ORAL LANGUAGE CHARACTERISTICS OF ACCURACY-DISABLED, RATE-DISABLED AND FLUENT NORMAL READERS

by

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Oral Language Characteristics of Accuracy-Disabled, Rate-Disabled 

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This study attempted to replicate the second part of a research article concerning the oral language characteristics of two groups of reading disabled subjects, accuracy-disabled and rate-disabled readers, and a group of fluent normal readers. Accuracy-disabled readers were defined as readers who scored at least 1.5 grade levels below their expected age-grade placement on two standardised reading tests measuring word recognition accuracy. Rate disabled readers had obtained age-appropriate word recognition accuracy but were deficient in word recognition speed also measured on two standardised reading tests. The fluent normal readers were reading at similar word recognition accuracy levels as the rate disabled subjects but were faster in terms of word recognition speed. There were 16 subjects between 8 and 13 years of age in each group who were enrolled in their local elementary schools in School District #41 (Burnaby). Oral language characteristics were investigated using standardised language tests such as the Illinois Test of Psycholinguistic Abilities, the Boston Diagnostic Aphasia Examination, the Berry-Talbott Language Test, the Detroit Test of Learning Aptitude, the Rapid Automatized Naming Test, and the Peabody Picture Vocabulary Test-Revised. The oral language characteristics investigated included lexical functions,
morphology and syntax, and auditory memory skills.

The accuracy disabled children appeared to be handicapped by a general language impairment evident on several different dimensions of oral language development which included vocabulary and word knowledge skills, the application of morphological and syntactic rules with irregular items, simple and complex nonsense items, and specific auditory memory skills investigated, relative to the normal sample. The rate disabled children encountered specific difficulties with the speed needed for accessing and providing names for single visual arrays and with multiple visual arrays, letter naming only. They also encountered difficulties with oral vocabulary knowledge and the application of morphological and syntactic rules with irregular items and complex nonsense items. Three oral language measures -- oral vocabulary, irregular morphological and syntactic rules, and speed of letter naming -- appeared to be pervasively associated with deficient reading skills regardless of the type of reading disability.
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CHAPTER 1

Introduction and Review of the Literature

Children who are learning to read within the educational system sometimes continue to experience difficulties despite numerous remedial intervention programs. These children whose difficulties in learning to read persist over time are often referred to as "reading-disabled". It has been suggested that some or all of these reading-disabled children may actually have difficulties with skills that are considered prerequisite to learning to read, such as some oral language skills. Although many studies have attributed various language deficiencies to the reading-disabled population, a limitation to these studies lies within the different criteria of achievement used to define the disabled reader. This chapter will investigate Lovett's (1984a, b, c) work in attempting to define particular criteria of achievement development from LaBerge and Samuels (1974) model of reading and the expansion of its basic concepts by Ehri and Wilce (1979, 1983). This chapter will then review Lovett's concept of the subtyping of reading disabilities based on the constructs of speed and accuracy. Research pertaining to various aspects of auditory memory, oral language competence and verbal learning ability shall be outlined. Finally, this chapter will outline the three research questions posed by Lovett, and adopted in this present study, concerning the investigation of the oral language characteristics of
two subtypes of reading-disabled subjects in comparison to a group of fluent normal readers.

A Model of Reading

During the late 1960s and 1970s reading research was directed toward understanding how information was stored and processed and hence a variety of different types of reading models were developed. New models tended to draw upon the conceptualizations of the reading models preceding them. Each reading model tended to be developed from somewhat different perspectives depending upon the researcher's ideological background (Mosenthal, 1984a, b). LaBerge and Samuels' (1974) information processing model of skilled reading behaviour contributed to this growing font of knowledge concerning reading acquisition by advocating two criteria of achievement against which the development of any reading skill could be measured. Previously, a sufficient indication of skill acquisition had been a demonstration of accurate performance. LaBerge and Samuels contended, however, that skill acquisition had to be developed to the point of automaticity. In their view, fluent reading was achieved only when the reader was able to engage automatically in all visual and semantic levels of the decoding process, thus allowing almost all available attention to be allocated to the appreciation of textual meaning. The developmental contribution of this model lies within its prediction that the reader will not become skilled if component skills are not automatized or
still require attentional direction for their accurate performance.

**Beyond Automaticity**

In the current literature a commonly accepted definition of automaticity refers to a skill which has been demonstrated to be overlearned to the point that it seemingly requires little or no conscious attention for its enactment. Following the prediction that arose from LaBerge and Samuels' model, Guttentag and Haith (1978) investigated the reading skills of good and poor first and third grade readers. Their results suggest that known words may be recognized automatically by good readers by the end of the first grade and by poorer readers by third grade. This study supported the findings of such researchers as Ehri (1976), Golinkoff and Rosinski (1976) and Pace and Golinkoff (1976). More recent studies such as those by West and Stanovich (1979), and Stanovich, Cunningham and West (1981) appear to suggest that the acquisition of automatic word recognition processes may occur even earlier than the third grade with less skilled or poor readers. As Lovett (1984c) pointed out, there is no similar evidence, however, regarding the automaticity with which with disabled and/or dyslexic readers identify familiar words.

Attempts to study the normal acquisition of word recognition using the achievement criteria of accuracy and automaticity have led to the realization that automaticity is not the final phase in the attainment of skill development. West and Stanovich (1979) and
Stanovich (1980), for example, contended that the developing ability
to recognize words automatically did not appear to be the main factor
accounting for improved reading ability beyond the second grade. Two
studies by Ehri and Wilce (1979, 1983) indicated that automatic word
recognition is usually attained before the readers have maximized word
recognition speed. Biemiller (1977) also found that after word
recognition automaticity had been achieved, recognition time continued
to decrease.

Stanovich et al. (1981) argued that differences in speed rather
than automaticity of the word recognition processes differentiated
school aged samples of good and poor readers. This idea that speed is
an important determinant of individual differences in reading is also
supported by studies such as Barron (1980), Ehri and Wilce (1979,
Jackson and McClelland (1975, 1979) and Jackson (1980)
investigated determinants of individual differences in university
undergraduates. Their studies, as Lovett (1984c) pointed out, appear
to offer further support that the speed with which a meaning memory
can be accessed is a critical ability difference among adult readers.
Chabot, Zehr, Prinzo and Petros (1984) found that skilled and less
skilled adult readers were distinguishable from each other in terms of
the speed of accessing semantic information from both words and
pictures. They proposed that "the development of rapid word
recognition skills is the primary factor which distinguishes skilled
from less skilled reading performance" (p. 60). Thus, many researchers (Biemiller, 1977; Doehring, 1976; Guttentag & Haith, 1978; Lovett, 1984a, b, c; West & Stanovich, 1978, 1979) have proposed that increases in word recognition speed rather than attention and automaticity may be a more relevant determinant in the study of reading skill and reading disabilities.

**Development of Word Recognition Skills**

Ehri and Wilce (1979, 1983) in summarizing the various research findings outlined above, contended that the development of word recognition skills comprised three phases: accuracy, automaticity and speed. In the accuracy phase unfamiliar words become familiar and are accessed accurately by direction of the reader's attention to component letters as they map sounds. Gradually through practice familiar words are recognized automatically without deliberate attention during Phase 2. Then in Phase 3, the speed of processing familiar words increases to a maximum as the components involved in recognition and production become consolidated as whole units in the reader's memory.

Ehri and Wilce (1983) investigated the development of the third phase in the word recognition process. The purpose of their study was to explore further the development of word identification speed with skilled and less skilled normal readers in grades 1, 2, and 4, and to focus on the attainment of unitized speeds in an attempt to determine
when Phase 3 is reached for familiar words during the early years. Ehri and Wilce contended that the third phase is attained when all components of the identification process (that is, graphic, phonological, semantic) operate together as a unit within memory for particular words. In the first experiment, skilled and less skilled readers were required to identify familiar printed words, consonant-vowel-consonant (CVC) nonwords, digits, and pictures. Attainment of unitized speeds to printed words was inferred only if the subjects identified words as rapidly as digits. First grade skilled readers attained unitized speed with familiar words but not with CVCs. The CVC combinations were not recognized until a year later. Whereas the older skilled readers were rapidly able to read the CVC combinations, less skilled readers were not able to read familiar words as rapidly as digits until the fourth grade. Ehri and Wilce's second experiment following LaBerge and Samuels' (1974) concept that practice makes perfect investigated whether younger less skilled readers could attain unitized levels of responding with simple practice reading familiar words. They found that even after practising familiar words up to 18 times, younger less skilled readers were unable to attain unitized response speeds. Ehri and Wilce hypothesized that because the younger less skilled readers lacked adequate information concerning letter-sound relationships they would have difficulty retaining and integrating in memory the complete spellings of the words with corresponding pronunciation and meanings. Integration appeared
essential for the rapid retrieval and word recognition necessary for skilled reading. Thus Ehri and Wilce contend that less skilled readers need more than simple word practice. They need more knowledge about letter-sound relationships to facilitate the integration of the spelling of words with their appropriate pronunciation and meaning in order to utilize this knowledge to develop speed. This concept is also supported by the findings of Lovett (1984a, b, c).

**Subtyping Reading Disabilities**

Based on Ehri and Wilce's (1983) phases in the acquisition process of word recognition, Lovett (1984a, b, c) contended that children with reading disabilities could also be further subtyped on the basis of such performance criteria as accuracy and speed. Lovett (1984a) pointed out that in the current research reading disabled samples typically have only been examined in respect to the first phase of learning, that is, in the acquisition of gaining familiarity with the printed word to the point of recognizing the word reliably and accurately. Since accuracy however is "not the culmination of skilled development" (Ehri & Wilce, 1983, p. 4), Lovett (1984c) argued that research also needed to address the construct of recognition speed. Thus following LaBerge and Samuels' (1974) work and the expansion of Ehri and Wilce (1983), Lovett (1984a, b, c) contended that the specification of two criteria of skill acquisition has provided a general conceptual framework within which two broad
subgroups of reading disabled children can be identified.

The first group of reading disabled children is that which has been labelled by Lovett (1984a, b, c) as "accuracy-disabled". The accuracy-disabled children are those who have failed to achieve age-appropriate performance in decoding accuracy and following Ehri and Wilce's (1983) terminology, are disabled at the first phase of reading acquisition. The second broad subtype of reading disabled children are those who demonstrate a breakdown in the later phases of word acquisition development, that is, those children that demonstrated age appropriate levels of word recognition accuracy but were markedly deficient in reading speed relative to normal expectations. Lovett (1984a, b, c) labelled this group as "rate-disabled". Lovett (1984c) contended that the reliability of this diagnostic distinction has been supported by the recent evidence of Carver's (1983) research with both adults and children that proposed that reading rate was a stable characteristic of individual readers.

