD	1.98				
	Language Delayed	M	6.87				
		SD	2.13				
Word Articulation	Normal Readers	M	10.62	3.32	5.51	<.01	↑
		SD	1.52				
	Reading Disabled	M	10.48				↑
		SD	1.97				
	Language Delayed	M	8.80				
		SD	2.08				
Total Score	Normal Readers	M	71.62	68.72	31.1	<.01	↑ ↑
		SD	9.03				
	Reading Disabled	M	59.15				↑
		SD	7.29				
	Language Delayed	M	52.27				
		SD	8.48				

[a]Arrows pair means that were statistically different at $p < .05$

TABLE VIII

Standardized Discriminant Function Coefficients for Several Groups of Predictors

		PV	OV	GU	SI	CC	WD	WA	Gates-MacGinitie COMP	Gates-MacGinitie VOC	CHI	df	p
Analysis 1 (7 subtests)	Function 1	0.07	0.25	0.03	0.55	0.26	-0.07	0.22	-	-	56.01	14	<.01
	Function 2	-0.57	-0.45	-0.21	0.52	-0.16	0.25	0.53	-	-	13.44	6	<.05
Analysis 2 (7 subtests plus comprehension)	Function 1	-0.01	0.12	0.01	0.28	-0.05	-0.22	0.14	0.84	-	117.38	16	<.01
	Function 2	0.20	0.02	0.07	-0.69	-0.28	-0.21	-0.41	0.69	-	26.30	7	<.01
Analysis 3 (7 subtests plus vocabulary)	Function 1	0.03	0.22	-0.05	0.44	0.07	-0.15	0.28	-	0.48	78.20	16	<.01
	Function 2	0.43	0.31	0.10	-0.63	-0.10	-0.29	-0.48	-	0.51	15.96	7	<.05
Analysis 4 (7 subtests plus comprehension and vocabulary)	Function 1	-0.00	0.12	-0.00	0.28	-0.05	-0.21	0.14	0.87	-0.04	118.06	18	<.01
	Function 2	0.20	0.01	0.12	-0.65	-0.20	-0.18	-0.41	0.90	-0.39	27.65	8	<.01
Analysis 5 (5 principal subtests)	Function 1	-0.12	-0.22	-0.02	-0.57	-0.31	-	-	-	-	58.79	10	<.01
	Function 2	-0.61	-0.55	-0.27	0.97	-0.09	-	-	-	-	9.12	4	<.06
Analysis 6 (5 principal subtests plus comprehension)	Function 1	-0.02	-0.06	0.02	-0.25	-0.00	-	-	-0.81	-	102.930	12	<.01
	Function 2	-0.16	-0.04	-0.08	0.97	0.36	-	-	-0.77	-	20.80	5	<.01
Analysis 7 (5 principal subtests plus vocabulary)	Function 1	-0.07	-0.17	0.06	-.44	-0.14	-	-	-	-0.44	63.49	12	<.01
	Function 2	0.44	0.37	0.13	-1.04	-0.18	-	-	-	0.58	11.30	5	<.05
Analysis 8 (5 principal subtests plus comprehension and vocabulary)	Function 1	-0.03	-0.06	0.01	-0.25	-0.01	-	-	-0.87	0.01	103.971	14	<.01
	Function 2	-0.16	-0.03	0.14	0.91	0.28	-	-	-1.00	0.43	22.060	6	<.01

TABLE IX
Prediction Results

		Actual Group	Number of Cases	Predicted Group Membership: Normal Readers Group 1	Reading Disabled Group 2	Language Delayed Group 3	Percent of "Grouped" Cases Correctly Classified
Analysis 1 (7 subtests)	Normal Readers	1	29	19 65.5%	9 31.0%	1 3.4%	
	Reading Disabled	2[a]	23	3 13.0%	16 69.6%	4 17.4%	71.64%
	Language Delayed	3	15	0 0.0%	2 13.3%	13 86.7%	
Analysis 2 (7 subtests plus Comp)	Normal Readers	1	29	28 96.6%	0 0.0%	1 3.4%	
	Reading Disabled	2	23	0 0.0%	19 82.6%	4 17.4%	88.06%
	Language Delayed	3	15	1 6.7%	2 13.3%	12 80.0%	
Analysis 3 (7 subtests plus Voc)	Normal Readers	1	29	25 86.2%	3 10.3%	1 3.4%	
	Reading Disabled	2	23	3 13.0%	16 69.6%	4 17.4%	80.60%
	Language Delayed	3	15	1 6.7%	1 6.7%	13 86.7%	

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Table IX - continued

		Actual Group	Number of Cases	Predicted Group Membership: Normal Readers Group 1	Reading Disabled Group 2	Language Delayed Group 3	Percent of "Grouped" Cases Correctly Classified
Analysis 4 (7 subtests plus Comp and Voc)	Normal Readers	1	29	28 96.6%	0 0.0%	1 3.4%	89.55%
	Reading Disabled	2	23	0 0.0%	20 87.0%	3 13.0%	
	Language Delayed	3	15	0 0.0%	3 20.0%	12 80.0%	
Analysis 5 (5 principal subtests)	Normal Readers	1	29	21 72.4%	8 27.6%	0 0.0%	67.16%
	Reading Disabled	2	23	4 17.4%	13 56.5%	6 26.1%	
	Language Delayed	3	15	0 0.0%	4 26.7%	11 73.3%	
Analysis 6 (5 principal subtests plus Comp)	Normal Readers	1	29	28 96.6%	0 0.0%	1 3.4%	85.07%
	Reading Disabled	2	23	0 0.0%	18 73.9%	5 26.1%	
	Language Delayed	3	15	1 6.7%	3 13.3%	11 80.0%	

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Table IX - continued

		Actual Group	Number of Cases	Predicted Group Membership: Normal Readers Group 1	Reading Disabled Group 2	Language Delayed Group 3	Percent of "Grouped" Cases Correctly Classified
Analysis 7 (5 principal subtests plus Voc)	Normal Readers	1	29	24 82.8%	5 17.2%	0 0.0%	76.12%
	Reading Disabled	2	23	1 4.3%	16 69.6%	6 26.1%	
	Language Delayed	3	15	1 6.7%.	3 20.0%	11 73.3%	
Analysis 8 (5 principal subtests plus Comp and Voc)	Normal Readers	1	29	28 96.6%	0 0.0%	1 3.4%	85.07%
	Reading Disabled	2	23	0 0.07%	18 78.3%	5 21.7%	
	Language Delayed	3	15	1 6.7%	3 20.0%	11 73.3%	

a(n=23) due to the eliminating of the 4 Grammatic Completion scores in this group