A COMPARISON OF GOOD AND POOR READERS' ABILITY TO UTILIZE CONTEXTUAL INFORMATION WHILE READING

CHARLOTTE ST. CLAIR STRONG

A COMPARISON OF GOOD AND POOR READERS' ABILITY TO UTILIZE CONTEXTUAL INFORMATION WHILE READING

A Thesis

Submitted to

The School of Graduate Studies

Memorial University of Newfoundland

In Partial Fulfillment

of the Requirements for the Degree of

Master of Education

by

Charlotte Strong, B.A.

ABSTRACT

This investigation set out to discover whether good and poor reading comprehenders utilize semantic and syntactic information to facilitate word recognition. Current reading theories range from "bottom-up" models, in which precise word identification is a prerequisite to accurate comprehension, to "top-down" psycholinguistic models, in which identification of each letter or even each word is not only unnecessary for comprehension to take place, but also acts to impede reading fluency. Prediction of upcoming material, grounded in an implicit knowledge of grammatical constraints and the redundancy of the English language is an essential component of psycholinguistic theory. No consensus has yet been reached on the respective importance of visual and contextual information to proficient reading.

In this investigation, sixty grade four subjects from ten schools were selected on the basis of their grade equivalent scores on the Gates-MacGinitie reading test, so that they were all average in word recognition ability, but either high or low in comprehension. The subjects were asked to orally read a set of forty-five sentences selected from the third, fourth, and fifth grade Evaluation Manuals of the Nelson Reading Program. Two forms of each sentence were presented to the subjects: a) as it appeared in the story, and b) altered semantically, or semantically and syntactically simultaneously, the verb having been replaced by another verb which changed the meaning of the sentence only, with an alternate type of verb, or with another

part of speech.

If proficient reading could be characterized by minimal attention to visual information and a strong reliance on contextual cues, good comprehenders could have been expected to overlook the deliberately inserted anomalies, substituting words which would be acceptable semantically and syntactically. However, the results showed that the investigative technique did not differentiate good and poor readers on any measure of dependence on contextual information. Level of difficulty of the material had the effect of reducing the semantic and syntactic acceptability of substitution errors, as expected, but graphemic and phonemic similarity scores did not increase correspondingly. The low comprehenders made slightly fewer unacceptable errors than those which were semantically and syntactically acceptable in the sentence. High comprehenders, however, corrected more than twice as many unacceptable errors as those which were acceptable, even when the correction resulted in an accurate rendering of a violated sentence, which was, by its nature, anomalous. This finding was taken to indicate that good comprehenders were better able to utilize visual information than poor comprehenders, as the contextual information was unsupportive of the correction.

The failure of the instrument to differentiate good and poor readers raised serious questions concerning the validity and reliability of the error detection paradigm, and of oral reading error analysis. For this reason, case studies were undertaken of four subjects, two scoring at each end of the

range of comprehension scores. Observations arising from the case studies showed good readers to be more reliant on contextual information than poor readers. Both reader types displayed an awareness of the contravention of linguistic rules, by making significant pauses before or after a target word, in the case of the good readers, or by saying the altered word more slowly than others in the sentence, in the case of the poor readers. Only the high comprehenders repeated portions of the sentence in order to resolve the anomaly, and the length of their pauses suggested that even when they did not repeat the context aloud, they were reviewing it silently.

In summary, results of the error analysis showed good readers to be better users of visual information than poor readers, and observations arising from the case studies showed them to be better users of contextual information. Both groups displayed an awareness of the inserted anomalous words, but the unrelated sentences did not provide sufficient context to enable them to demonstrate their ability to utilize contextual information to facilitate word recognition. The findings led to two main suggestions: a) that "the disruptive effect" not be used in further research, and b) that educational programs and methods should stress the development of both bottom-up and top-down abilities.

ACKNOWLEDGEMENTS

I would like to express profound gratitude to the members of my supervisory committee, Dr. Marc Glassman and Professor Jeffrey Bulcock. Their guidance, suggestions, and support greatly facilitated the completion of this work.

I would like to thank my mother, Katherine Strong, whose interest and many hours of child care were very much appreciated.

I would like to thank my children, Peter and Ian, for their patience and understanding.

Finally, I would like to express my heartfelt appreciation to my husband, Earle McCurdy, whose assistance, tolerance, sacrifice, and sense of humour made this thesis possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF CHARTS

Chapter 1

THE PROBLEM

Background of the Study

The issue of whether reading activity is governed primarily by visual or cognitive cueing strategies has its roots in a philosophical debate dating at least from the eighteenth century.

> In the past history of psychology, almost as far back as the beginnings of modern philosophy, there has been much controversy as to whether the immediate datum of sense or some more general factor of mind plays the greater part in determining the nature of conscious processes...The two views are the psychological echo of the old philosophical war cries of "innate ideas" and "the mind a tabula rasa": a legacy of Hume's impressionism and the Kantian a priori.
> (Pillsbury, 1897, 315)

Current reading theories may be thought of as being on a "top-down" - "bottom-up" continuum, the main point on which they differ being essentially the amount of active cognitive effort required of the reader to achieve comprehension. This was described by Wildman and Kling (1979)as:

> ...a continuous dimension...bounded on one end by the theories which assign to the reader a totally passive role; his senses merely piece together coded visual stimuli, one at a time and in left-to-right sequence, resulting in an abstract representation of words. These "words" are translated by reference to a mental lexicon and are then integrated to comprise a meaningful statement. On the other end of the active-passive spectrum are theories which envision the reader as essentially and implicitly a writer. That is, the reader continually generates hypotheses about what is being read; these are periodically confirmed or disconfirmed by a comparison to a sample of the visual array.

> Between these two extreme models the majority of reading theories can be arranged according to the extent of active reader involvement they require or allow. An important subset of the cognitive activities which comprise that involvement can be labeled generically as "anticipation." (130)

The theories at the active end of the range can be described as "hypothesis testing" or "analysis-by-synthesis" models. The term "analysis-by-synthesis" was used originally to describe a theory formulated to enable computers to identify cursive writing, and was subsequently applied to the field of speech perception by Halle and Stevens (1964).

According to this model, a context predisposes a subject to generate a set of general expectations about the material to be read. A preliminary scanning of the print allows the reader to extract distinctive features from which he constructs, or synthesizes, a possible form of the visual array of letters. This tentative hypothesis is checked against the visual features for a match: if success is achieved, the process continues.

The message being formulated is organized into a larger pattern, incorporating new information. The effectiveness of the constructive activity is thus affected by the reader's experience, linguistic skill, and cognitive abilities. Neisser (1967) suggests that without a proper strategy for selecting the order in which patterns are synthesized, the notion of analysis-by-synthesis would reduce to a crude form of trial and error. Hence, the role of linguistic structure can be seen to be essential to reading activity.

The reading model of Goodman (1976) is probably the most widely known of the recent theories, and is one which places heavy emphasis on the role of anticipation, minimizing the importance of decoding each word. Reading to Goodman (1976) is a "psycholinguistic guessing game", which he describes as:

> ...a selective process. It involves partial use of available minimal language cues selected from perceptual input on the basis of readers' expectations. As this partial information is processed, tentative decisions are made to be confirmed, rejected, or refined as reading progresses.
>
> ...Reading involves an interaction between thought and language. Efficient reading does not result from precise perception and identification of all elements, but from skill in selecting the fewest, most productive cues necessary to produce guesses which are right the first time. The ability to anticipate that which has not been seen, of course, is vital in reading...(498)

According to psycholinguistic theory, anticipation of the semantic and syntactic features of upcoming material is an integral function of most reading tasks, although it may not be necessary for successful comprehension to take place. Reading difficult, unusual, or unfamiliar text may require a slower one-word-at-a-time approach which would likely inhibit comprehension of more common reading matter where such a method would place too great a strain on the functions of memory.

No precise definition of prediction mechanisms has been attempted by psycholinguistic researchers, but Wildman and Kling (1976) have described three types of anticipation which appear to operate below the reader's level of awareness. Semantic anticipation refers to the reader's processing of semantic

information to predict underlying ideas of upcoming words, and syntactic anticipation refers to his ability to rely on his awareness of the syntactic structure of the language to predict the grammatical categories of upcoming words. Spatial anticipation refers to the reader's use of peripheral vision to determine the shape and length of upcoming words and to note the placement of empty spaces. This information may guide him to fixate upon words providing significant clues.

The idea that reading activity is conceptually directed is not new. Pillsbury's (1897) tachistoscopic experiments, conducted nearly a century ago, found that adult subjects often overlooked letter substitutions, omissions, and mutilations, and their responses were often affected by the meaning of a word read aloud prior to the exposure of the target.

More recently, the importance of the reader's cognitive input was demonstrated in a study by Goodman (1965) in which children who had difficulty decoding words in isolation dealt successfully with those same words in a running context.

Kolers (1970) found that seventy-five percent of the time when errors were made reading nouns, verbs, and prepositions, other nouns, verbs, and prepositions respectively were substituted, and eighty-eight percent of the errors were semantically and syntactically acceptable.

> Subjects appeared not to be reading words as such,...but words in terms of their grammatical relations to other words. (106)

A seminal and widely cited study by Weber (1970) found that for both good and poor readers, ninety-one percent of first

graders' oral reading errors were grammatically acceptable in terms of the preceding context.

MacKinnon (1959) found children overlooked errors that made little or no difference to the grammatical structure or acceptability of a sentence.

Wildman and Kling (1976) concluded from their examination of the evidence that readers use anticipation when it is strategic to do so, and when they do, they order their expectations according to their knowledge of (a) the rules of grammar, (b) the experimental situation, and (c) the relative frequencies of syntactical sequences.