A series of studies were designed by Lovett and her colleagues (Lovett, 1984a, b, c; Lovett, Ransby & Barron, 1984; Lovett, Ransby, Hardwick & Johns, 1985) to investigate the validity of accuracy and rate as a set of criteria for the subtyping of reading disorders and to further explore a number of indices of reading and nonreading skill development in the two samples of reading disabled children outlined, in comparison with a matched group of young fluent normal readers.
The children were matched in terms of age, sex and I.Q. measures. Lovett (1984a) contended that on the basis of data presented, some support could be claimed for her theoretically motivated approach for subtyping on the basis of accuracy and speed criteria. From the reading disabled children referred to remedial reading programs, two distinct groups with differing difficulties were identified. The two groups differed in terms of their breakdown in the acquisition of word recognition skills. This finding was further supported by Lovett (1984c) in an analysis of data that revealed distinct profiles of reading and other non-reading difficulties that were consistent with the two distinct broad subtypes proposed by Lovett in earlier studies.

The two subtypes identified by Lovett were consistently different within and across the studies on all accuracy-based measures of written language skills (Lovett, 1984a). It appeared that all aspects of the accuracy-disabled readers' systems and the indices of spelling and reading achievement measured were affected by their failure to develop accurate context-free word recognition processes (Lovett, 1984c). Overall Lovett and her colleagues found that the accuracy-disabled readers read more slowly, produced more word recognition errors, and comprehended less in terms of textual content than the other two comparison groups -- that is, the rate-disabled readers and the fluent normal readers. The errors they encountered were similar on both orthographically regular words, that is, those which are consistent with spelling-to-sound correspondence (for example, wade,
pink) and exception words, that is, words whose pronunciation violates spelling-to-sound correspondence rules (for example, broad, have) (Lovett, 1984a, c; Lovett, et al., 1984) and also on other graphically sensible pseudowords (Lovett, 1984c). Lovett (1984c) contended that these errors encountered on the orthographically sensible pseudowords were an indication of the extent to which these readers were still confused about the underlying print-to-sound translation and the appropriate visual translation of the English orthography system. On further investigation, Lovett (1984c) found that the accuracy-disabled readers lagged significantly behind the other two groups in the ease with which they could acquire new pseudoword-symbol associations. Thus Lovett contended that "a deficit in this aspect of sound symbol processing would appear an obvious handicap to the acquisition of decoding skill and a significant concomitant to these children's persistent inaccuracies" (Lovett, 1984c, p. 38).

In comparison to the accuracy-disabled group the rate-disabled difficulties appeared more selectively impaired. The rate-disabled readers demonstrated a significantly reduced word recognition speed in comparison to the fluent normal readers (Lovett, 1984a), and they required significantly longer time to identify new items (Lovett, 1984c). The difference between the rate-disabled and the fluent normal readers in time required to identify new words increased as the word frequency decreased (Lovett, 1984c). Lovett (1984c) also found that the depressed word recognition times appeared to have a negative
effect on their ability to read connected speech, even though they were matched with fluent normal readers in their ability to recognize words in isolation.

**Oral Language Research**

Within the literature, there appears to be a general consensus that reading disabled or learning-disabled school-aged children demonstrated along with their difficulties in reading, associated problems with certain areas of speech and/or language development. In fact within the United States, learning-disabled children are defined as those who demonstrate "a disorder in one or more of the basic psychological processes involved in understanding or using language, spoken or written" (U. S. Office of Education, 1977, p. 64083). This disorder is thus reflected in a significant discrepancy between age and/or general abilities and academic achievement (Snyder, 1984).

There have been a number of single studies in the literature that offered support to the concept that reading disabled and learning-disabled children are significantly different from their normally developing peers on a range of oral language indices. The oral language indices investigated in these studies included various aspects of auditory memory (Conners, Kramer and Guerra, 1969; Hennebert, 1964; Katz & Ilmer, 1972), oral language competence as measured by morphological and syntactical abilities (Dixon, 1982; Fry, Johnson & Muehl, 1970; Hook, 1976; Lovett, 1984a, b, c; Moran & Bryne,

Learning-disabled children were found to differ significantly from their normally developing peers with such speech functions as the speed with which they could identify undistorted words presented auditorially (Hennebert, 1964), their ability to interpret competing messages in dichotic listening (Conners, et al., 1969), auditory reception and auditory retention abilities (Katz & Ilmer, 1972). Other auditory language processing problems associated with learning disabilities and reading disabilities included auditory figure-ground problems (Flowers & Costello, 1970), difficulties with phonemic discrimination (Aten & Davis, 1968; Birch & Belmont, 1964; Blank, 1968; Rudel, Denckla, & Broman, 1981), auditory memory deficits (de Hirsch, Jansky & Langford, 1966; Spencer, 1967), and auditory-visual integration deficits (Birch & Belmont, 1965).

Snyder (1984) contended that the problems that learning-disabled children encountered with lexical comprehension were not evident if one only considered their ability to comprehend the meaning of single words on such vocabulary tests as the Peabody Picture Vocabulary Test (PPVT). Studies such as those of Wiig and Semel (1973) and Wiig, et al. (1973), when comparing normal and learning-disabled children's comprehension of words, found that both groups performed similarly on the PPVT. In contrast, Lovett (1984c) found that the vocabulary
comprehension of her accuracy-disabled readers as measured on the PPVT was significantly behind that of the rate-disabled and fluent normal readers. However, if her data on the mean scores obtained on the PPVT by both the accuracy-disabled and the rate-disabled group is collapsed into one group labelled reading-disabled or learning-disabled, then the results found by Lovett would be similar to those found by Wiig and Semel (1973) and Wiig, et al. (1973). This appears to offer additional support to the importance of further subtyping groups of reading disabled or learning-disabled children, since word comprehension as examined by PPVT may be indicative of only the accuracy-disabled group rather than the rate-disabled group. Such a distinction or subtyping of learning disabilities was not considered by Wiig and Semel or Wiig et al. Further investigations and/or replication of Lovett's research is needed to consider such a possibility.

Elementary school-aged learning-disabled children appeared to have particular difficulty comprehending specific types of word categories such as those that express spatial, temporal and kinship relations (Snyder, 1984; Wiig & Semel, 1973). Lovett (1984c) found that the accuracy-disabled children were significantly inferior to the rate-disabled and fluent normal children in their ability to analyze and contrast word meanings. The accuracy-disabled children were also inferior to their rate-disabled children when required to associate unfamiliar pseudowords and novel symbols in a task designated to
simulate some of the learning involved in initial reading acquisition (Lovett, 1981, 1984a,b,; Lovett, Ransby & Barron, 1984). Lovett's findings are consistent with findings of other researchers. Johnson and Myklebust (1967), Wiig and Semel (1974) and Denckla (1979), found that learning-disabled children tended to be slower and more accurate in naming objects and pictures, in naming verbal opposites and completing verbal analogies.

The internalization of linguistic rules -- phonological, morphological and syntactic -- permit the child to generate novel sentences. The morphological rules which indicate such semantic information as number and tense specify the word inflections and markers while the syntactic rules specify word order, which is of primary importance in generating sentences (Wiig & Semel, 1976). Research seems to indicate that learning-disabled children exhibit deficits and delays in processing and producing both morphological and syntactical forms (Dixon, 1982; Fry, et al., 1970; Lovett, 1984a, b, c; Rudel, et al., 1981; Vogel, 1975, 1977; Wiig & Semel, 1973).

In her 1974 study, Vogel examined learning-disabled children's knowledge of morphology using the Berry-Talbott Language Test (1969). She found that the learning-disabled children with reading comprehension difficulties performed significantly poorer than their fluent normal peers. Analysis of the data demonstrated that knowledge of morphology was one of the three measures found that significantly differentiated between achieving and learning-disabled children. In
an investigation of the qualitative and quantitative differences in morphology use between learning-disabled and fluent normal children, Wiig et al. (1973) found that learning-disabled children demonstrated significant deficits in their knowledge of morphology, which was felt to suggest a delay in the acquisition of the internalization of morphological rules.

In later studies, Vogel (1975, 1977) compared the abilities of normal and dyslexic second graders on a variety of linguistic and suprasegmental measures using the Grammatic Closure subtest of the Illinois Test of Psycholinguistic Abilities (ITPA) and the Berry-Talbott Test (1969). She found that the dyslexic children performed significantly poorer than their normal peers in their ability to mark morphologically real and nonsense words embedded in sentence contexts. Hook (1976) used the same measures as Vogel with normal and learning-disabled fourth graders and found similar results. Dixon (1982) also found similar results in her investigation of inflectional morphology with age-matched, reading-matched, and reading-disabled 8 and 9-year-olds.

Moran and Byrne (1977) investigated the use of three regular past tense markers with matched groups of normally developing and learning-disabled children. In their study the learning-disabled group made significantly more errors across the three markers, used qualitatively different strategies for marking past tense and used more redundant markers than their normally developing peers.
Lovett (1984a, b) found however that not all learning-disabled children were similarly disadvantaged in their knowledge and use of morphology. She divided her group of reading disabled children into two broad subtypes (Lovett, 1984c), that of accuracy-disabled and rate-disabled. Using the Grammatic Closure subtest of the ITPA and the Berry-Talbott Test, she found that the accuracy-disabled children were significantly impaired in their ability to manipulate basic morphological rules with both real and nonsense words. However, no reliable differences were found between the rate-disabled and fluent normal children in their manipulation of either the simple or the more complex items (Lovett, 1984c). Lovett's findings indicate the importance and need of further investigation of the manipulation of morphological structures within the two broad subtypes of reading disabled children outlined.

Fry et al. (1970) analyzed oral language samples obtained from groups of matched 7-year-old good and poor readers. They found that the poor readers' oral language was typified by less frequent use of subject-verb-object formats, and clauses as direct objects, indirect objects and complements, fewer transformations, and more subject-verb agreement errors than their fluent normal peers. Snyder (1984) contended that this study demonstrated that children with reading problems often have deficient syntactic skills.

Using the Northwestern Syntax Screening Test (NSST) (Lee, 1971), Semel and Wiig (1976) investigated the syntactic abilities of 34
learning-disabled children and 17 academically achieving peers, ranging in age from 7 to 11 years. Their findings suggested that the learning-disabled children demonstrated significant delays in the comprehension and use of the syntactic structures investigated. Lovett's (1984c) study found that the accuracy-disabled children were significantly disadvantaged in their knowledge and manipulation of syntactic structures as compared to their matched rate-disabled and fluent normal peers. Unfortunately only a small number of syntactic rules are investigated in the Grammatical Closure subtest of ITPA and the Berry-Talbott Test.

Studies by Vellutino, Steger, Harding, and Phillips (1975), Rudel et al. (1976) and Vellutino (1979) have suggested that learning-disabled children may be disadvantaged in comparison to their normally developing peers in terms of their verbal learning ability. Vellutino et al. (1975) found that poor readers were inferior on tasks requiring visual and verbal abilities, as compared to normal readers, but unimpaired on non-verbal, visual-auditory tasks. Rudel et al. (1976) contended that the inferior ability of their dyslexic subjects in learning tasks using morse code and braille was possibly due to the overt or covert requirements of these tasks.

The evidence that learning-disabled children are inferior to their normally developing peers in some or all aspects of speech and language development has, as Lovett (1984c) pointed out, led some researchers such as Denckla (1979) to suggest that "dyslexia" could be
best conceptualized as a class of developmental language disorders, whereas Vellutino (1979) offers a more conservative explanation of a "verbal deficit" hypothesis of developmental reading failure. Lovett's rate-disabled and fluent normal comparisons offer some support for Vellutino's verbal deficit or limited capacity theory. The rate-disabled readers were confirmed to be decoding text at significantly lower rates. Although the two samples did not differ in their comprehension abilities, Lovett found that they did differ in terms of the accuracy with which the texts were decoded.

**Summary**

There are conflicting results presented in the literature as to the nature of speech and language difficulties encountered by disabled readers. Lovett (1984c) contended that this can be attributed in part to the different criteria of achievement researchers use to define their disabled readers. Because of this, Lovett and Vellutino contend that as yet there are no definite conclusions as to which of these areas is etiologically more significant" (Vellutino, 1979, p. 347). Thus, Lovett (1984c) following Ehri & Wilce's (1979, 1983) three phases of reading acquisition, has defined two specific broad subtypes of reading disabled students -- accuracy-disabled readers and rate-disabled readers. Using these specific definitions, Lovett presented support for different profiles of speech and language skills for the two broad subtypes. In summary, Lovett contended that final
interpretation of such data awaits further empirical investigation
with these two identified subtypes of reading disabilities. This
study is an attempt to replicate as closely as possible the second
aspect of Lovett's study which was designed to "examine the verbal
deficit hypothesis with these two samples of disabled readers to
determine whether either sample might demonstrate a profile of
language impairment which may be potentially constraining both oral
and written language development" (p. 10).

By comparing the two samples of reading disabled subjects with
their fluent normal peers on a range of oral language measures, it is
possible to consider the following questions formulated by Lovett
(1984c):

1. Are the accuracy-disabled children handicapped by a
general language impairment evident on several
different dimensions of oral language development
relative to the normal sample?

2. Is there an oral language component concomitant to the
rate-disabled sample's disability?

3. Are there any oral language measures which appear
pervasively associated with deficient reading skill,
regardless of whether the reading disability is an
accuracy or rate deficit?
CHAPTER 2

Method

The Population Sampled

The reading disabled samples were selected from 11 local schools in the Greater Vancouver Metropolitan Area (School District #41, Burnaby). Referrals for subjects in the reading disabled sample originated from the Learning Assistance teachers and School Board Diagnosticians or Psychologists. Children between the ages 8 and 13 years enrolled in elementary classrooms were accepted for screening as potential subjects. If, however, such factors as English as a second language, mental retardation, serious emotional disturbances, chronic medical conditions, hyperactivity or hearing impairment were present, then these children were not considered as subjects for this study.

The normal sample was also recruited from the same local Burnaby schools. Teachers were asked to select children for candidates who were enrolled in age-appropriate grade placements and who were considered to be normally achieving readers. Only children who were native speakers of English were considered for the fluent normal sample.
Subject Selection

The initial selection of subjects for each of the three sample groups was made on an a priori basis according to the child's performance on a screening battery. In Lovett's (1984c) study, several samples of reading behaviour were obtained for each subject on the basis of multiple measures. The screening battery in Lovett's study included:

1. Durrell Analysis of Reading Difficulty
   a. Oral Reading
   b. Word Recognition, and
   c. Word Analysis. (Durrell, 1955)

2. Gates-McKillop Reading Diagnostic Tests
   a. Word Flash
   b. Words Untimed and
   c. Phrases Flash. (Gates & McKillop, 1962)

3. Gilmore Oral Reading Test (Gilmore & Gilmore, 1968)

4. Peabody Individual Achievement Test: Reading Recognition. (Dunn & Markwardt, 1970)

5. Slosson Oral Reading Test. (Slosson, 1963)
6. Test of Rapid Reading Responses:
   a. WDR and
   b. WHD. (Dohering, 1976)

7. Biemiller Test of Rapid Reading Processes
   (Biemiller, 1981)

8. Wide Range Achievement Test: Reading
   (Jastak & Jastak, 1978)

In order to be classified as "accuracy-disabled" in Lovett's (1984c) study, the subject had to score 1.5 years below grade level expectations on at least four measures of word recognition accuracy. This was assessed on tests 1c, 2b, 4, 5 and 8 above. To be classified as "rate-disabled", subjects had to score close to, at, or above grade level on at least four measures of word recognition accuracy and 1.5 grade years below expected grade level on four out of five reading speed measures. Reading speed was assessed on tests 1a, 2c, 3, 6b and 7 from the list above. Subjects in the normal fluent group received an abbreviated screening battery which consisted of measures 3, 4, 5 and 8 and the Weschler Intelligence Scale for Children - Revised (WISC-R). There were more accuracy test measures in the abbreviated screening battery. This was devised by Lovett (1984c) so that individual matching of fluent normal readers and rate-disabled readers.
was possible. Hence each fluent normal reader was decoding at the same level of accuracy as his rate matched rate-disabled subject but at a faster speed (Lovett, 1984c).

In this attempted study replication, however, an abbreviated form of the screening battery was undertaken because of time constraints and feasibility in terms of a master's thesis. All reading measures used in Lovett's (1984c) study correlated highly ($r > 0.9; p < .001$). In consultation with Lovett's research staff on their perception of the value of the various reading tests as screening devices for subject selection, and with critical evaluations available in current literature, an abbreviated form of the screening battery was established.

For purposes of this study in order to be classified as "accuracy-disabled", the subject had to score at least 1.5 years below grade level expectations on two measures of word recognition accuracy. Each subject was assessed on the S.O.R.T. and the Reading Recognition subtest of the P.I.A.T. If the subject scored 1.5 years or more below grade level expectations on only one of these two tests, then the Reading subtest of the third test selected, the W.R.A.T. was administered. Similarly, in order to be classified as "rate-disabled", the subject had to score close to, at, or above grade level on two word recognition accuracy tests and at least 1.5 years below grade level on two of the measures of reading speed. The reading speed measures used were the Gilmore and the Biemiller tests.
If the subject scored 1.5 years below grade expectations on only one of the reading speed tests, then the oral subtest of a third test, the Durrell, was administered.

The third sample of subjects, the fluent normal readers was selected on their performance on three reading tests, the S.O.R.T., the P.I.A.T. and the Gilmore. Since it was not possible to administer an intelligence test (as in Lovett's study) to the subjects selected for the study, but in order to make some attempt at ensuring that the normal group was representative of the general population, a larger number of subjects than needed for the fluent normal reader sample was tested and those subjects who scored exceedingly high or low on the PPVT-R were excluded, that is the standard score on the PPVT-R had to be between 81 and 117.

A total of 16 accuracy-disabled, 16 rate-disabled, and 16 fluent normal readers were selected for each sample. Attempts were made to provide comparative samples in terms of chronological age, grade, and ratio of males to females. Descriptive statistics summarizing the three samples' performance on the screening measures are provided in Table 1.
Table 1

Matching Variables for Accuracy-disabled, Rate-disabled, and Fluent Normal Samples

<table>
<thead>
<tr>
<th></th>
<th>Accuracy-Disabled Mean (S.D.)</th>
<th>Rate-Disabled Mean (S.D.)</th>
<th>Fluent Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>9.66 (1.31)</td>
<td>9.98 (1.27)</td>
<td>9.99 (1.21)</td>
</tr>
<tr>
<td>Age-grade placement</td>
<td>4.5 (1.15)</td>
<td>9.98 (1.26)</td>
<td>4.5 (1.26)</td>
</tr>
<tr>
<td>Sex ratio:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male to female</td>
<td>11:5</td>
<td>12:4</td>
<td>12:4</td>
</tr>
</tbody>
</table>

Measures of Language Performance

Several tests of oral language were administered to each subject. The oral language battery was selected by Lovett (1984c) to focus on lexical functions, specifically word retrieval and word knowledge factors, and also on the knowledge of the language in terms of morphological and syntactic structures. Lovett also investigated auditory span memory. Two more areas of auditory memory, auditory sequential and sentence imitation, were also included in the present study.

The tests used are outlined below:
Oral Language Tests: Lexical Functions

1. **Visual Confrontation Naming** (Goodglass & Kaplan, 1972)

   The Visual Confrontation Naming subtest of the Boston Diagnostic Aphasia Examination requires retrieval of verbal labels in response to pictorial presentations. The pictures represent objects (chair, key, glove, feather, hammock, cactus), letters (H, T, R, L, S, G), geometric forms (square, triangle), colours (red, brown, pink, blue, grey, purple), numbers (7, 15, 700, 1936, 42, 7000), and actions (running, sleeping, drinking, smoking, falling, dripping). The accuracy and latency of each response are recorded manually by the examiner. In Lovett’s (1984c) adapted version of scoring response latencies are expressed in 1/100 second intervals. Intervals are recorded starting with the presentation of the target stimulus and finishing with the beginning of the subject's response utterance.

2. **Auditory Confrontation Naming** (Goodglass & Kaplan, 1972)

   In the Responsive Naming subtest of the Boston Diagnostic Aphasia Examination, the subject is asked a series of ten factual questions such as "What colour is grass?", "What do you do with a razor?" and "What do you tell time with?". Three different types of responses, adjectives, nouns and verbs, are elicited. Again the accuracy and latency of each response are recorded manually by the examiner.
3a. **Verbal Opposites** (Baker & Leland, 1967)

The Verbal Opposites subtest of the Detroit Tests of Learning Aptitude requires retrieval and formulation of antonyms. This subtest contains 96 stimulus items arranged in classes of nouns (boy, girl), verbs (lost, found), and adjectives (early, late). The examiner first establishes that the child understands the antonym relationships on the practice item, then works from the target items until the subject reaches a ceiling of five consecutive errors. Following Lovett's (1984c) adapted scoring procedure, the actual response and its latency are recorded for each item. If no response is obtained after 15 seconds, then the examiner records it as an error.

3b. **Word Opposites** (Hammill, 1985)

Since Lovett's study was undertaken the DTLA has been revised. It was decided to include the appropriate subtest on both the original DTLA and the new DTLA-2. Although the new author claims that the subtest on the DTLA-2 has basically remained unchanged, the order of presentation of the items has been rearranged and the number of items included has decreased from 96 to 50. New standard scores and percentile ranks have also been included.

The method of presentation of this subtest remains the same. The actual response and its latency (to the 1/100th of a second) are recorded for each item. Standard scores and median latencies were calculated for each subject.
4. **Peabody Picture Vocabulary Test - Revised** (Dunn & Dunn, 1981)

This test was designed to evaluate single word, receptive vocabulary comprehension in the age range two years three months to eighteen years five months. The test materials consist of 3 demonstration plates and 150 test plates. On each page there are four black-and-white line drawings, three of which are foils, and one the target item. The stimuli pictures are presented in order of increasing difficulty. The predominant proportion of the stimulus words are nouns followed by progressive tense verbs, and adjectives. The examiner reads the target word aloud and the subject is required to point to the picture corresponding to the target word. The child's response choice, but not its latency, are recorded.¹

5. **Rapid "Automatized" Naming** (Denckla & Rudel, 1976)

This test consists of four charts, each with 5 items; repeated in random sequence giving a total of 50 stimuli. Four stimulus arrays are used, which depict sets of numbers (1, 6, 9, 4, 7), colours (red, green, black, blue, yellow), letters (p, o, d, a, s), and objects (comb, key, watch, scissors, umbrella). The subject is first given a

¹ In Lovett's (1984c) study the PPVT was administered, rather than the revised edition, because the revised edition was not available in Lovett's clinical setting at the commencement of her study.
practice trial which requires identification of five items on a card, then the subject is presented with an array of 50 items (the five presented ten times in randomized order) and is asked to name them sequentially as rapidly as possible. Total naming time (to the 1/100th of a second) and errors are recorded manually.