Gibson (1975) does not discount the viability of the analysis-by-synthesis model, but raises the following questions:

> 1. What units is the reader predicting, letters, words, phrases, sentences, or the general plot or meaning?
> 2. What informs the reader where to focus attention?
> 3. What constitutes confirmation? What happens if he finds he has guessed wrong? (451-452)

McConkie and Rayner (1976), who have done innovative research in the area of eye movements and the role of peripheral vision in reading by using an on-line computer technique, also cast doubt upon the tenability of the extreme top-down position. Their research shows that a reader does not make a distinction between words and non-words further than four to six character positions to the right of a fixation point. They argue that:

> ...as hypotheses of syntactic form do not lead to predictions of specific words to be encountered, it is difficult to see how it could account for the semantic and syntactic appropriateness of misreadings. The words emitted must be selected on some other basis than the hypothesis itself, if the hypothesis

> is not assumed to be an anticipation of words to be encountered. Thus the model resorts to direct perception of visual features to select words, and analysis-by-synthesis becomes a theory permitting words to be identified with fewer visual cues...The analysis-by-synthesis position assumes making hypotheses is faster than visual processing, that the reader anticipates actual words. But prose is not sufficiently redundant; "next word guesses" are wrong more often than not. (157)

To some extent, what is at issue is the time required to generate a hypothesis. That is, can a skilled reader recognize most words on the basis of visual information more quickly than he could generate and test a hypothesis? If he can, does he, in fact, generate hypotheses or utilize a prediction mechanism at all?

Rationale for the Study

This study investigated the interaction of readers' comprehension ability and their strategic use of semantic and syntactic cues to facilitate word recognition.

The role of anticipation in reading was tested in a study by Isakson and Miller (1976) employing the "disruptive effect," which they define as:

> ...the degree to which the probability of an occurrence of oral reading errors is increased by the inclusion of an unknown or confusing word or structured element in written context. (788)

Twelve sentence trios were constructed so that the verbs remained unaltered, were violated semantically, or were violated semantically and syntactically. For example:

Normal: The old farmer planted the bean seeds in the rich, brown soil.

Semantic Violation: The old farmer paid the bean seeds in the rich, brown soil.

Syntactic and Semantic Violation: The old farmer went the bean seeds in the rich, brown soil.

Using scores from the Iowa Test of Basic Skills, the investigators selected subjects who were average on word recognition, but high or low in comprehension.

The investigators found that the errors of the poor comprehenders were not affected by the nature of the sentence, whereas good comprehenders made few errors on normal sentences, more errors on those which has been violated semantically, and more again on the semantically and syntactically violated sentences. Isakson and Miller (1976) concluded that poor readers process only one word at a time, fail to integrate word meanings, and are not sensitive to semantic and syntactic constraints.

These findings are contradicted by the results of studies which show that poor readers are equally aware of linguistic features of the reading material (Allington and Fleming, 1978; Allington and Strange, 1968b; Cioffi, 1982; Hutson, Cowger, and Wallbrown, 1980; Merrill, Sperber, and McCauley, 1980; Schvaneveldt, Ackerman, Semlear, 1977; Schwartz and Stanovich, 1981; and, Weber, 1970), and those which show that poor readers' deficiency in decoding skills forces them to rely on contextual information to facilitate reading (Allington, 1978; Allington and Fleming, 1978; Allington and Strange, 1977; Biemiller, 1970; Schvaneveldt, Ackerman, and Semlear, 1977; and, Stanovich, West, and Feeman, 1981).

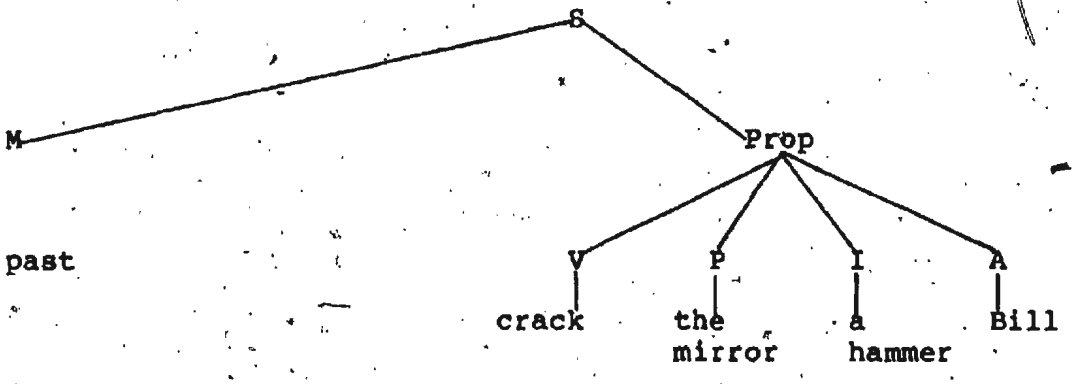
This study will attempt to shed further light on the issue of whether semantic and syntactic anticipation is a

feature of both good and poor reader behavior.

Significance of the Study

If anticipation can be shown to be a feature of skilled reading behavior, and if knowledge of grammar is fundamental to the ability to anticipate, then reading instruction ought to reflect these ideas.

Sentence complexity, in recent years described in terms of the number and type of elements in the deep structure of a sentence, appears to play a role in processing. The concepts of deep structure and surface structure have come into prominence with the widespread acceptance of Chomsky's linguistic theory (1957, 1965). A tree diagram can be constructed for each sentence, which shows all the underlying concepts implied by the surface structure, the form of the sentence which is written or spoken. For example, the deep structure of "Bill cracked the mirror with a hammer" can be represented by the following tree diagram:



S - sentence Prop - position P - patient A - agent
M - modality V - verb I - instrument

(Liles, 1972, p. 39)

The surface structure of a sentence is realized after transformations are applied in an ordered fashion, as follows:

deep structure
|
underlying structure 3 (transformation applied)
|
underlying structure 2 (transformation applied)
|
underlying structure 1 (transformation applied)
|
surface structure

(Liles, 1972, p. 34)

Sentences such as passives must undergo many transformations to get from the level of underlying concept to surface structure. The effect deep structure can have on reading behavior was illustrated in a study by Wanat and Levin (1967). They found that when changes were made in the deep structure, the eye-voice span, the number of words correctly reported after the reading material had been removed, varied. Pairs of sentences having the same surface structure but different deep structures were constructed. For example:

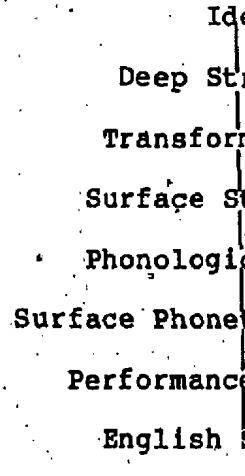
A His brother was beaten up by the gang.
B His brother was beaten up by the park.

Sentence B was found to be more difficult to process because it had an extra category, an adverbial phrase, and it required a slot for an agent (that is, his brother was beaten up by someone by the park), even though this is not realized in the surface structure.

On the basis of the results of the eye-voice span experiment, Wanat and Levin (1967) concluded that efficiency of reading processing is a function of the congruence of constraints between the surface structure and the deep structure of

sentences, and also a function of the number of structural categories required in the deep structure.

The following diagram clearly illustrates the transformationalist view of grammar, the structure which organizes linguistic elements into meaningful phrases.



(Liles, 1972, p. 56)

If research can establish a strong link between awareness of grammatical constraints, anticipation, and comprehension, then reading programs stressing decoding skills or repetitive reading of unnatural language patterns might be replaced by those based upon an integrated language arts approach, which would aim to develop the reader's inherent linguistic abilities.

Chapter 2

REVIEW OF THE LITERATURE

Syntactic Anticipation

Eye-Voice Span Studies

The eye-voice span (EVS) technique has been used for over sixty years to investigate the relationship between grammatical structure and reading. The most common procedure, the "lights out" method, requires subjects to read a sentence orally from a lit screen. When the light is turned off, the subject must continue to recite what he has seen. The EVS is taken to be the number of words read after the "lights out" position. As it is difficult to judge whether a subject is reporting all that he actually saw, or only that which he remembered seeing, this method may be criticized for being a test of memory. Notwithstanding this limitation, EVS studies allow a fascinating insight into the reading process, and the results have been shown to be congruent with inferences made from studies of eye movements (Gibson and Levin, 1975).

The studies which follow reveal that readers do rely upon grammatical structure to gain meaning. Syntactic awareness allows a reader to anticipate the class of upcoming words, thereby facilitating recognition and comprehension.

Levin and Turner (1970) gave subjects at grades two, four, six, eight, ten, and college level four types of sentences: active, each phrase having two words; active, each phrase having three words; passive, each phrase having three words; and passive, each phrase having four words. They found

that across all ages and sentence types the mean EVS was 2.19 words for unstructured word lists, but 3.91 for sentences. The EVS increased with age, and even grade twos showed they used grammatical structure, in that their mean EVS was 2.74 compared to 2.19 for the word list. However, the grade twos did not end the EVS at phrase boundaries as all other age groups did.

A study by Levin and Cohn (1968) found that by grade four, children are able to use grammatical structure, that they improve with age, and good readers are more adept at using grammar to simplify the reading task. The subjects at grades two, four, nine, and eleven were given instructions to read passages (a) normally, like reading to a friend aloud, (b) carefully, in preparation for reading, and (c) right through for the general idea. Across all grades reading carefully produced the shortest EVS, 3.69. Normal reading produced an EVS of 3.97, and skimming, 4.14.

Levin, Grossman, Kaplan, and Yang (1972) found the EVS to be longer in the more constrained right embedded sentences, those having a dependent clause following the main verb, than for left embedded sentences, the most significant lights-out position being at the verb. In the first experiment, nine college students read sixty sentences which were either left or right embedded, and the EVS was measured at five critical positions. Two further experiments increased the number of critical positions. In addition to the finding that the EVS was longer in right embedded sentences, the researchers found the EVS increased with successive critical positions, indicating

that an increase in sequential constraints in sentences affects sentence processing.

Levin and Kaplan (1968) found the EVS to be longer for passive sentences, whose grammatical form is more constrained, than for active ones. Eighteen college students were presented with four types of sentence: active and passive, each containing phrases four words in length, and active and passive, each containing five word phrases. Each sentence was embedded in separate paragraphs of four or five unrelated sentences. The EVS scores were obtained at various points starting after the third word and every succeeding word up to the "by" phrase in passive sentences, and the corresponding point in the active forms, which was a prepositional phrase. The findings showed the EVS was longer for passive than active sentences at the point where the two forms began to be differentially constrained, and that the EVS tended to terminate at phrase boundaries.