Oral Language Tests: Syntax and Morphology

1. **Grammatic Closure** (Kirk, McCarthy & Kirk, 1968)

The Grammatic Closure subtest of the Illinois Test of Psycholinguistic Ability assesses the subject's ability to formulate and complete sentences by applying the appropriate morphological and syntactic rules. This subtest has 33 items utilizing the rules for forming regular and irregular noun plurals, noun derivations, noun possessive singulars, regular and irregular past tenses, past participles, pronouns, adverbs, propositions, comparatives and superlatives, and the adjective "any". The subject is presented with one or more pictures on a plate and asked to complete the examiner's sentence.

The authors of this test have provided norms for a total correct score only. Thus Lovett (1984c) devised a scoring key for use in her investigation. Since, as Lovett pointed out, there are too few instances of each type to permit calculation of a separate score, the items were divided into those requiring a highly regular or
predictable rule and those requiring application of a less predictable or "irregular" rule. Thus she sorted the test items into a subset of 12 regular and 21 irregular items. An example from Lovett's revised scoring system is presented below:

**Regular:**
Here is a dog. Here are two _______. (dogs)

**Irregular:**
Here is a sheep. Here are lots of _______. (sheep)

2. **Berry-Talbott Language Test** (Berry, 1977)

In this test the examiner shows the subject a card on which pictures and then the examiner's statements are presented. Based on Berko's (1958) Experimental Test of Morphology, the Berry-Talbott materials consist of fantasy pictures referred to by nonsense names. An example of a test item presents a black-lined drawing with the accompanying test "Yesterday I saw a nad. Then I saw another one. Yesterday I saw two _______. (nads)" The subject is required to provide the missing word applying the appropriate morphological or syntactical rules for each item. In this test there are 51 trials presented on 44 separate plates. A range of morphological and syntactic applications are elicited, including pluralization, possessives, comparatives and superlative adjectives, locative propositions, negation and past tense constructions.

In order to score this test Lovett (1984c) used Vogel's (1975, 1977) scoring adaptation of the 1966 Berry-Talbott materials. Items
in this test were considered simple or complex. Items were "simple" if they required the addition of a single terminal phoneme, (e.g. (gan -> gans), or "complex" if they required an addition of a terminal syllable, a formation of a compound word, or an internal vowel shift (cubash -> cubashes, nuppy -> unnuppy, tring -> trang). Vogel (1975, 1977) contended that some nonsense words because of their phonological relationships to actual English words, can be considered simple or complex, depending on the role or association used in forming a response. The pluralization of the item "geif" would be considered simple if the response was "geifs" (as in the rule reef -> reefs) but complex if the response was "geives" (as in the rule leaf -> leaves). Lovett adopted Vogel's adapted scoring system. However since additional items had been added in the revised 1977 Berry-Talbott Test, the majority of which were prepositions, Lovett added the qualification that all real word responses were to be separated out from pseudoword responses. Thus Lovett's scoring system which will be used in this study, has a total of three response sets: Simple Nonsense, Complex Nonsense, and English. Lovett provided the following examples:

**Simple Nonsense:**
Yesterday I saw a nad. Then I saw another one.
Yesterday I saw two _______. (nads)

**Complex Nonsense:**
I am a fooz. This fooz is my friend.
We are two _______. (foozes)
English:
The gloob wondered how far he could see from the top of his sloot. To find out he climbed _______ it. (up, on, on top of)

Oral Language Tests: Auditory Memory and Recall

1a. Auditory Attention for Unrelated Words

(Baker & Leland, 1967)

This is a subtest of the Detroit Tests of Learning Aptitude which evaluates short-term auditory memory abilities for unstructured and unrelated words. The subtest contains two sets of items. Each set consists of seven word groups, increasing in length from two to eight words. The examiner says a list of unrelated words at the rate of one per second. The subject is required to repeat the words in the same order spoken by the examiner. Every child is administered the entire set of words since there is no basal or ceiling level on this subtest. The subject's responses are scored to reflect the number of words recalled on all items, that is, simple score, and the relative number of words recalled per word group for the total test, that is, weighted score. The simple score allocates a score of one point for every word correctly recalled with a maximum of 70 points. Whereas the weighted score is obtained by multiplying the number of words correctly recalled in each list by the number of words included in the list to a
maximum of 406 points. In obtaining both scores order is disregarded. Normative data is provided for the age range three to nineteen years.

1b. **Word Sequences** (Hammill, 1985)

This subtest was one of the original subtests on the DTLA and was previously called Auditory Attention for Unrelated Words. The scoring system was simplified in the revised edition and a standard score was obtained for each subject. The earlier items at the two word level were omitted and additional items at the higher levels were included.

2a. **Auditory Retention for Related Syllables**

(Baker & Leland, 1967)

This subtest of the Detroit Tests of Learning Aptitude evaluates the immediate recall of 43 sentences. These sentences are not controlled for syntactic complexity, which is a factor known to influence sentence recall (Wiig & Semel, 1976). The sentences range in length from 5 words to 22 words. The examiner reads aloud each sentence and the subject is required to repeat the sentence verbatim. Repetitions of sentence with more than three errors, either substitutions, additions or omissions, are scored as incorrect. Each correct sentence repetition is scored on a point scale designed to reflect the number of errors. Normative data is also provided for the age range 3 years to 19 years.
2b. **Sentence Imitation** (Hammill, 1985)

This subtest was called the Auditory Attention for Related Syllables in the old DTLA edition. Essentially the content of this subtest has remained unaltered with a few items now omitted. Each sentence is read aloud to the subject who is required to repeat it verbatim. Any error in sentence repetition is scored as a 0 for the overall sentence. Standardized scores and percentile rates are included.

3. **Auditory Sequential Memory** (Kirk, et al., 1968)

This subtest of the Illinois Test of Psycholinguistic Abilities evaluates the ability to recall a sequence of digits, thus providing some insight regarding the number of units a child can successfully store in short-term memory for immediate recall. Analysis of error patterns can also provide the examiner with information regarding the nature of sequencing difficulties experienced by the child. This subtest consists of 28 items which contain a series of digits from 2 to 8 in increasing length. The digits are said aloud by the examiner at a rate of 2 digits per second. The subject is required to repeat the digits in exactly the same sequence. If the subject makes an error on the first presentation the examiner is allowed to repeat the sequence. However a penalty of one point occurs in scoring, that is, each correctly repeated digit sequence on the first attempt obtains a score of 2, whereas a correctly repeated sequence on the second
attempt obtains a score of 1. Both basal and ceiling levels are obtained. Normative data is available for ages 2 years to 10 years 3 months.

**Summary**

Thus the subjects are selected for each of the three sample groups on an *a priori* basis according to their performance on the abbreviated screening battery. Three areas of oral language are investigated: lexical functions, morphology and syntax, and auditory memory. The oral language measures are investigated on the above outlined subtests of the following standardised language tests: the ITPA, the DTLA and the DTLA-2, the Boston, PPVT-R and the Berry-Talbott. For a summary of these tests see Table 2.
### Table 2

**Screening Selection Battery and Oral Language Test Measures**

<table>
<thead>
<tr>
<th>Screening Battery</th>
<th>Oral Language Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>i. Accuracy Measures</strong></td>
<td><strong>i. Lexical Functions</strong></td>
</tr>
<tr>
<td>a) S.O.R.T.</td>
<td>a) Boston Diagnostic Aphasia Examination Visual</td>
</tr>
<tr>
<td>b) P.I.A.T. Reading Recognition subtest</td>
<td>b) Boston Diagnostic Aphasia Examination Responsive Naming subtest</td>
</tr>
<tr>
<td>c) W.R.A.T. Reading subtest</td>
<td>c) DTLA Verbal Opposites subtest; and DTLA-2 Word Opposites subtest</td>
</tr>
<tr>
<td><strong>ii. Rate Measures</strong></td>
<td><strong>ii. Morphology and Syntax</strong></td>
</tr>
<tr>
<td>a) Gilmore Oral Reading Test</td>
<td>a) I.T.P.A. Grammatic Closure subtest</td>
</tr>
<tr>
<td>b) Biemiller Test</td>
<td>b) Berry-Talbott Language Test</td>
</tr>
<tr>
<td>c) Durrell Test Oral Reading</td>
<td></td>
</tr>
<tr>
<td><strong>iii. Auditory Memory and Recall</strong></td>
<td><strong>.</strong></td>
</tr>
<tr>
<td>a) DTLA Auditory Attention for Unrelated Syllables DTLA-2 Word Sequences</td>
<td></td>
</tr>
<tr>
<td>b) DTLA Auditory Attention for Related Syllables DTLA-2 Sentence Imitation</td>
<td></td>
</tr>
<tr>
<td>c) ITPA Auditory Sequential Memory</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 3

Results

Introduction

Compatible with the replication of Lovett's (1984c) study and the current interest in oral language predictions of reading skill, different dimensions of oral language development were assessed in an effort to determine if the three reading groups differed on any general linguistic parameters which are assumed to underlie the process of reading acquisition. The parameters assessed were lexical functions, syntax and morphology, and auditory memory. The performance data were analyzed in a series of one-way analyses of variance. Measures were grouped according to the dimension of oral language development assessed and with reader group (accuracy-disabled, rate-disabled, fluent normal), a factor under which subjects were tested. Each one-way analysis of variance was subjected to two tests for homogeneity of variance: Cochrans C and Bartlett-Box F. Since sample means were equal and variances were found to be equivalent, the results were then subjected to the Scheffé procedure to determine which, if any, groups were significantly different.

Significant group differences were revealed across the three broad areas of oral language skills investigated in this study. Within the category of lexical functions significant reader group
effects were shown on visual confrontation naming tests in terms of accuracy ($F(2,45) = 7.73, p < .001$), and latency ($F(2,45) = 28.47, p < .00001$). The latency of rapid automatized naming of letters ($F(2,45) = 10.75, p < .002$), the latency of auditory confrontation naming ($F(2,45) = 19.23, p < .0001$), associative naming in terms of accuracy ($F(2,45) = 8.80, p < .0006$), and latency ($F(2,45) = 19.94, p < .00001$), and receptive vocabulary measures ($F(2,45) = 13.09, p < .00001$). With measures of morphological and syntactical knowledge, significant reader group effects were revealed on the Berry-Talbott Language Test ($F(2,45) = 39.97, p < .00001$), and the Illinois Test of Psycholinguistic Abilities ($F(2,45) = 16.34, p < .00001$). Significant reader group differences were also noted on the auditory memory tasks of digit span memory ($F(2,45) = 11.97, p < .0001$), word span memory ($F(2,45) = 12.19, p < .0001$), and sentence imitation ($F(2,45) = 6.04, p < .0047$). These effects and group comparisons will be summarized in a series of tables and described in further detail.