Levin and Turner (1966) also found the EVS to be longer for passive sentences, but only for subjects past the sixth grade level. Two similar sets of sentences, one using grade two vocabulary and the other having vocabulary at the grade six level, were presented to ten students in each of grades two, four, six, eight, ten, and adults. For the younger students, in grades two and four, there was a significant interaction between the voice of the sentence and the lights-out position: the EVS was longer before the verb in passive

sentences but longer after the verb in active ones. The findings also showed that the good and faster readers read to the end of phrase boundaries more often than slower or poor readers.

Resnick (1970) found that when the EVS falls, ending at phrase boundaries falls as well. Fifty-four passages were presented on a screen to four groups: grades three, five, college students, and college students reading upside-down material. The EVS and stops at phrase boundaries were measured. The college students reading the inverted material performed at the same level as the grade threes in the study, but unlike the grade threes, when they overcame the perceptual problems, they did utilize their knowledge of syntax.

Other Studies Which Demonstrate the Importance of Grammar to Comprehension

Brown and Miron (1971) found that fluent oral readers pause at grammatical junctures. A professional talker gave a rendition of the Meteorological Message, consisting of facts about weather and instrumentation written for Air Force trainees, material for which pre-knowledge was obviously low. Sixty-four percent of pause variance could be predicted from the syntactic measures of surface structure, clause analysis, or structural complexity.

Cooper (1974) found that when subjects were simultaneously presented with spoken language and a visual field (nine line drawings on a grid) containing elements semantically related to the informative items of speech, they tended to

spontaneously direct their line of sight to those elements which were most closely related to the meaning of the language currently heard. Most importantly, over sixty percent of the time subjects made correct responses prior to question termination. Forty-five percent of the visual selection of correct answers was based on hearing all or part of the first anticipatory cue word.

Subjects often executed fixation responses even to articles, prepositions, and conjunctions. Apparently, uninformative words may actually possess sufficient information content to trigger correlated fixation responses. For example, in the sentence, "There would be lions and _____," the word "and" signifies the sentence will likely be completed by a circus animal other than lion. Subjects made fixations on the basis of a minimal number of phonetic and syntactic cues.

To test the effect of syntax on subjects' ability to recall sentences, Epstein (1967) presented ninety-six university students with unstructured sentences. Some of each set were chunked, that is, had their phrase boundaries marked with arrows. Analysis of variance was used to compare the mean number of correct words recalled under each condition. The findings showed the effect of syntactic structure was significant, and the difference between structured and unstructured material was greater for chunked than unchunked sentences.

Foss and Lynch (1969) found that when subjects' reaction times to the presence of a phoneme were calculated, the reaction time was longer for sentences having a difficult

surface structure syntax, for example, a self-embedded sentence in which one sentence is embedded in another. A self-embedded sentence has the form, "The rioter that the whiskey intoxicated broke the window," while two sentences are embedded in, "The rioter that the whiskey the store sold intoxicated broke the window." As comprehension difficulty could not be attributed to a difference in words or concepts, the effect of surface structure was apparent. The subjects were required to push a button whenever they heard a specified phoneme.

Wanat (1976) found that the position of an embedded clause affected eye movements. He found that more visual attention was required to read a sentence type which was less structurally predictable, in this case, left embedded sentences, those having a dependent clause occurring before the main verb.

The study was designed to investigate whether a reader's eye fixation pattern reflects his internalized linguistic rules. The eye movements of twelve mature readers were recorded as they read examples of left embedded sentences and eight examples of those which were written using the same phrases but cast as right embedded. Half the sentences were read orally and half silently, and to ensure the subjects read for meaning, they were told they would be asked to paraphrase some of the sentences. The results showed that the total time spent on forward fixational pauses in reading the less predictable left embedded sentences was significantly greater than the total time spent on forward fixational pauses in reading the more

predictable right embedded sentences.

Hamilton and Deese (1971) carried out an investigation to determine whether syntactic or semantic factors had the greater effect on comprehension. Thirty mature subjects listened to a tape of 288 sentences, and indicated whether each was comprehensible or not. The sentences were constructed so that one third were center embedded, one third were right branching, and one third were mixed, that is, the subordinate clauses contained contiguous subjects and predicates while the main clause did not. In addition, each of these sentence types contained either semantically compatible or incompatible subjects and predicates. For example, "king" and "abdicated" were considered to constitute a well-suited pair, whereas "dog" and "fly" did not.

The researchers found the perception of a subject-predicate relation was sufficient to determine comprehensibility. Comprehension was impaired when the subject and predicate were discontiguous, as in the case of the center embedded sentences such as, "The choir that the organist that the congregation complimented directed sang new hymns." Contiguity of subject and predicate within complex sentences was found to be more significant than sentence length or appropriateness of the subject-noun and the verb. It was also found that right branching sentences were more comprehensible than the same sentences cast as center embedded, supporting the findings of Foss and Lynch (1969), Levin, et al., (1972), and Wanat (1976).

The findings of the Hamilton and Deese (1971) investigation are also congruent with those of Levin, Ford, and Beckwith (1968), who found that homographs were pronounced more rapidly when the preceding word signaled its part of speech, for example, the ____, they ____, rather than its meaning. Both were more rapid than no context at all.

Mehler, Bever, and Carey (1967) found that surface phrase structure was the linguistically defined level which interacted most strongly with the visual scanning pattern. Changing the surface phrase structure of a sentence resulted in a larger change in eye movements than changing the vocabulary while holding the structure constant. Changing the deep structure had a smaller effect than changing the vocabulary.

Pairs of ambiguous sentences were constructed so as to be different at the level of surface structure or deep structure only, or different at both levels simultaneously. Each sentence was embedded as the fourth sentence of a five sentence story which made one interpretation more probable; the sentence was then presented to forty university students.

The following sentences illustrate how two sentences can have the same surface structure but different deep structures:

> (a) The staring of the hunters was awful.
> (b) The staring at the hunters was awful.
>
> Two levels of phrase structure are assigned to each sentence by the grammar...Different surface structure is easily noticed and affects stress, pitch, and rhythm....Deep structure specifies logical relations words and phrases bear to each other--actor, action.

> object--independently of the actual order of words. (213)

The researchers found that, as a rule, the subjects fixated on the first half of each immediate constituent of the sentence, which is the surface structure unit of phrasal analysis.

To test the effect of sequential contextual constraints on reading, Miller and Coleman (1967) presented variations of the cloze technique to 479 college students reading thirty-six reading passages ranging in difficulty from grade one level to technical prose. In one variation, every fifth word was deleted, and five forms of the passage were constructed so that the deletions began with the first word, the second word, and so on. Thus, the effect of deletions in different parts of the sentence could be established. In a second version, 150 forms of the passage were constructed, each having only one word deleted. A third version required subjects to proceed through the passage guessing the next word. After each guess, the correct word was revealed. The findings showed a steady increase in correct guesses from the first word of a sentence to the last, but there was found to be little utilizable constraint across sentence boundaries.

The findings of an oral reading study by Kolers (1970) basically agree with this. Ten to thirty word sentences which had been geometrically transformed in various ways had clauses divided into fifths for analysis purposes. In all sentences except those of fifteen words, the maximum number of errors

occurred in the second fifth of a clause, the part of an independent clause which contains parts dealing with verbs. There was a decline in errors after the second fifth, showing that the more of a grammatical structure a reader had grasped, the less likely he is to make an error.

In the Kolers (1970) study, there was selective patterning of readers' substitution errors. Seventy-five percent of the time when errors were made reading nouns, verbs, and prepositions, other nouns, verbs, and prepositions were substituted. Fifty percent of the time, errors in the other five parts of speech were the same. (By normal odds the figure would be twelve percent.)

Further, adjectives were the second most likely substitute for nouns. Next to adjectives themselves, nouns and adverbs were most likely to replace adjectives. Nouns were almost never replaced by pronouns, and pronouns, conjunctions, and articles were hardly ever replaced by nouns, clearly demonstrating readers' subconscious reliance upon syntactic structure. Eighty-eight percent of errors were semantically and syntactically acceptable, and only nineteen percent were acceptable syntactically but distorted the meaning of the sentence as a whole.

Sawyer (1971) tested the hypothesis that:

> Grammatical structure is a set of rules which facilitates the recognition of the elements which make up that structure. (374)

She exposed legible sentences and those which had been physically altered to appear blurred; eight degrees of blur were created. It was found that "by plus agent" phrases in passive sentences were recognized under more blurred conditions than comparable prepositional phrases in active sentences. "By" phrases introducing locatives were more easily recognized than "by" phrases introducing agents in simple passive sentences. Readers were able to recognize right embeddings under poorer physical conditions than left embeddings.

Weber's (1970) study, noted previously, showed both good and poor readers exhibited evidence of using the grammatical context to facilitate reading. Over a six month period observers recorded portions of the oral reading of students in two grade one classes as they performed in their reading groups. The findings showed that a high percentage of the oral reading errors in each class, ninety-one percent and eighty-eight percent respectively, were grammatically acceptable to the preceding context. This was the case for both good and poor readers.

To test the hypothesis that there is an inverse relation in the use of contextual and stimulus information, a graphemic similarity score was calculated for each grammatical and ungrammatical substitution error. The findings showed the mean graphemic similarity scores to be higher when the substitution was ungrammatical for both good and poor readers. It is interesting to note that good readers' grammatical substitution errors had a higher graphemic similarity score than those of

poor readers, indicating that at the grade one level, at least, good readers are better users of graphemic information than poor readers.

The high group also differed from the low group on the measure of the number of corrections on grammatical and ungrammatical errors. The good readers ignored seventy-three percent of the grammatical errors but only fifteen percent of those which were not acceptable. The poor readers, however, overlooked sixty-five percent of the grammatical errors, a performance similar to that of the high group, but passed over nearly an equal number of syntactically unacceptable errors, fifty-eight percent. Weber (1970) concluded that this comparison did not necessarily indicate that poor readers were insensitive to syntactic violations, but that their strategies for locating ungrammatical errors may be inefficient.