**Reading Skills of the Three Groups**

When performance on the group screening measures was examined, it was confirmed statistically that the accuracy-disabled children were significantly inferior to the rate-disabled and fluent normal peers in the accuracy with which they could decode single words. The fact that the accuracy-disabled children were significantly inferior on the standardized reading measures, the SORT and PIAT, to the other two
samples, simply indicates the screening procedure was successful in identifying a sample of children who were disabled in their reading ability at the very first criterion of word recognition skill attainment, that is, the accuracy criterion. No significant difference was noted between the performance of the rate-disabled sample and their fluent normal peers on the reading accuracy measures. This indicates that the two groups were comparable in their ability to decode accurately single words which was one of the aims in the subject selection process.

The Gilmore test was administered to all 48 subjects. Analysis of the results indicates that the rate-disabled readers were significantly inferior to their fluent normal readers in terms of the speed with which they could decode connected text, although there was no significant difference in accuracy ability as determined by their grade equivalent estimates. This simply indicates that this test was also successful at defining a sample of readers who had already attained the first criteria of word recognition that of accuracy, but who were disabled at the criterion of speed. The means and standard deviations of each sample and the results of individual group comparisons have been summarized in Table 3.
### Table 3

Summary Statistics on Accuracy-Disabled, Rate-Disabled and Fluent Normal Samples: Performance on Common Screening Battery

<table>
<thead>
<tr>
<th></th>
<th>Accuracy-Disabled Mean (S.D.)</th>
<th>Rate-Disabled Mean (S.D.)</th>
<th>Fluent Normals Mean (S.D.)</th>
<th>Individual Comparisonsa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Word Recognition Accuracy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.O.R.T. Scores</td>
<td>57.2 (20.7)</td>
<td>109.3 (35.3)</td>
<td>116.7 (32.0)</td>
<td>S</td>
</tr>
<tr>
<td>Grade Equivalent Estimates</td>
<td>2.8 (1.0)</td>
<td>5.4 (1.7)</td>
<td>5.8 (1.6)</td>
<td>S</td>
</tr>
<tr>
<td>S</td>
<td>S</td>
<td>S</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>P.I.A.T. Reading Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentiles</td>
<td>27.8 (4.6)</td>
<td>45.2 (6.4)</td>
<td>45.7 (10.5)</td>
<td>S</td>
</tr>
<tr>
<td>Grade Equivalent Estimates</td>
<td>2.7 (0.8)</td>
<td>5.4 (1.3)</td>
<td>5.6 (2.1)</td>
<td>S</td>
</tr>
<tr>
<td>S</td>
<td>S</td>
<td>S</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td><strong>Reading Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gilmore Rate (w.p.m.)</td>
<td>82.9 (19.1)</td>
<td>54.5 (17.5)</td>
<td>125.1 (24.1)</td>
<td>S</td>
</tr>
<tr>
<td>Grade Equivalent Estimates</td>
<td>3.0 (1.3)</td>
<td>5.6 (2.0)</td>
<td>6.3 (1.8)</td>
<td>S</td>
</tr>
<tr>
<td>S</td>
<td>S</td>
<td>S</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>

aNS = not significant at p < .01  
S = significant at p < .01
Lexical Functions

There were consistent differences between the three reading samples on specific measures of lexical function. The accuracy with which the three reading groups were able to name single items presented auditorially (Auditory Confrontation $F(2,45) = 1.66, p < .20$), was equivalent and close to ceiling level on the standardized tests used. This pattern was also revealed with the rate-disabled and fluent normal readers' ability to name single items presented visually. However the accuracy-disabled readers were shown to be significantly inferior to their fluent normal peers in their ability to name items presented visually. The three samples did differ significantly in terms of the speed with which labels for visually presented items could be supplied ($F(2,45) = 28.47, p < .00001$). The rate-disabled group was significantly inferior in the speed with which responses were made on auditory confrontation tasks in comparison to both the accuracy-disabled group and the fluent normal group's performance ($F(2,45) = 19.23, p < .00001$). The accuracy-disabled and fluent normal groups did not differ significantly at the 0.01 level of significance in terms of auditory confrontation naming speed. In terms of accuracy ($F(2,45) = 19.76, p < .00001$) of antonym naming, the accuracy-disabled group was significantly inferior to the rate-disabled and fluent normal samples' performance. However on the speed
of antonym naming the rate-disabled group was significantly inferior
to the accuracy-disabled and fluent normal readers ($F(2,45) = 20.42, p < .0001$).

These data suggest that the rate-disabled group suffers from a
naming speed disadvantage that influences both the speed at which the
reader can decode words and the speed at which the reader can complete
visual and auditory tasks including symbols or pictures or question
formats. The accuracy-disabled group appears to have specific
difficulties accurately naming visually presented items and recalling
opposites presented auditorially.

The three reading groups' ability to name multiple visual arrays
was examined using a task that Denckla and Rudel (1976) claimed
provided a simulation of the naming aspect of connected text within
which the interference of orthographic, syntactic and semantic
information was removed. The three reading groups did not differ in
terms of the accuracy and time taken on three of the four subtests,
that is, colours, numbers and objects (see Table 4). With the speed
of letter naming the accuracy-disabled and rate-disabled group
differed significantly from their fluent normal readers ($F(2,45) =
10.75, p < .0002$). There was, however, no significant letter naming
difference between the two reading disabled groups (AD $M = 32.96$, RD $M
= 31.03$).

The final comparisons of lexical functions focused on the
vocabulary and word knowledge of the three reading groups. The
Table 4

The Oral Language Skills of Accuracy-Disabled, Rate-Disabled and Fluent Normal Samples: Lexical Functions

<table>
<thead>
<tr>
<th></th>
<th>Accuracy-Disabled Mean (S.D.)</th>
<th>Rate-Disabled Mean (S.D.)</th>
<th>Fluent Normals Mean (S.D.)</th>
<th>Individual Comparisons a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Naming to Visual Confrontation</strong></td>
<td></td>
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<tr>
<td><strong>Visual Confrontation</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Naming Accuracy</td>
<td>33.1 (2.3)</td>
<td>33.5 (1.9)</td>
<td>35.4 (1.0)</td>
<td>NS</td>
</tr>
<tr>
<td>Median Latencies</td>
<td>1.404 (0.576)</td>
<td>2.062 (0.682)</td>
<td>0.662 (0.173)</td>
<td>S</td>
</tr>
<tr>
<td>R.A.N. Colours: Accuracy (/50)</td>
<td>49.7 (0.8)</td>
<td>50.3 (1.6)</td>
<td>49.9 (0.3)</td>
<td>NS</td>
</tr>
<tr>
<td>Time</td>
<td>51.124 (19.260)</td>
<td>48.898 (9.905)</td>
<td>40.727 (9.915)</td>
<td>NS</td>
</tr>
<tr>
<td>R.A.N. Numbers: Accuracy (/50)</td>
<td>49.9 (0.5)</td>
<td>49.9 (0.3)</td>
<td>49.9 (0.2)</td>
<td>NS</td>
</tr>
<tr>
<td>Time</td>
<td>30.908 (6.255)</td>
<td>30.192 (8.721)</td>
<td>23.421 (4.050)</td>
<td>NS</td>
</tr>
<tr>
<td>R.A.N. Numbers: Accuracy (/50)</td>
<td>49.1 (2.1)</td>
<td>49.6 (1.0)</td>
<td>49.9 (0.2)</td>
<td>NS</td>
</tr>
<tr>
<td>Time</td>
<td>67.094 (16.398)</td>
<td>64.576 (20.483)</td>
<td>53.509 (7.805)</td>
<td>NS</td>
</tr>
<tr>
<td>R.A.N. Letters: Accuracy (/50)</td>
<td>49.6 (0.8)</td>
<td>49.9 (0.5)</td>
<td>49.9 (0.2)</td>
<td>NS</td>
</tr>
<tr>
<td>Time</td>
<td>32.964 (7.381)</td>
<td>31.031 (7.104)</td>
<td>22.888 (4.771)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Naming to Auditory Confrontation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsive Naming Accuracy (/10)</td>
<td>9.2 (1.0)</td>
<td>9.4 (0.7)</td>
<td>9.7 (0.5)</td>
<td>NS</td>
</tr>
<tr>
<td>Responsive Naming Median Latencies</td>
<td>1.279 (0.532)</td>
<td>1.938 (0.684)</td>
<td>0.804 (0.241)</td>
<td>S</td>
</tr>
</tbody>
</table>
Table 4 (continued)

<table>
<thead>
<tr>
<th></th>
<th>Accuracy-Disabled Mean (S.D.)</th>
<th>Rate-Disabled Mean (S.D.)</th>
<th>Fluent Normals Mean (S.D.)</th>
<th>Individual Comparisons$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associative Naming</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Opposites: Accuracy</td>
<td>6.4 (1.4)</td>
<td>8.9 (2.2)</td>
<td>11.3 (2.7)</td>
<td>S S NS</td>
</tr>
<tr>
<td>(standard scores)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal Opposites: Median</td>
<td>1.682 (0.443)</td>
<td>2.491 (0.705)</td>
<td>1.282 (0.393)</td>
<td>S NS S</td>
</tr>
<tr>
<td>Latencies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receptive Vocabulary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picture Vocabulary Scores</td>
<td>91.3 (11.0)</td>
<td>97.9 (10.5)</td>
<td>109.6 (9.2)</td>
<td>NS S S</td>
</tr>
</tbody>
</table>

$^a$NS = not significant at $p < .01$
S = significant at $p < .01$
accuracy-disabled and rate-disabled readers were significantly delayed in comparison to their fluent normal peers in terms of the extent of words with which they were familiar (PPVT-R = AD $\bar{X} = 91.3$, RD $\bar{X} = 97.9$; FN $\bar{X} = 109.6$). There was, however, no significant difference between the accuracy-disabled and rate-disabled group receptive vocabulary skills. Accuracy-disabled children were significantly inferior to the rate-disabled and fluent normal peers in their ability to analyze and contrast word meanings (Verbal Opposites Accuracy: AD $\bar{X}$ of S.S. = 6.4, RD $\bar{X}$ of S.S. = 8.9, FN $\bar{X}$ of S.S. = 11.3). The sample means and standard deviations on the above measures are presented in Table 4.