In contrast to Weber's (1970) findings, Weinstein and Rabinovitch (1971) found that with I.Q. partialed out, the facilitative effect of syntactic structure was greater for good readers than poor ones. Twenty-six good readers were compared to fifteen poor readers, all aged eight to eleven years, as they learned four strings of words, two structured and two unstructured, and were asked to recall them. Good readers learned the structured lists in fewer trials than those which were unstructured, and they learned the structured lists more rapidly than poor readers did. For poor readers, differences in the number of trials required for structured and unstructured material was not significant.

In two separate experiments the effect of knowing the syntactic structure of a sentence before reading it was tested by Wisher (1976). When subjects were required to remember a sequence of numbers before reading a sentence, it was found that when the syntactic structure was known, the subjects were able to devote more effort to rehearsing the numbers, increasing their recall. In the second experiment, subjects were timed as they read sentences. When the structure was known, reading times decreased. Wisher (1976) concluded that syntax has the capacity to organize text for a reader.

Studies Demonstrating the Importance of the Verb

In this present investigation, it was the verb which was manipulated. The following studies illustrate the significance of the verb in the sentence.

Several studies show the verb to be the most significant word in a sentence, and therefore the word which provides the greatest amount of information for a reader. According to Chafe (1970):

> A verb is always present in a sentence although it may be deleted before the surface structure is reached. The nature of the verb determines what the rest of the sentence will be like; it determines what nouns will accompany it and how they will be semantically specified, and what the relations of these nouns to it will be. Inflexional units, such as past tense, apply to the verb only, not the whole sentence. Certain verbs dictate the presence of certain types of nouns ... (97)

Fodor, Garrett, and Bever (1968) found that verb complexity, defined in terms of the number of patterns of grammatical analysis trees a given verb will allow, affects subjects' sentence comprehension. In their first experiment, adult subjects listened to twelve pairs of sentences and were required to restate each in their own words. Of each pair, one had a verb which permitted complement structures and was therefore more complex than the other of the pair which had a transitive verb. Sentences having complement verbs permit a greater variety of deep structure configurations than do those with transitive verbs. The results showed performance decreased for those sentences containing more complex verbs.

In a second experiment, adult subjects were required to form sentences from words typed on individual file cards. Each sentence had two versions differing only in that one had a main verb which takes both complement structures and direct objects while the other version had a transitive verb. Of thirty sentences, thirteen showed more frequent failures to complete in their complement versions, four in the non-complement versions and thirteen showed no difference. Of thirty subjects, eighteen made more errors on complement sentences, six showed the reverse effect, and six performed equally well.

Healy and Miller (1970) had subjects perform a sentence sorting task. Sentences with the same verb but different agents were placed in one pile by most subjects.

In Wanat's (1976) study of eye movements and left and right embedded sentences, cited previously, in both types of embeddings most fixation time was allocated to the main verbs of the sentence.

Gough (1976) has proposed that the reading process consists of letter-by-letter identification followed by a lexical search for meaning. His "bottom-up" information processing model does not permit higher order intellectual activity to facilitate letter or word recognition. The studies cited here provide ample evidence that readers do in fact utilize grammatical cues and their linguistic competence to affect their perception and interpretation of the visual material.

Semantic Anticipation

Evidence supporting semantic anticipation in reading is not nearly as abundant as for syntactic anticipation, probably because, as Burke (1976) states,

> Syntax is generated from a finite set of rules and structures. Meaning relationships are infinite and less predictable. (86)

Studies dealing with ambiguous words can shed light on the mechanics of semantic prediction, as the effect of prior context on accessing one meaning over another can be tested. There are differing opinions in the literature on the matter of cognitive access to meanings of ambiguous words. While there are studies which show prior context does not bias subjects towards one meaning over another (Conrad, 1974; Foss and

and Jenkins, 1973; Holmes, Arwas, and Garrett, 1977), many studies concluded that prior context does lead subjects to anticipate one meaning of an ambiguous word over another.

To explain the inconsistent findings of the context effect on the meaning assigned to ambiguous words, Hogaboam and Perfetti (1975) outlined four models, ranging from the "prior decision" model, which posits that prior context determines which meaning will be accessed, to the "ordered search" model at the other end of the span, in which access to multiple meanings occurs in a fixed order regardless of the context in which the ambiguous word is found.

The findings of the studies cited below offer substantial evidence in support of the former model.

Swinney and Hakes (1976) found context placed selective constraints upon information accessed for ambiguous words, but only certain possible types of disambiguating prior contexts produced a prior effect. Subjects listened to seventy sentence pairs, some of which were ambiguous. Each pair was preceded by distant disambiguating context, an immediate disambiguating context, or no disambiguating context at all. For each pair, subjects were asked to press a button when they heard a word beginning with a specified phoneme. The results showed that reaction times were longer for ambiguous sentences than for non-ambiguous sentences when there was no disambiguating context. For immediate and distant context conditions, reaction

times were not significantly longer for the ambiguous pairs than for the control pairs.

In an experiment by Schuberth and Eimas (1977), observers classified letter strings as words or non-words under three conditions: the target stimulus alone presented, the target preceded by an incomplete sentence, and the target preceded by a string of four spelled-out digits. The targets were either semantically congruous or incongruous with the incomplete sentence. Non-word targets were either pronounceable or non-pronounceable. It was found that sentence contexts facilitated classification of both pronounceable and non-pronounceable congruous words, but interfered with the classification of incongruous words. Digits interfered equally.

In a study by Schvaneveldt, Meyer, and Becker (1976), subjects had to decide whether selected strings of letters were English words. When the first and third words related to the same meaning of the second word in the trio, for example, save - bank - money, the reaction time to recognize the third word decreased. When the first and third words related to different meanings of the second word (for example, river - bank - money) reaction times did not differ from a control sequence with unrelated words. In a second similar experiment, semantic context was found to influence recognition of ambiguous words.

An experiment by Meyer and Schvaneveldt (1971) showed that recognizing the meaning of one word facilitated recognition of the second word of a pair. Forty-eight pairs of associated

words, for example, bread - butter, forty-eight pairs of unassociated words, forty-eight pairs of non-words, and ninety-six pairs involving a word and a non-word were presented to subjects who pressed a "yes" key if both letter strings were words, and a "no" key if they were not. It was found that the "yes" responses were significantly faster for pairs of associated words.

In a second experiment, subjects pressed a "same" key if two letter strings were both words or both non-words. "Same" responses were significantly faster for pairs of words.

Morton (1964) tested the effects of context in an experiment utilizing a tachistoscope. Words were flashed with either an incomplete sentence or a row of X's is front of them. Exposure time was increased by 11.54 msec. to a criterion of two successive correct responses. Following one correct response, exposure time was kept the same. There were three conditions: high probability context, low probability context, and no context.

Results showed that the threshold under the high probability context condition was significantly lower than under the low probability condition, while both context conditions had a highly signficant effect compared with the control condition. Further, when errors were made under the two context conditions, there was a bias toward giving as an incorrect response a word more probable in the context than the stimulus word.

The effect of familiarity on reading rate was tested by Pierce and Karlin (1957). Subjects of at least high school

education read aloud as fast as they could typed lists of words chosen at random from a given vocabulary. It was found that the 500 most familiar trisyllable words were read as rapidly as the least familiar one syllable words.

In a separate experiment the word lists prepared kept length and familiarity constant for a given list. Words were chosen from a list of 20,000 most frequently encountered words. Reading rates were measured for (a) the thousand most familiar words, (b) the ninth to tenth thousand most familiar, and (c) the nineteenth to twentieth thousand most familiar. There was found to be a consistency among readers as to the relative effect of length and familiarity.

In yet another experiment by Pierce and Karlin (1957), reading rates for randomized lists of eight nonsense words averaging 1.5 syllables per word, for example, 'jevhin,' and 'tosp,' which were necessarily unfamiliar when first encountered, increased as the readers became more familiar with the words from successive readings, until the rates approached those of the first experiment.

Biemiller (1977) tested the effect of context on reading rate in an experiment using children from grades two to six and adults who were college graduates. The subjects were told to read as quickly as possible two basal reader passages, two fifty word lists selected from the passages, and two fifty letter lists.

He found that: (a) the time required to identify letters, words, and words in context was reduced as children got

older, (b) less time was required to identify words in context than words out of context or letters, and (c) younger children took longer to read simple words out of context than letters, while older children took about the same time to identify either letters or words. Biemiller concluded that most children and adults require less time, as measured in mean seconds per unit, to read text than they do to read words.

Carey, Harste, and Smith (1981) tested the effect of context as two groups of students read two ambiguous passages. For the first passage, the dominant interpretation was a convict planning an escape from prison but a non-dominant interpretation of a wrestler trying to break a hold was also reasonable. For the second passage the dominant interpretation was of friends getting together to play cards and the non-dominant interpretation was of a rehearsal for a woodwind ensemble.

The subjects read the passages, took a vocabulary test, were asked for a free recall of the second passage, then took a multiple choice test for both passages. Different music and physical education majors were tested in two settings: a physical education or music class, or a neutral class, English, for example. The experimenters concluded that:

> ...reading is a socially determined phenomenon...language and language learning are fundamentally social as well as cognitive encounters with meaning. (211)

Students' background was found to be a much better predictor of passage interpretation in the more constrained environments than in the neutral ones.

Tulving and Gold (1963) found that increasing the length of congruous context facilitated tachistoscopic identification of words, while increasing the length of incongruous context interfered. Subjects were required to read sentences, completing them with a tachistoscopically presented congruous or incongruous word. The experimenters concluded that it was the amount of relevant information in the context which was important, that the amount of stimulus information needed was an inverse function of the amount of information available from other sources, the same conclusion reached by Weber (1970), using a different investigative technique several years later.

Studies Showing Reading Behavior to be Adult-Like by Fourth Grade

This investigation used grade four subjects only, but as several experiments have shown that reading behavior is adult-like by this age, general inferences about reading may be drawn from the results.

Levin and Turner (1966) in an EVS experiment using grades two, four, six, eight, ten, and adults, found the EVS to be longest on three word phrases except for grade twos.

Biemiller (1977), in an experiment using children in grades two to six, found younger children took longer to read

simple words out of context than letters, while older children took about the same time to identify either letters or words.

Taylor and Frankenpohl (1960) found that even the fastest reader is limited to about four fixations per second, which is the rate achieved by fourth graders.

Resnick (1970), in an EVS study using grades three, five, college students, and college students reading upside-down material, found performance improved from grade three to college, but college students reading upside-down words performed at the level of the grade threes. When they overcame the perceptual problems, they did use their knowledge of syntax, unlike the grade threes.

Tinker (1965) found eye movements become more adult-like at fourth grade, and that the EVS is the same for second graders regardless of phrase length, but for fourth graders and older subjects, the EVS was longer for three word phrases than for two or four word phrases.

Levin and Cohn (1968), in an EVS study of grades two, four, nine, and eleven, found older children had a longer EVS and by fourth grade children were able to use grammatical structure.

Summary

In summary, there is ample evidence that readers utilize syntactic and semantic information to facilitate reading. Specifically, the studies cited show:

1. Syntactic structure provides a general facilitative effect on reading (Epstein, 1967; Levin and Turner, 1970; Wisher, 1976).

2. Both good and poor readers utilize syntactic constraints (Weber, 1970).

3. Good readers make greater use of syntactic information than poor readers (Levin and Cohn, 1968; Levin and Turner, 1966; Weinstein and Rabinovitch, 1971).

4. Syntactic structure influences the reading behavior of older readers more than younger ones (Levin and Cohn, 1968; Levin and Turner, 1966; Levin and Turner, 1970; Resnick, 1970).

5. Complex grammatical constructions impede reading fluency while more syntactically constrained material, for example, passive sentences and those having a clause following the main verb, has the effect of increasing fluency or comprehensibility (Brown and Miron, 1971; Fodor, Bever, and Carey, 1968; Foss and Lynch, 1969; Hamilton and Deese, 1971; Levin, Grossman, Kaplan, and Yang, 1972; Levin and Kaplan, 1968; Levin and Turner, 1966; Sawyer, 1971; Wanat, 1976).

6. The effect of the syntactic context increases through the length of the sentence (Kolers, 1970; Levin, et al., 1972; Miller and Coleman, 1967).

7. Syntactic context exerts more influence than semantic context (Cooper, 1974; Hamilton and Deese, 1971; Healy and Miller, 1970; Levin, Ford, and Beckwith, 1970).

8. Surface structure organization has a greater effect on reading than deep structure (Brown and Miron, 1971; Foss and Lynch, 1969; Mehler, Bever, and Carey, 1967).

9. The verb is the most significant word in the sentence (Chafe, 1970; Fodor, Garrett, and Bever, 1968; Healy and Miller, 1970; Wanat, 1976).

10. Prior semantic context has a priming or disambiguating effect (Biemiller, 1977; Carey, Harste, and Smith, 1981; Morton, 1964; Schuberth and Eimas, 1977; Schvaneveldt, Meyer, and Becker, 1976; Swinney and Hakes, 1976; Tulving and Gold, 1963).

11. Word familiarity increases reading speed (Pierce and Karlin, 1957).

12. Reading behaviour has adult-like characteristics by fourth grade (Biemiller, 1977; Levin and Cohn, 1968; Levin and Turner, 1966, Resnick, 1970, Taylor and Frankenpohl, 1960, Tinker, 1965).

Chapter three will describe the manner in which this investigation dealt with the question of whether contextual information is of sufficient strength to allow good and poor reading comprehenders to utilize a prediction strategy to facilitate word identification.

Chapter 3

METHODOLOGY

Introduction

According to psycholinguistic theory, reading behaviour is governed by cognitive processes. Obviously, at some point perception of at least some letters, words, or their distinctive features is essential to comprehension, but the proficient reader requires a minimal amount of graphemic and phonemic information to recognize words. He is able to integrate information from several sources to produce a hypothesis about the identity of an upcoming word, a hypothesis which is either accepted as the reader proceeds through the sentence, or, because of encountering unsupporting cues, is rejected causing an eye regression, or, less likely, progression in order to reassess the context.

The English language is highly redundant. For example, plurality can be indicated through a marker on a noun, use of a number-bearing determiner, a plural marker on a verb, or use of specific vocabulary. Similarly, tense, mood, and sentence type (declarative, imperative, interrogative) can be and usually are denoted by several indicators. Certain nouns are often used with a specific class of verbs, adjectives are usually associated with compatible nouns, and verbs require use of suitable nouns; for example, the subject of "dine" cannot be inanimate. In addition, English is based upon rules which govern word order, phrase placement, and use of inflexions.

These and other factors all combine to form what

linguists call the grammar of the language. Evidence illustrating children's creative, non-imitative use of language indicates that language is not learned merely through imitation of adult speech. Rather, language development seems to follow a pattern which appears to be innate. While grammars vary for different languages, there likely exists an underlying predisposition to discover and use language structure.

This is essentially the view of Chomsky (1957, 1965, 1970), the linguist who developed the model of grammar upon which the psycholinguistic reading theory is based. As Lyons (1970) states:

> Chomsky's assumption that certain formal principles of grammar are innate is intended to account for two problems simultaneously: (i) the universality of the principles on the assumption that they are in fact found to be universal and, (ii) the child's success in constructing the grammar of his language on the basis of the utterances he hears around him. It is the second of these questions that Chomsky regards as the more important ('the language is "reinvented" each time it is learned, and the empirical problem to be faced by the theory of learning is how this invention of grammar can take place'). (112)

The reader, then, faces the reading task with all the experience of his oral language, the perhaps unarticulated but nevertheless firmly rooted knowledge of grammar, semantic input from his life experiences, and a mind capable of perceiving, organizing, understanding, and evaluating incoming information. In fact, according to this model, information about the material being read is as much outgoing as it is incoming.

The reader's cognitive activity permits him to select an absolute minimum amount of graphemic information. Although only four to six letters may be in focus during an eye fixation (McConkie and Rayner, 1976a), shapes and spaces in the peripheral field can provide valuable information about word shape and length, reducing the alternatives from which the reader must make a choice.

Material which is difficult or which relates to unfamiliar concepts and experiences will necessitate the reader's gleaning more stimulus related information in order to decode and subsequently attempt to understand, whereas material which is more compatible to the reader's background can actually be decoded with the aid of comprehension. The proficient reader is able to make strong predictions before encountering a word.

Statement of the Problem

This investigation was based upon the question of whether both good and poor reading comprehenders utilize a prediction strategy, grounded in an awareness of the semantic and syntactic structure of the reading material, to facilitate word recognition.

High and low reading comprehenders, who were all of average word recognition ability, were asked to read orally a set of forty-five sentences, thirty of which had had the verbs changed to alter their meaning, syntax, or both. It was expected that high comprehenders would overlook the deliberately inserted errors, substituting grammatically acceptable alternatives.

Theoretical Framework and Research Design

The Isakson and Miller (1976) study is of particular interest to this investigation. It was designed to provide support for a conceptualization of reading failure described by Cromer (1970) in which poor readers are classified as being either of the "deficit" or "different" type. "Deficit" readers' poor vocabulary and word identification skills were thought to be the source of their reading difficulty, while "different" readers have adequate word recognition skills but fail to comprehend what they read.

Studies supportive of Cromer's position that comprehension difficulty can be the result of poor word recognition ability or a failure to integrate word meanings were criticized because they failed to control for the word recognition level of the subjects. Thus, the Isakson and Miller (1976) study was designed to test for the relationship between sensitivity to semantic and syntactic cues and comprehension ability without the interference of varying word recognition abilities.

Because the good comprehenders made an increasing number of errors as the severity of the disruptions increased while the number of errors of the low comprehenders was not affected by sentence type, Isakson and Miller concluded that good readers were more sensitive to linguistic cues, and utilized semantic and syntactic information to integrate the meanings of individual words. Poor readers were seen to ignore linguistic cues and treat words in isolation. This finding is contradicted by several studies which show both good and poor

readers rely on linguistic knowledge to facilitate reading (Allington and Fleming, 1978; Allington and Strange, 1968b; Cioffi, 1982; Hutson et al., 1980; Merrill, Sperber, and McCauley, 1980; Schvaneveldt, Ackerman, and Semlear, 1977; Schwartz and Stanovich, 1981; and Weber, 1970).

The fact that the Isakson and Miller (1976) study did not arise from the psycholinguistic school of thought, but rather came about as a means of defining two distinct types of reading failure, probably explains why a secondary analysis performed on their work was not considered in their hypothesis or discussion. If, in fact, good readers are more sensitive to semantic and syntactic cues, according to psycholinguistic theory, they should make predictions based on their linguistic knowledge and experience, and their processing of the sentence at hand. If the readers' expectations about upcoming words had sufficient strength, the good readers should have been more likely to overlook an incongruous word, making a substitution more in line with their predictions.

However, the findings of the Isakson and Miller (1976) study appear to be contradictory. The good readers made an increasing number of errors across sentence type, indicating their superior sensitivity to violations of linguistic rules, but when the two groups were compared on the number of errors made on each sentence type, it was the low readers who made significantly more errors on semantically violated sentences than the good readers. If the low comprehenders treated words as individual entities, as the authors claim, they should have

been expected to notice the disrupted words and read them verbatim. If poor readers can be characterized as not being able to integrate the meaning of individual words, the incongruous nature of the insertions should not have created any particular difficulty for them.

By the same reasoning, low comprehenders could have been expected to make fewer errors on the doubly violated sentences than the high comprehenders, but the results showed there was no difference between the groups on this measure. As all the subjects were selected to have average word recognition ability, it is curious that poor readers made more errors than good readers on the normal sentences. These comparisons were not seen by Isakson and Miller (1976) to provide a measure of sensitivity to semantic and syntactic cues, and the findings were not explained or discussed.