Morphology and Syntax

The children’s knowledge of the language structure was assessed by the use of two standardized language tests which evaluated their ability to formulate and complete sentences with the application of the appropriate morphological and syntactic rules. The items included the use of regular and irregular rules with real words and simple and complex rules with nonsense items. The results of these tests are summarized in Table 5.
## Table 5

The Oral Language Skills of Accuracy-Disabled, Rate-Disabled and Fluent Normal Samples: Knowledge of Language Structure

<table>
<thead>
<tr>
<th></th>
<th>Accuracy-Disabled Mean (S.D.)</th>
<th>Rate-Disabled Mean (S.D.)</th>
<th>Fluent Normals Mean (S.D.)</th>
<th>Individual Comparisons&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grammatic Closure Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular Items (/12)</td>
<td>11.1 (0.7)</td>
<td>11.5 (0.9)</td>
<td>11.4 (2.5)</td>
<td>NS NS NS</td>
</tr>
<tr>
<td>Irregular Items (/21)</td>
<td>13.8 (3.5)</td>
<td>16.0 (3.8)</td>
<td>19.9 (1.4)</td>
<td>NS S NS</td>
</tr>
<tr>
<td>Total Score (/33)</td>
<td>24.9 (3.9)</td>
<td>26.8 (4.5)</td>
<td>31.8 (1.4)</td>
<td>NS S S</td>
</tr>
<tr>
<td><strong>Berry-Talbott Materials</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple Nonsense Items&lt;sup&gt;b&lt;/sup&gt; (/14)</td>
<td>11.1 (2.5)</td>
<td>12.4 (1.3)</td>
<td>13.3 (0.6)</td>
<td>NS S NS</td>
</tr>
<tr>
<td>Complex Nonsense Items&lt;sup&gt;b&lt;/sup&gt; (/30)</td>
<td>11.6 (4.2)</td>
<td>18.9 (2.9)</td>
<td>23.9 (1.9)</td>
<td>S S S</td>
</tr>
<tr>
<td>English Items (/11)</td>
<td>10.0 (1.8)</td>
<td>9.9 (0.9)</td>
<td>10.4 (0.6)</td>
<td>NS NS NS</td>
</tr>
<tr>
<td>Total Score (/51)</td>
<td>33.2 (6.4)</td>
<td>41.3 (3.9)</td>
<td>47.7 (2.6)</td>
<td>S S S</td>
</tr>
</tbody>
</table>

<sup>a</sup>NS = not significant  
S = significant at p < .01  
<sup>b</sup>Overlap of four trials are reflected in maximum score - i.e. trials on which either a simple rule application or a complex derivation from English constitute acceptable response.
No consistent differences were found on the regular items of the ITPA ($F(2,45) = 0.17$, $p < .84$), or the English items on the Berry-Talbott ($F(2,45) = 0.85$, $p < .43$). Performances were close to ceiling level on the regular items ($AD \bar{X} = 11.1$, $RD \bar{X} = 11.4$, $FN \bar{X} = 11.4$, maximum score = 12), and the English items ($AD \bar{X} = 10.0$, $RD \bar{X} = 9.9$, $FN \bar{X} = 10.4$, maximum score = 12). The irregular items of the ITPA did significantly distinguish the two reading disabled groups from their fluent normal peers ($F(2,45) = 16.50$, $p < .00001$), but no significant difference between the two groups was revealed. Analysis of the results on the simple nonsense items revealed a significant difference between the performances of the accuracy-disabled group ($AD \bar{X} = 11.1$) and that of their fluent normal peers ($FN \bar{X} = 13.3$). Thus the accuracy-disabled children were less able than their fluent normal peers to manipulate basic morphological rules on simple nonsense items in which the root word essentially remains intact with no phonological transformations required (e.g., gan -> gans). However there was no significant difference between the performance of the rate-disabled group ($RD \bar{X} = 12.4$) and the other two groups on this subtest. The accuracy-disabled group was significantly inferior to the other groups and the rate-disabled group was inferior to their fluent normal peers ($F(2,45) = 62.12$, $p < .00001$), in their manipulation of more complex nonsense items in which the modification of the phonological structure (e.g., lutz -> lutzes), or of the overall form of the word (for example, nuppy -> unnuppy).
The grammatic closure subtest of the ITPA served to identify the broad category of reading disabled children from their fluent normal peers but did not appear to detect the possible nature of the reading disability. From the analysis of the results it appears that the complex nonsense subtest and the total score of the Berry-Talbott did identify the individual groups, whereas the simple nonsense subtest only identified the accuracy-disabled group and not the rate-disabled group from their fluent normal peers.

**Auditory Memory**

Consistent differences between the accuracy-disabled group and their fluent normal peers were revealed when three aspects of children's auditory memory skills were assessed: auditory sequential memory ($F(2,45) = 11.97, p < .0001$), word span ($F(2,45) = 12.18, p < .0001$), and sentence imitation ($F(2,45) = 6.0411, p < .0047$). The results are outlined in Table 6.

The accuracy-disabled children were significantly inferior to their fluent normal peers in their ability to recall digits in the correct sequence when presented auditorially ($AD X = 31.5, FN X = 42.0$). This skill correlates highly with the ability to decode phonemes (Wepman & Morency, 1975). Thus it is not surprising to find that the accuracy disabled children who are disabled at the first criteria of word recognition also have poor auditory sequential span memories. Significant differences between the accuracy-disabled and
Table 6

The Oral Language Skills of Accuracy-Disabled, Rate-Disabled and Fluent Normal Samples:
Auditory Memory

<table>
<thead>
<tr>
<th></th>
<th>Accuracy-Disabled Mean (S.D.)</th>
<th>Rate-Disabled Mean (S.D.)</th>
<th>Fluent Normals Mean (S.D.)</th>
<th>Individual Comparisonsa AD &amp; RD AD &amp; FN RD &amp; FN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit Span Memory (s.d.)</td>
<td>31.5 (4.8)</td>
<td>37.4 (6.1)</td>
<td>42.0 (7.1)</td>
<td>NS S NS</td>
</tr>
<tr>
<td>Word Span (s.d.)</td>
<td>6.4 (2.3)</td>
<td>7.8 (2.2)</td>
<td>10.4 (2.4)</td>
<td>NS S NS</td>
</tr>
<tr>
<td>Sentence Imitation (s.d.)</td>
<td>8.5 (3.2)</td>
<td>10.3 (2.5)</td>
<td>12.0 (2.8)</td>
<td>NS S NS</td>
</tr>
</tbody>
</table>

aNS = not significant at p < .01
S = significant at p < .01
rate-disabled groups were revealed when the probability level was relaxed from 0.01 to 0.05. At this relaxed level of significance, it would appear that digit span memory is a good indicator of accuracy difficulties and differentiates this group from both the rate-disabled and fluent normal peers. However because of the large number of one-way analysis of variances used and the increased probability of a significant difference due to chance, the more conservative level of significance, that is, 0.01 has been adopted.

The two versions of the Word Span subtest (or the Auditory Attention for Unrelated Syllables, as it was previously called) of the DTLA were administered randomly to each subject after a suitable time interval. The DTLA has recently been revised and this particular subtest, although it remained part of the new test, has been revised and some test items eliminated and others added. For the purposes of replication the original version of DTLA was administered and the results have been compared to the results of the revised DTLA-2 in Table 7. Both reading disabled groups were significantly inferior to their fluent normal peers (AD $\bar{X} = 23.2$, RD $\bar{X} = 26.3$, FN $\bar{X} = 42.8$) in their immediate recall of the lists of unrelated words used in the DTLA. No significant differences were revealed with an individual comparison of the two reading groups. However the pattern of results revealed are slightly different with the revised subtest and new scoring procedure of the DTLA-2. The accuracy-disabled group was still inferior to the fluent normal group but the rate-disabled group did not differ significantly to their fluent normal peers.
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (S.D.)</td>
<td>23.2 (5.9)</td>
<td>6.4 (2.3)</td>
<td>8.5 (3.2)</td>
<td>30.8 (10.7)</td>
<td>6.4 (1.4)</td>
<td>1.518 (0.386)</td>
<td>1.662 (0.443)</td>
</tr>
<tr>
<td>Rate Disab.</td>
<td>26.3 (7.6)</td>
<td>7.8 (2.2)</td>
<td>10.3 (2.5)</td>
<td>35.9 (9.9)</td>
<td>8.9 (2.2)</td>
<td>2.343 (0.744)</td>
<td>2.492 (0.705)</td>
</tr>
<tr>
<td>Flu. Norm.</td>
<td>42.8 (10.7)</td>
<td>10.4 (2.4)</td>
<td>12.0 (2.8)</td>
<td>44.7 (7.6)</td>
<td>11.3 (2.7)</td>
<td>1.210 (0.352)</td>
<td>1.292 (0.393)</td>
</tr>
<tr>
<td>Individual Comparison</td>
<td>AD &amp; RD AD &amp; FN RD RN FN</td>
<td>AD &amp; RD AD &amp; FN RD RN FN</td>
<td>AD &amp; RD AD &amp; FN RD RN FN</td>
<td>AD &amp; RD AD &amp; FN RD RN FN</td>
<td>AD &amp; RD AD &amp; FN RD RN FN</td>
<td>AD &amp; RD AD &amp; FN RD RN FN</td>
<td>AD &amp; RD AD &amp; FN RD RN FN</td>
</tr>
<tr>
<td>S. D.</td>
<td>S</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

**Table 7**

Comparisons of Results on DTLA and DTLA-2 with Accuracy Disables, Rate Disables and Fluent Normal Samples on the Appropriate Memory Subtests and on the Associative Naming Subtests.
Table 7 (continued)

\[^a\text{NS = not significant at } p < .01\]
\[^S\text{ = significant at } p < .01\]

\[^b\text{Revised DTLA-2 contains same subtest items but with some item deletions and changed item presentation - revised norms.}\]
A third aspect of auditory memory was also investigated. This task required the subject to repeat accurately an auditorially presented sentence. This is not a task that relies solely on auditory memory skills but one that involves an intricate interplay of auditory memory, semantics and syntax. Despite the involvement of language components, the rate-disabled group did not significantly differ from either the accuracy-disabled group or their fluent normal peers (AD $\bar{X}$ = 8.5, RD $\bar{X}$ = 10.3, FN $\bar{X}$ = 12.0). However the accuracy-disabled children were inferior to the fluent normal readers in their ability to recall auditorially presented related words.

Overall the accuracy-disabled children were inferior to their fluent normal peers in their immediate recall of related and unrelated words and in the immediate sequential recall of digits. This suggests that the accuracy-disabled children may have an underlying auditory memory problem that could influence in part their negative ability to decode written information accurately.
CHAPTER 4
Discussion

Introduction

Following Lovett's (1984c) recommendation of replication of her study with similarly defined and compared samples of the three reading groups involved, the present study has attempted to replicate as closely as possible the second section of her research concerning the oral language characteristics of the two reading disabled groups compared with a group of fluent normal peers. The criteria of speed and accuracy were the measures of performance used to identify the three groups.

Oral Language Characteristics of Accuracy-Disabled Readers

Analysis of the present data revealed that relative to their fluent normal peers, the accuracy-disabled subjects appeared to be handicapped by a general language impairment. This was evident on several different dimensions of oral language development such as lexical functions, morphology and syntax, and auditory memory skills. When the measures of lexical function investigated were compared to those results obtained by their fluent normal peers, the accuracy-disabled group were impaired in the overall range of words with which they were familiar and with their ability to analyze and contrast word meanings. In her study, Lovett (1984c) found that visual
confrontation naming times and serial naming times were equally slow, relative to the normal group, for the two disabled reading groups. She found that the accuracy-disabled children were significantly slower than the rate-disabled children in their naming of serial letter arrays only. However the results obtained in this study were somewhat different. Like the results in Lovett's study, the accuracy-disabled group and the rate-disabled group were found to be significantly slower than their fluent normal peers in visual confrontation naming. However, unlike in Lovett's study, but the accuracy-disabled children were significantly slower than their rate-disabled peers with visual confrontation naming. No significant differences were found in the speed of serial naming times for colours, numbers and objects for all three groups. With serial letter naming both reading disabled groups were equally slow relative to their fluent normal peers. Unlike Lovett's (1984c) accuracy-disabled group, the accuracy-disabled children in this study were found to be significantly inferior to their fluent normal peers in terms of the accuracy of response to the visual confrontation naming tasks.

The language systems of the accuracy-disabled group were impoverished relative to their rate-disabled and fluent normal peers in their manipulation of the morphological and syntactic rules investigated in the grammatic closure subtest of the ITPA and the Berry-Talbott Language Test. The results of the accuracy-disabled group compared to their fluent normal peers in this study were similar
in most sections to those found by Lovett (1984c). The accuracy-disabled children were significantly inferior to their fluent normal peers in their ability to manipulate those items that required the application of a less predictable or irregular rule, for example, steal -> stole, sheep -> sheep. However, unlike the results of Lovett's (1984c) study, there was no significant difference in the three groups' ability to manipulate items that required highly regular or predictable rules such as dog -> dogs, plant -> planted. Both reading disabled groups were at a comparable disadvantage to their fluent normal peers when the task required the application of basic morphological rules to pseudoword materials that were deemed simple in content, that is, the task required the addition of a single terminal phoneme, for example, dow -> dows. Similar to the results found in Lovett's (1984c) study, the accuracy-disabled children were less able than their fluent normal peers to manipulate pseudoword material when the phonological manipulations were complex, that is, they required the addition of a terminal syllable (for example, fooz -> foozes), a formation of a compound word (for example, nadhouse), or an internal vowel shift (for example, ling -> lang). On the overall total scores of the grammatical closure subtest of the ITPA and the Berry-Talbott Language Test, the accuracy-disabled group was significantly inferior to their fluent normal peers. If the accuracy-disabled group defined in the present study and in Lovett's (1984c) study is considered similar to those reported in the literature as dyslexic or severely
learning-disabled as Lovett maintains, then the results of this study in terms of morphology and syntax, support the findings of other researchers such as Wiig et al. (1973), Vogel (1975, 1977), Hook (1976), Wiig and Semel (1976) and Dixon (1982).

Lovett (1984c) found no significant differences across the three groups in their auditory memory abilities. As Lovett pointed out, this result appeared contrary to other research findings which suggested a number of auditory memory processes that were impaired in different samples of disabled and underachieving readers when compared to normally developing readers (Bauer, 1979; Conners et al., 1969; Hennebert, 1964; Katz & Ilmer, 1972; Lesgold & Perfetti, 1978; Siegel & Linder, 1984; Torgensen & Goldman, 1977; Wiig & Roach, 1975). Some of the problems involved in interpreting such findings occur in the fact that many of these studies utilize very different tasks to investigate the general concept of auditory memory, different populations have been investigated in each study, and developmental trends have also been noted but often were not controlled for. For example, Siegel and Lidner (1984) found that the performance of their older learning-disabled readers despite evidence of phonological code usage, seemed to indicate a general short term memory deficit, whereas their younger learning-disabled readers appeared impaired at the phonological coding stage. A review of the literature by Doehring et al. (1981) concluded that there is no unambiguous evidence that implicates auditory memory problems and reading disabilities.
In the present study, three aspects of auditory memory skills were investigated: that of auditory rote recall or auditory word span, sentence imitation and digit span memory. Although sentence imitation is no longer considered purely an auditory memory task (Hammill, 1985) in that it also involves the interaction of semantics and syntax, it is a task widely used within the school setting and within formal language tests to assess auditory memory. Results in the present study conflicted with the findings of Lovett (1984c). Relative to their fluent peers' performances, the accuracy-disabled readers were significantly impaired in their auditory recall of unrelated words. For purposes of replication auditory rote recall was investigated using the Auditory Attention for Unrelated Syllables subtest of the DTLA. Since the DTLA has been recently revised, auditory rote recall was also examined using the word span subtest of the DTLA-2, which, although similar in format, replaced the original subtest. A slightly different trend of results occurred. Using the original edition both reading disabled groups performed comparably and were significantly impaired in comparison to their fluent normal peers. However on the revised edition only the accuracy-disabled readers were significantly impaired. No significant differences were noted between the rate-disabled and accuracy-disabled readers or between the rate-disabled and fluent normal readers.

The development of auditory sequential memory, including auditory word span and digit span memory, peaks at around 6 to 7 years of age.
(Wepman & Morency, 1975), when the introduction of phonics in the regular school system occurs. Thus, it may be possible to predict that those children who are identified as having poor auditory sequential memory spans are children who are possibly at risk when learning phonics.

Sentence imitation was investigated on both the original DTLA and the revised DTLA-2. The same trend of results was noted on both editions, that is, the accuracy-disabled group was significantly impaired relative to their fluent normal peers. Digit span memory also revealed that the accuracy-disabled readers were significantly impaired relative to their fluent normal group. Overall this study offers support to the notion that the accuracy-disabled children are handicapped by an auditory memory impairment as measured by auditory word span, digit span memory and sentence imitation, relative to the normal sample.

**Oral Language Characteristics of Rate-Disabled Readers**

The rate-disabled readers encountered specific difficulties with the speed with which they could access and provide names for single visual arrays. In Lovett's (1984c) study the rate-disabled group also had similar difficulties. However, unlike this researcher, Lovett found no comparable difference in speed with single visual array items between the two reading disabled groups. In this study the rate-disabled readers were significantly slower than the accuracy-disabled
group and both groups were significantly slower than their fluent normal peers. When the tasks involved accessing and providing names for multiple visual arrays such as those used in the R.A.N. test which Denckla and Rudel (1976) maintained provided a partial simulation of the naming aspect of connected reading with the removal of orthographic, syntactic and semantic information, the rate-disabled group was found to be significantly slower than their fluent normal peers only on the letter naming subtest. Although the accuracy-disabled group was also significantly slower than their fluent normal peers on this subtest a comparable performance in terms of speed existed between the two reading disabled groups. These were not the results expected based on research by Lovett (1984a, b, c) and Denckla & Rudel (1976). With the letter naming subtest Lovett found the accuracy-disabled group was significantly slower than the rate-disabled groups and that both groups were significantly slower than their fluent normal peers. Lovett (1984c) also found that both reading disabled groups were comparable in the speed with which they could access and name colours, numbers and objects and that both were significantly slower than their fluent normal peers. No pairs of groups were found to be significantly different on the recall and naming of colours, numbers and objects in the present study.

In comparison to their fluent normal peers, the rate-disabled readers in the present study were significantly impaired in the overall range of vocabulary with which they were familiar. Lovett
(1984c) found no significant difference between these two groups on this measure. It should be mentioned that the new revised edition of PPVT was used in the present study while the original edition of PPVT was used in Lovett's study. Although the test format remained unchanged, some test items were altered and new norms were devised. Since the original PPVT was no longer considered reliable and was unavailable in the school district, the PPVT-R was administered instead. As the number of subjects in each group is relatively small, and different trends were observed to those noted in Lovett's study, the need for further investigation with the PPVT-R is evident.

Rate-disabled readers were also significantly impaired in terms of the speed with which they were able to analyze and contrast word meanings. In this study two measures of associative naming or verbal opposites were used. The associative naming subtest of DTLA was used to assess the children's ability to analyze and contrast word meanings in both Lovett's (1984c) study and the present study. However during the process of the present study a new revised test called the DTLA-2 became available. Some of the original test items were omitted in the revised edition but overall the author claimed that the subtest remained relatively unchanged. Although a new name, Verbal Opposites, was given the subtest remained relatively unchanged. New norms and standardized scores were also provided. The author of the present study decided to score the results using the old scoring system of the original DTLA for purposes of study replication and compare these
results with the new scoring system on the DTLA-2. In terms of the speed with which the rate-disabled group were able to analyze and contrast word meanings, the same trend of results occurred. The rate-disabled group was significantly slower than the other two groups. No significant difference between the accuracy-disabled and fluent normal groups was obtained. These results do not support Lovett's findings in terms of the rate-disabled group. She found no significant differences in speed for any of the three groups. Wiig and Semel (1975) found that learning-disabled children took a significantly longer time to respond on the associative naming subtest of the DTLA, than their normal achieving peers. In Wiig and Semel's study no distinction is made amongst the learning-disabled children as to the type of reading problem, that is, whether it is a rate-disabled or accuracy-disabled reading difficulty. However it would appear that if the data for the two reading groups was collapsed into one, a significant difference between the reading disabled group and the fluent normal group would still occur. Thus it would appear overall that the findings of this study support those of Wiig and Semel (1975) rather than those of Lovett (1984c) in terms of the speed with which subjects were able to analyze and contrast word meanings. Further investigation with larger sample sizes and the distinction of the types of reading groups is needed in order to make a judgement as to whether this aspect of speed is a significant characteristic of rate-disabled readers.
In Lovett's (1984c) study the rate-disabled readers did not significantly differ from their fluent normal peers in any aspect of morphology or syntax investigated by the grammatic closure subtest of the ITPA or the Berry-Talbott Language Tests. In the present study, the rate-disabled and fluent normal readers were significantly different on both overall test scores. Specifically, the irregular items on the grammatic closure subtest of the ITPA and the complex nonsense items of the Berry-Talbott were the items within the tests which served to distinguish between the performances of the rate-disabled and fluent normal groups. Unlike Lovett's findings, the accuracy-disabled and rate-disabled readers demonstrated no comparable differences on the scores obtained on the irregular items on the grammatic closure subtest and ultimately the total test score obtained on the ITPA. However like Lovett's findings with the complex nonsense items, the scores between the rate-disabled and accuracy-disabled group were significantly different, with the accuracy-disabled group more impaired than the rate-disabled group in their ability to manipulate and apply complex morphological and syntactic rules. In contrast to Lovett's findings both reading groups were significantly impaired in comparison to the performance of their fluent normal peers. From the findings of this study it appears that the rate-disabled readers have some specific difficulties with the application of irregular and complex morphological and syntactic rules and vocabulary knowledge.
Lovett (1984c) contended that since the rate-disabled sample's speed disadvantage was specific to the rapid labelling of a visual symbol or picture and was not evident on auditory responsive naming measures, then the rate disability could not be attributed to a general word retrieval or lexical access deficit. Thus it appeared to be more specific to language in its visible form. However these observations were not supported by the results of the present study. In this study, the rate-disabled sample demonstrated a speed disadvantage with the presentation of single visual arrays, and letter naming only on multiple visual arrays. But this speed disadvantage was also evident on auditory confrontation and associative naming tasks. The speed disadvantage on associative naming tasks was also found by Wiig and Semel (1975). This indicates that the concept of a general word retrieval or lexical access deficit attributed to the rate disability based on the results of the present study can not be negated. Since the present study involved only half the number of subjects involved in Lovett's study and such opposite results were obtained, further investigation is necessary in an attempt to understand the nature of the rate-disabled reader's difficulties.