The present investigation was designed to test for predictive behaviour using an improved version of the Isakson and Miller (1976) model. Several aspects of the studies were similar in the following ways: 1) both used grade four subjects; 2) word recognition scores from standardized tests were used to categorize students as average if their score was within $\pm$.5 years of grade placement; 3) subjects were classified as high comprehenders if their scores on a comprehension subtest were .5 years or more above grade level or low comprehenders if their scores were .5 years or more below grade level; and, 4) in both studies words were manipulated at the verb position.

This investigation, however, used sixty subjects

compared to forty-eight in the original, had fifteen sentence trios compared to twelve, and required subjects to read forty-five sentences, compared to twelve. Sentences were selected from the evaluation manuals accompanying the reading series in use in the schools from which the subjects were drawn, so that the reading material was likely to be related to the subjects' reading experience. In the original study, the sentences were artificially created. Each was exactly thirteen words in length, written to be rated as grade four level material according to a readability formula, and each of the words manipulated was chosen to be approximately equal in frequency of occurrence. The resulting constructions were less likely to be representative of typical reading material.

Each subject in the Isakson and Miller (1976) study read only one sentence from each group of three, consisting of the normal version, and two violated variations, whereas subjects in this study read all fifteen normal sentences as well as two violated versions of each one. The Isakson and Miller (1976) subjects were not vulnerable to having their reading of disrupted sentences affected by having seen, in some cases, the unaltered form first, but the study was then not able to compare subjects' reaction to normal and violated versions of the same sentence.

The Isakson and Miller (1976) study was designed so that for each normal sentence two violated forms were constructed, a semantically violated version and a semantically plus syntactically violated version. In each case the word changes

were made only at the verb position. This present investigation, although originally based on the Isakson and Miller (1976) design, combined the two groups of violated sentences for the analysis and discussion.

For Isakson and Miller (1976), substitution of a transitive (or intransitive) verb for another constituted a semantic change whereas substitution of a transitive for an intransitive verb (or vice versa) constituted both a semantic and a syntactic alteration.

In this investigation it was discovered that many of the verbs in the normal and violated sentences could have both a transitive and an intransitive sense. Thus, when a word substitution was made there was always a change in meaning but often there was also a change in the syntax of a sentence when only a semantic difference was desired.

Combining the two groups of violated sentences was possible because of the high correlation (r=.75) found to exist between semantic and syntactic variables (Beebe, 1981, p. 109). This relationship was borne out by the factor analysis conducted in this investigation on the variables semantic acceptability and syntactic acceptability of subjects' substitution errors. In fact, the correlation coefficient was almost identical (r=.78, from Table 5).

This investigation, based on psycholinguistic theory, looked for further evidence of good readers' reliance on semantic and syntactic cues. The substitution errors of each group were compared on measures of semantic and syntactic acceptability, and graphemic and phonemic similarity to the target words.

The number of corrections of both grammatical and ungrammatical substitution errors made by each group were discussed.

Hypotheses

Hypothesis 01: There will be no difference in the performance of high and low comprehenders reading unviolated sentences.

Hypothesis 02: High comprehenders will make more errors than low comprehenders on violated sentences.

Hypothesis 03: High comprehenders will make more errors on violated sentences than on those which have not been altered.

Hypothesis 04: Type of sentence will not affect the number of errors made by low comprehenders.

Hypothesis 05: High comprehenders' substitution errors will bear a lower degree of graphemic and phonemic similarity to the target words than those of low comprehenders.

Hypothesis 06: High comprehenders' errors will be semantically and syntactically acceptable in the context of the rest of the sentence whereas those of low comprehenders will not.

Hypothesis 07: As the level of difficulty increases, high comprehenders' substitution errors will reveal an increasing dependence upon graphemic and phonemic cues, and a corresponding decreasing reliance upon semantic and syntactic information.

Hypothesis 08: As the level of difficulty increases, both high and low comprehenders will make increasingly fewer errors on violated sentences.

Hypothesis 09: High comprehenders will correct a higher proportion of ungrammatical errors than will low comprehenders.

Hypothesis 10: High comprehenders who read an inserted anomaly verbatim will be more likely than low comprehenders to change other words in the sentence in an attempt to render it meaningful.

Methods and Procedures

The sentences were selected from the first stories of each Evaluation Manual of the Nelson Reading Program at the third, fourth, and fifth grade level. Five sentences were chosen at evenly spaced positions throughout each story, and three versions presented to the subjects: the correct form and two versions in which the verb was replaced by a word which altered either the meaning of the sentence, or the meaning and syntax simultaneously.

Each subject was asked to read a total of forty-five sentences, arranged so that no two sentences from any one group or from any one selection were presented consecutively.

Subjects were selected from the population of grade four classes of schools administered by the Avalon Consolidated School Board, St. John's, Newfoundland, which had given the Gates-MacGinitie Reading Test in the spring of 1981: ten elementary schools in total.

All subjects were within ±.5 years of grade placement on the vocabulary section of the Gates-MacGinitie test at the time of testing. Those comprising the high comprehender group scored .5 years or more above grade level on comprehension at the time of testing, while those comprising the low comprehender group scored .5 years or more below grade level. As the subjects were all rated as average on word recognition, inability to read the words in the target position should not have been a source of error.

Of seventy-two students who fit the high group criteria, thirty were selected at random, while of the total of thirty-one students who fit the low group criteria, one was chosen at random to be deleted. Thus, there were thirty subjects in each group.

The subjects were given three warm-up sentences, then were asked to read each of the forty-five experimental sentences, each typed on a five by eight inch file card. The students were instructed that: they had been selected to participate in a reading experiment; their individual identities were to remain confidential and were to be destroyed once the data had been compiled; their reading would be tape recorded as a safeguard; the experimenter would be making notes during the session; no assistance would be offered; they were to read as well as they could; and they could have as much time as they required.

All testing took place individually in a quiet, private setting within each school.

Instruments

1. The Gates-MacGinitie Reading Test

The Gates-MacGinitie Reading Test was used to screen subjects and categorize them as high or low comprehenders. Information from this test was used for two reasons. Firstly, it provided subtest scores for reading comprehension and word recognition so that on the basis of these two scores subjects could easily be rated as average in word recognition if they scored within a half year of grade level, low in comprehension if their comprehension score was a half year or more below grade level, or high in comprehension if their comprehension score was a half year or more above grade level.

Secondly, as very few students in any one class fit the criteria, quite a large number of classes had to be tested. For practical reasons, it was more feasible to screen subjects on the basis of a test which had already been administered in several schools than for the investigator to carry out a test which would provide the same information.

2. The Set of Forty-five Sentences

Each level of the Nelson Reading Series currently in use in the schools administered by the Avalon Consolidated School Board is accompanied by an Evaluation Manual containing four reading selections. The sentences used in this study were chosen from the first story of three of these manuals so the style would be familiar to the subjects. Levels three, four, and five were chosen so that each subject would be presented with material above, below, and at grade level.

3. The Goodman Taxonomy of Reading Miscues

The Goodman Taxonomy of Reading Miscues (1973) provides scales by which oral reading errors, or miscues as Goodman calls an utterance which is not the same as the original word in print, can be judged by criteria in eighteen categories, four of which were utilized in this study: graphemic similarity, phonemic similarity, syntactic acceptability, and semantic acceptability. When rated according to these scales, oral reading errors can be evaluated qualitatively and can provide a useful insight into the strategies readers employ. Bottom-up information processing is reflected in high graphemic and phonemic scores, while top-down processing is reflected in high semantic and syntactic acceptability scores.

The graphemic similarity scale ranges from zero, applied when there is no similarity at all, to nine, applied when the "expected response" and the "observed response" are homographs. For example, if a subject read "was" for "have," the substitution received a score of zero as there was no similarity between the two words; "want" read for "what" received a score of seven as the beginning, middle, and end portions were similar.

As for graphemic similarity, the scale for phonemic similarity ranges from zero to nine. A reading of "moving" for "morning" received a score of six as phonemically there are common beginning and end portions; "take" read for "like" received a score of one as they have a key sound in common;

"washed" read for "wished" received a score of eight because the two words differ by a single vowel.

Using a method described by Beebe (1981), the graphemic and phonemic scores were both calculated in the same way, as a percentage of the total possible score. For each subject, the denominator was formed by multiplying the total number of substitution errors (the only type of error which could possibly receive a rating) by nine, the maximum score possible. The numerator was formed by totalling the scores for each substitution error. The resulting fraction multiplied by 100 produced a percentage indicating the degree of graphemic and phonemic similarity.

The scales for semantic and syntactic acceptability each range from zero to three. A score of one was applied if the miscue resulted in a structure which was semantically (or syntactically in the latter case) acceptable only with the prior portion of the sentence. A score of two was given if the miscue resulted in a structure which was semantically (or syntactically) acceptable only with the following portion of the sentence. A score of three was given if the miscue resulted in a structure which was semantically (or syntactically) acceptable within the entire sentence.

For example, in the violated sentence, "All you need to do is wonder the combinations," when "wander" was substituted for "wonder", it was rated as three on the syntactic acceptability scale and one on the scale for semantic acceptability.

A percentage score was calculated for both semantic and syntactic acceptability in the same manner as for graphemic and phonemic similarity. For each subject, the denominator was formed by multiplying the total number of substitution errors by three, the maximum score possible. The numerator was formed by totalling the semantic and syntactic scores respectively. Again, the resulting fraction multiplied by 100 yielded a percentage indicating the degree to which a reader's miscues were semantically and syntactically acceptable within the context of the sentence.

For each subject and for each dependent variable of graphemic and phonemic similarity and semantic and syntactic acceptability, scores were calculated for each of the three levels of difficulty as well as the totals.

Statistical Procedures

Three types of error at the verb position were recorded: those of repetition, omission, and substitution. Using the Goodman taxonomy (1976), the latter were coded for graphemic and phonemic similarity, and semantic and syntactic acceptability. For each subject and in each category, total scores were calculated as well as scores at each of the three levels of difficulty.