**Oral Language Characteristics and Deficient Reading**

With the oral language measures investigated in this study there appears to be three measures pervasively associated with deficient reading skill regardless of whether the reading disability is defined
as an accuracy or rate deficit. The three oral language measures were oral vocabulary, irregular morphological and syntactic rules, and the speed of letter naming. These results are in contrast to those of Lovett's (1984c). Her data suggested that both reading disabled groups demonstrated a naming speed disadvantage specific to a rapid naming of a visual symbol or picture. In this study however, the two samples of disabled readers experienced a naming speed disadvantage specific to letter naming only. These findings appear to offer some support to the concept that reading disabled children, regardless of the type of deficit, suffer from some type of reading speed disadvantage. Further investigation is necessary to unravel the type and extent of this suspected reading speed disadvantage.

Oral vocabulary as measured on the PPVT-R, was another oral language measure investigated that appears to be associated with deficient reading skills. The results of this study are in contrast to those of Wiig et al. (1973), Wiig and Semel (1973) and Snyder (1984). These researchers found that there was no difference between scores obtained by learning-disabled subjects and those obtained by normally developing children. Lovett (1984c) obtained slightly different results in that she found that the accuracy-disabled children were significantly different from the rate-disabled and fluent normal children. However if the mean scores obtained by both groups of reading disabled children were collapsed and compared to their fluent normal peers, no significant difference would have been
revealed. A difficulty with Lovett's results is that in order to obtain a significant difference between the accuracy-disabled group and the other two groups Lovett has used two lower levels of significance ($p < .05$ and $p < .06$). Whereas other significant differences tend to have been reported at higher levels of significance (for example, $p < .01$ and $p < .001$). In the present study both reading groups were at a comparable significant disadvantage to their fluent normal readers. One of the differences between this present study and the previous research reported occurs in the fact that the revised edition of PPVT (or the PPVT-R) was used whereas the original PPVT was used in previous research studies reported. In order to determine if this difference is significant and would alter the trend of results, a comparison study between the two versions of the test needs to be undertaken. Lovett's findings also demonstrated the need to subtype further and define the broad categories of "learning-disabled" and "reading disabled" used in the literature.

Another area that appeared to be pervasively associated with deficient reading was the application of irregular morphological and syntactic rules as examined on the grammatic closure subtest of the ITPA. Lovett (1984c) however, found a significant difference between the accuracy-disabled readers and the other two groups on both the regular and irregular items. Although different, the findings of these two studies seem to offer support that at least some of the
reading disabled children have difficulties applying irregular morphological and syntactical rules. Since the number of morphological and syntactic rules investigated by the ITPA is relatively small and thus does not allow for individual analysis of difficulties, then further investigation with more in-depth testing needs to be undertaken with the two broad subtypes of reading disabilities defined by Lovett, in order to obtain clearer insights into the nature of morphological and syntactical difficulties encountered.
CHAPTER 5

Summary and Conclusions

Purpose of the Study

This study has attempted to replicate the second section of Lovett's (1984c) research concerning the oral language characteristics of two groups of reading disabled children compared to a group of their peers with fluent normal reading skills. These three groups were selected to represent three very different levels of reading ability based on Ehri and Wilce's (1979, 1983) postulated three successive phases involved in the word recognition process. Thus the constraints of accuracy and speed were used as measures of performance criteria.

Subject Selection

The three groups, unlike in Lovett's (1984c) study, were all drawn from a local school district. There were 16 subjects between the ages of 8 and 12 years of age, in each of the three groups. Each subject was initially screened for subject suitability using an abbreviated screening battery.

The first group of reading disabled children included those who had failed to achieve age-appropriate performance with decoding accuracy and were thus disabled at the first phase of reading acquisition as defined by Ehri and Wilce (1979, 1983). Thus to be
classified as accuracy-disabled the subject had to score at least 1.5 years below age-grade expectations on two out of three standardized reading tests that measured decoding accuracy at the single word level. The second group of reading disabled children were those who had achieved age-appropriate decoding accuracy skills but who were delayed at age-appropriate reading speeds. Lovett (1984c) contended that this group constituted a newly identified subtype of reading disabled children. Similarly to be classified as rate-disabled the subject has to score at least 1.5 years below age-grade expectations on two out of three standards reading rate measures and close to, at or above age-grade expectations on two out of three of the accuracy decoding tests. The third group consisted of normally achieving readers, that is, they demonstrated developmentally appropriate levels of word recognition accuracy and reading speed. Attempts were made to match all three groups in terms of age, age-grade placement and sex ratio. The fluent normal sample had to score at or above age-grade expectations on two reading accuracy tests and one rate test. Because it was not possible for the researcher to administer standardized IQ measures to the subjects involved, attempts were made to control for intelligence by using the available IQ scores administered by the School Board psychologists in order to ascertain that all reading disabled subjects fell within the average range of intelligence as measured by the standardized test. Since the fluent normal subjects had not been given standardized IQ tests, classroom teachers were
asked to propose subjects who were considered to be average students. The PPVT-R was also administered as part of the screening procedure and to be considered as a candidate the subject had to score between 3 and 7 on the stanine measure.

Measures of Language Performance

Once the subjects were selected three areas of oral language were investigated: lexical functions, morphology and syntax, and auditory memory. The oral language measures were examined on the appropriate subtests of the following standardized language tests: the ITPA, the DTLA, the R.A.N. test, the Boston Diagnostic Aphasia Examination, PPVT-R and the Berry-Talbott Language Test. The performance data was then analyzed in a series of one-way analyses of variance according to the oral language development assessed and with reader group (accuracy-disabled, rate-disabled, fluent normal) a factor under which subjects were examined.

Results and Conclusions

Overall the analysis of the present data revealed that the accuracy-disabled readers appeared to be handicapped by a general language impairment that was evident on several different dimensions of oral language development relative to the normal sample. In terms of the lexical functions investigated, the accuracy-disabled group was impaired in the overall ability to analyze and contrast word meanings,
and unlike subjects in Lovett's (1984c) study, impaired in terms of their ability to respond accurately to visual confrontation naming tasks. They were also impoverished in their ability to manipulate morphological and syntactic rules with simple and complex nonsense items and irregular items. Three aspects of auditory memory were also investigated: auditory word span, digit span memory, and sentence imitation. Relative to their fluent normal peers only (not to rate-disabled readers), the accuracy-disabled group was significantly impaired on all three measures. Lovett investigated auditory word span only and found no significant difference between the groups.

The rate-disabled group demonstrated a speed disadvantage in terms of the time taken to access and provide names for single visual arrays. When multiple visual array tasks were given, the rate-disabled group had significantly impaired speed-to-letter naming only. This was in contrast to Lovett's (1984c) findings with multiple visual array in which the rate-disabled sample had difficulties also with speed of colour, object and number naming. The oral language component concomitant to this particular pattern of reading dysfunction was demonstrated with impaired vocabulary knowledge and the reduced ability morphological and syntactic rules with irregular items and complex nonsense items.

Three oral language measures -- oral vocabulary, the speed of letter naming, and the application of irregular morphological and syntactic rules, appeared to be pervasively associated with deficient
reading skills regardless of the type of reading disability. Lovett, however, found that an overall speed disadvantage with all aspects of single and multiple visual arrays was pervasively associated with deficient reading. Since Lovett's findings were only replicated in this present study with the speed disadvantage of letter naming, further investigation into what oral language measures are pervasively associated with deficient reading, is needed.

**Suggestions for Further Research**

Despite the small sample size and the somewhat differing results to those found by Lovett (1984c), the results of the present study clearly offer support for Lovett's conceptual departure from a unidimensional definition of reading dysfunction, to the conceptualization of reading disorders on a continuum with normal reading acquisition. Further investigation into the complex area of oral language needs to be undertaken with each kind of reading disabled group.

The rate-disabled group in the present study, was able to manipulate accurately the early morphological and syntactic structures investigated. However in both this study and Lovett's study, the rate-disabled group had difficulties with more complex nonsense items. This particular finding raises questions as to the ability of this group to manipulate the more advanced and later acquired syntactic forms, for example, passives, sentences with embedded phrases and
clauses, and question formats. Thus further investigation into these more advanced structures which are prevalent in the educational curriculum, is needed.

Because both Lovett's and the present study find at least one of the reading disabled groups to appear impaired in their ability to manipulate oral vocabulary, further research needs to be undertaken with oral vocabulary beyond the single word level. Other aspects of semantics such as synonyms, single and multiple word meanings, semantic absurdities, categorization and classification skills also need to be explored with both groups. Since the findings of this study are different from Lovett's in terms of auditory memory skills (and two additional areas were examined in this study), these findings await further replication and exploration with similarly defined groups.

**Educational Implications**

The results of Lovett's (1984c) and the present study indicate that reading disabled children do have some oral language deficits. These results have important educational implications. Materials presented to children first learning to read have been developed to contain subjects that are familiar to the children's backgrounds, lifestyles and cognitive abilities. It is presupposed by the complexity of the written language used in such materials that these children have already mastered the comprehension and use of such
language constructs within the oral framework. This will pose serious difficulties for those children who have not mastered such skills in listening comprehension and/or verbal language abilities.

It is the responsibility and goal of the educational system to provide appropriate teaching strategies for the development of skilled reading in all children. Thus it is necessary for the teacher and program developer to be aware of and take into consideration the deficiencies in oral language of the reading disabled population in order to develop efficient and effective reading programs. Lovett's (1984c) and the present study, found that there are some oral language measures that are pervasively associated with deficient reading skills. These oral language measures could be utilized to form the basis of a screening test to be administered to the pre-reader. The screening test could be used to assist in the identification of those children who because of their oral language difficulties, may be "at risk" for developing a reading disability. Strategies for developing these deficient oral language skills could then be incorporated into a reading readiness program or into the general kindergarten curriculum; for example, it was found in this study that oral vocabulary was one of the oral language measures pervasively associated with deficient reading. Programs could be developed to expose the "at risk" child to a wide range of vocabulary and other language experiences that would enhance the development and comprehension of the appropriate vocabulary.
The findings of this study also demonstrated that not all reading disabled children have the same profile of oral language difficulties. Two distinct subtypes, accuracy-disabled and rate-disabled readers, were identified. This has further educational implications in that programs developed for one type of reading disability may not be as effective and efficient tools for another type of reading disability. Programs need to be developed that will take into consideration the different profiles of oral language difficulties found in the two broad subtypes identified; for example, in this study it was found that only the accuracy-disabled readers demonstrated poor auditory memory skills. These skills play a vital role in the development of reading via a phonics approach. Thus a program that enhanced that development of such skills in the pre-reader or younger reader, or one that taught compensatory behaviours for the older reader, would be important and effective for the accuracy-disabled reader. Such a program would be ineffective for the rate-disabled reader who had no such difficulties.

The results in this study indicate a continuing need for further exploration as to the precise oral language characteristics of these newly defined types of reading disabled children and their fluent normal controls and specification of a framework within which to describe their development. Such findings have strong educational implications in terms of the development of appropriate remedial intervention programs and possible preventive programs for the reading disabled population.
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