Three correction scores were also calculated for each subject. The proportion of corrections of errors made on all forty-five words was found by dividing the total number of

corrections made by the total number of substitution and omission errors (repetition errors by their nature cannot be corrected) and multiplying by 100 to obtain a percentage.

The proportion of acceptable miscues corrected was found by dividing the number of acceptable miscues which were corrected by the total number of omission and substitution errors and multiplying by 100. The proportion of grammatically unacceptable miscues was calculated in the same way.

A miscue was defined as acceptable if the entire resulting sentence was both semantically and syntactically acceptable. Similarly, a miscue was defined as unacceptable if the entire resulting sentence was unacceptable semantically and/or syntactically. These criteria were utilized whether or not the miscue occurred in a normal or violated sentence.

For example, if in the semantically and syntactically violated sentence, "Soon there safe a clearing all the way round the cabin" the subject substituted "will be" for "safe" but later regressed and read aloud "safe," it was described as a correction made on a grammatical miscue.

In the normal sentence, "Hammer and nails came next, with many other things," the omission of the target word "came" rendered the sentence unacceptable semantically and syntactically. When the error was corrected it was classified as a correction of an unacceptable miscue.

Two other variables, described by the mnemonics CHNEG and CHPOS were also considered. CHNEG refers to the situation

in which a violation results in a subject making errors while reading the unaltered words in the sentence, although the violation itself was read verbatim. In such cases the errors had to be judged to be arising out of the violation.

CHPOS refers to the situation in which a reader, having read a violated word verbatim, then changed other words in the sentence to agree with the violation, in effect creating a grammatical sentence out of an ungrammatical one.

In each case, the maximum CHNEG or CHPOS score for each sentence was one. The total CHNEG and CHPOS scores were calculated for each subject.

The data were compiled, written in machine readable form, and, using the Statistical Package for the Social Sciences Program (1975), a one way analysis of variance was performed. High and low comprehenders' scores were compared by type of sentence, level of difficulty, graphemic similarity, phonemic similarity, semantic acceptability, syntactic acceptability, corrections of acceptable and unacceptable errors, and other errors in the sentence.

A factor analysis was performed to combine (a) the graphemic and phonemic similarity scores, and (b) the semantic and syntactic acceptability scores. High and low comprehenders were then compared on the two new variables, graphemic-phonemic similarity, and semantic-syntactic acceptability.

Expected Outcomes

As the high and low comprehenders in this study were all rated as average in word recognition, they were not expected to differ in their performance on normal sentences.

On violated sentences, high comprehenders were expected to make more errors at the verb position than low comprehenders. According to psycholinguistic theory, good readers process print more efficiently by using a prediction strategy rather than a precise letter and word identification approach. They were expected to ignore words in the text which did not fit with their expectations, substituting words which did.

It was expected that high comprehenders would make more errors on violated sentences than on normal ones, whereas poor readers, using bottom up processing strategies, would read the incongruous words verbatim, resulting in similar scores on both sentence types. If good readers are more sensitive to linguistic constraints, when these constraints are violated, the good reader should have been less likely to interpret the disruption as being acceptable and more likely to substitute a word congruent with his reading of the sentence to that point.

Low comprehenders were expected to make substitution errors which had a high degree of graphemic and phonemic similarity to the target word, if they primarily use graphemic and phonemic information to identify words.

High comprehenders' top-down word identification strategies were expected to result in substitution errors which had a low degree of graphemic and phonemic similarity, but,

unlike the low group, their errors were expected to be semantically and syntactically acceptable in the sentence.

As the level of difficulty increased, high comprehenders were not expected to be able to utilize a prediction strategy as successfully, were expected to pay stricter attention to the print, and therefore have an increasing grapho-phonic score, and a decreasing semantic-syntactic score.

Because it was expected to be more difficult for both groups to utilize a prediction strategy for more complex material, both groups were expected to be forced to attend to the print more exactly, notice the inserted anomalous words, and thereby make fewer errors on violated sentences as their level of difficulty increased.

If high comprehenders primarily rely upon their tacit knowledge of linguistic structure to facilitate reading, they could be expected to have a greater awareness of an ungrammatical utterance and make a higher proportion of corrections of this type of error than low comprehenders.

High comprehenders, if they are utilizing cognitive processes and tapping their knowledge of grammar to aid in word recognition, should be comprehending as they read in order to generate further hypotheses. If they were reading for meaning they could be expected, if they happened to read an anomalous word verbatim, to attempt to render the sentence meaningful by appropriately altering other words in the sentence.

Limitations

One limitation of the study is that while the data were collected in the first three weeks of the grade four school year, screening of subjects was based on Gates-MacGinitie reading tests administered in May and June of the previous school year. There simply would not have been time to complete the research before the summer vacation. However, as no students received formal instruction during the interval, the validity of the study should not be impaired.

One possible source of error lies in the fact that the low comprehender subjects were drawn from a smaller population (thirty out of a possible thirty-one) than were the high comprehenders (thirty out of a possible seventy-two).

Another limitation is one common to many investigations, that is, that subjects were reading in an artificial situation. Reading behaviour under more relaxed and natural conditions may be different.

Finally, as the sentences were presented in random order, in some cases subjects' readings of violated sentences may have been influenced by having seen the normal, correct form of a sentence before the disrupted versions, or vice versa. These effects were minimized by having any two sentences from a group separated by several others. The advantage of being able to compare each subject's performance on the three versions of the same sentence outweighed the limitations of the design.

Chapter 4

RESULTS OF THE INVESTIGATION

The errors high and low comprehenders made on forty-five sentences of two different types and at three levels of difficulty were counted, coded according to the guidelines of the Goodman taxonomy of reading miscues (1976), and written in machine readable form. Using the Statistical Package for the Social Sciences (Nie et al., 1975), descriptive statistics were computed, and an analysis of variance performed to compare the two groups on thirty-nine variables.

A factor analysis was performed on four of the variables: graphemic similarity, phonemic similarity, syntactic acceptability, and semantic acceptability, creating the latent variables grapho-phonic similarity and syntactic-semantic acceptability. An analysis of variance was then conducted on the two composites as dependent variables.

To judge the effect of level of difficulty, the appropriate variable means calculated for the analysis of variance procedure were plotted in graph form.

The variables entered into analysis were ascribed mnemonics, which are presented in Table 1.

Findings

Hypothesis 01: There will be no difference in the performance of high and low comprehenders reading unviolated sentences.

Hypothesis 02: High comprehenders will make more errors than low comprehenders on violated sentences.

TABLE 1

Mnemonics Ascribed to the Variables

Mnemonics	Description
WORDREC	Word recognition grade equivalent score on the Gates-MacGinitie Reading Test
RDGCOMP	Reading comprehension grade equivalent score on Gates-MacGinitie Reading Test
CORSENT	Score on 15 correct sentences
VIOLTOT	Score on 30 semantically or semantically and syntactically violated sentences.
GTOTAL	Total score on all forty-five sentences
L3TOT	Score on 15 level 3 sentences
L3COR	Score on 5 correct level 3 sentences
VIOL3	Score on 10 semantically or semantically and syntactically violated sentences.
L4TOT	Score on 15 level 4 sentences
L4COR	Score on 5 correct level 4 sentences
VIOL4	Score on 10 level 4 sentences violated either semantically or semantically and syntactically.
L5TOT	Score on 15 level 5 sentences
L5COR	Score on 5 correct level 5 sentences
VIOL5	Score on 10 level 5 sentences violated semantically or semantically and syntactically.
GTOT	Total graphemic similarity score
G3	Graphemic similarity on 15 level 3 sentences
G4	Graphemic similarity on 15 level 4 sentences

Table 1 (Cont'd.)

Mnemonics	Description
G5	Graphemic similarity on 15 level 5 sentences
PTOT	Total phonemic similarity score
P3	Phonemic similarity on 15 level 3 sentences
P4	Phonemic similarity on 15 level 4 sentences
P5	Phonemic similarity on 15 level 5 sentences
SYTOT	Total percentage of syntactically acceptable substitution errors
SY3	Percentage of syntactically acceptable substitution errors at level 3
SY4	Percentage of syntactically acceptable substitution errors at level 4
SY5	Percentage of syntactically acceptable substitution errors at level 5
SEMTOT	Total percentage of semantically acceptable substitution errors
SEM3	Percentage of semantically acceptable substitution errors at level 3
SEM4	Percentage of semantically acceptable substitution errors at level 4
SEM5	Percentage of semantically acceptable substitution errors at level 5
PCORTOT	Proportion of corrections on all 45 words
PACC	Proportion of acceptable errors corrected
PUNACC	Proportion of unacceptable errors corrected
CHNEG	The number of times a violation had a negative effect on the reading of other portions of the sentence
CHPOS	The number of times a reader made other portions of a sentence agree with a violation

When high and low comprehenders' scores were compared on each of the sentence types, there was found to be no significant difference in their performance. The results are presented in Table 2, rows 2.03 and 2.04.

While the outcome is in line with the hypothesis in the case of normal sentences, the significance of this finding is substantially diminished in light of the result of the other comparison in this group. The required task clearly did not elucidate the underlying differences which caused the subjects to score high or low in comprehension on the standardized reading test.

Hypothesis 03: High comprehenders will make more errors on violated sentences than on those which have not been altered.

Hypothesis 04: Type of sentence will not affect the number of errors made by low comprehenders.

The data analysis showed support for hypothesis three but not for hypothesis four as both high and low comprehenders made more errors on violated sentences than on normal ones. The results are displayed numerically on Table 3 and graphically on Chart 1.

Hypothesis 05: High comprehenders' substitution errors will bear a lower degree of graphemic and phonemic similarity to the target words than those of low comprehenders.

Hypothesis 06: High comprehenders' substitution errors will be semantically and syntactically acceptable in the context of the rest of the sentence whereas those of low comprehenders will not.

Both hypotheses five and six were rejected.

TABLE 2

One Way Analysis of Variance Results:
Effects of Rank (High or Low Comprehenders)
on Criterion Variables (N=60)[a]

	Criterion Variable	Source	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level	Eta Squared
2.01	WORDREC	Between Within	170.02 564.97	1 58	170.02 9.74	17.454	.0001	0.231
2.02	RDGCOMP	Between Within	7326.15	1 58	7326.15 23.91	306.423	.0000	0.841
2.03	CORSENT	Between Within	0.82	1 58	.82	0.787	0.3786	0.013
2.04	VIOLTOT	Between Within	15.00 526.600	1 58	15.00 9.079	1.652	0.2038	0.028
2.05	GTOTAL	Between Within	22.82 762.17	1 58	22.82 13.14	1.736	0.1928	0.029

[a]See Appendix 3 for descriptive statistics.

Table 2 (Cont'd)

	Criterion Variable	Source	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level	Eta Squared
2.06	L3TOT	Between Within	0.07 166.87	1 58	0.07 2.88	0.023	0.8795	0.0004
2.07	L3COR	Between Within	.000 20.73	1 58	.000 .36	.000	1.000	.000
2.08	VIOL3	Between Within	0.417 124.167	1 58	0.417 2.141	0.195	0.6607	0.003
2.09	L4TOT	Between Within	4.82 131.37	1 58	4.82 2.27	2.127	0.1502	.035
2.10	L4COR	Between Within	0.07 15.67	1 58	0.07 0.27	0.247	0.6212	0.004
2.11	VIOL4	Between Within	3.750 111.233	1 58	3.750 1.918	1.955	0.1673	.033

Table 2 (Cont'd.)

	Criterion Variable	Source	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level	Eta Squared
2.12	L5TOT	Between	3.75	1	3.75	1.471	.2302	.025
		Within	147.9	58	2.55			
2.13	L5COR	Between	.27	1	.27	1.00	.32	.017
		Within	15.47	58	.27			
2.14	VIOL5	Between	1.667	1	1.667	.941	.3361	.016
		Within	102.733	58	1.771			
2.15	GTOT	Between	21.6	1	21.6	.166	.6852	.003
		Within	7548.33	58	130.144			
2.16	G3	Between	32.27	1	32.27	.076	.7844	.001
		Within	24770.33	58	427.08			
2.17	G4	Between	224.27	1	224.27	.30	.5893	.005
		Within	44125.67	58	760.79			
2.18	G5	Between	81.67	1	81.67	.104	.7481	.002
		Within	45488.93	58	784.29			

Table 2 (Cont'd.)

	Criterion Variable	Source	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level	Eta Squared
2.19	PTOT	Between	5.4	1	5.4	.028	.8674	.001
		Within	11131.53	58	191.92			
2.20	P3	Between	874.02	1	874.02	1.607	.2100	.027
		Within	31542.97	58	543.84			
2.21	P4	Between	1738.82	1	1738.82	1.642	.2052	.028
		Within	61434.17	58	1059.21			
2.22	P5	Between	299.27	1	299.27	.359	.5512	.006
		Within	48296.47	58	832.70			
2.23	SYTOT	Between	1297.35	1	1297.35	4.073	.0482	.066
		Within	18472.30	58	318.49			
2.24	SY3	Between	928.27	1	928.27	1.604	.2104	.027
		Within	33567.07	58	578.743			
2.25	SY4	Between	6976.82	1	6976.82	4.166	.0458	.067
		Within	97130.17	58	1674.66			
2.26	SY5	Between	1685.40	1	1685.40	1.676	.2006	.028
		Within	58336.53	58	1005.80			

Table 2 (Cont'd.)

	Criterion Variable	Source	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level	Eta Squared
2.27	SEMTOT	Between Within	96.27 15277.13	1 58	96.27 263.40	.365	.5478	.006
2.28	SEM3	Between Within	1050.02 44570.97	1 58	1050.02 768.47	1.366	.2472	.023
2.29	SEM4	Between Within	1188.15 54506.70	1 58	1188.15 939.77	1.264	.2655	.021
2.30	SEM5	Between Within	114.82 16156.17	1 58	114.82 278.56	.412	.5234	.007
2.31	PCORTOT	Between Within	46.82 17422.03	1 58	46.82 300.38	.156	.6944	.003
2.32	PACC	Between Within	166.67 8782.67	1 58	166.67 151.43	1.101	.2985	.019
2.33	PUNACC	Between Within	385.07 10136.87	1 58	385.07 174.77	2.203	.1431	.037
2.34	CHNEG	Between Within	28.02 678.17	1 58	28.02 11.69	2.396	.1271	.040
2.35	CHPOS	Between Within	.15 36.43	1 58	.15 .69	.239	.6269	.004

TABLE 3

Table of Means Showing the Effect of Rank on the Scores of Normal and Violated Sentences (N=60)[ab]

Comprehension Level	Percentage of normal sentences read correctly	Percentage of violated sentences read verbatim
Low (N=30)	92.67	71
High (N=30)	94.2	74.34

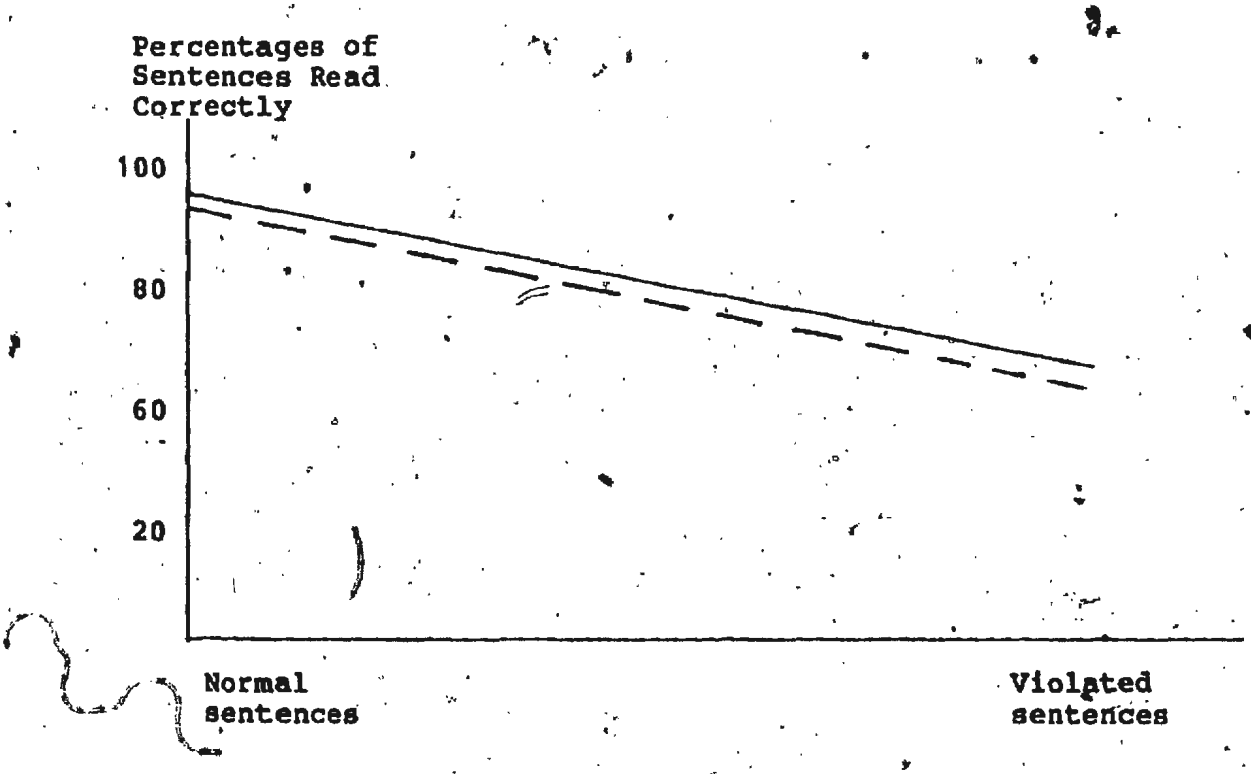
[a]See Appendix 3 for descriptive statistics.

[b]Although the hypotheses and discussion refer to the mean number of errors made by each group on each of the sentence types, the scores presented in Table 3 represent the percentage of sentences read correctly (verbatim).

CHART 1

Graph of Table 3

The Effect of Rank on the Mean Scores of Normal and Violated Sentences
(N=60)



KEY: Low Comprehenders _ _ _
High Comprehenders _____

As can be seen by referring to Table 2, rows 2.15, and 2.19, there was no support for hypothesis five. By looking at the means of each group, presented in Table 4, it can be seen that the low group did have higher scores on the graphemic and phonemic similarity scales than did the high group, as predicted, but this difference was slight.

The results show that for each group the average error bore a moderate graphemic and phonemic similarity to the original word.

The results of the analysis for hypothesis six are inconsistent. In spite of a factor analysis which showed quite clearly that the syntactic and semantic factors have a high positive correlation ($r=.78$, from Table 5), only the syntactic acceptability comparison showed a significant difference. The results are presented on Table 2, rows 2.23 and 2.27. The difference, however, was not in the predicted direction. As can be seen from Table 4, the low comprehenders' scores were higher than those of the high comprehenders in each of the four categories in this group, not just graphemic and phonemic acceptability as expected.

Using the Statistical Package for the Social Sciences (Nie, et al., 1975, pp. 468-515), a factor analysis was performed to see if by constructing composite variables the relationships could be strengthened. Composite variables are more reliable, or accurate, than raw score variables. Thus, use of composites as criterion measures would constitute a firmer test of a hypothesis than use of raw score variables.

TABLE 4

Table of Means Comparing High and Low Comprehenders on the Dependent Variables of Graphemic Similarity, Phonemic Similarity, Semantic Acceptability, and Syntactic Acceptability of Substitution Errors (N=60)[a]

Comprehension Level	Graphemic Similarity	Phonemic Similarity	Syntactic Acceptability	Semantic Acceptability
Low (N=30)	67.63	68.16	67.80	45.37
High (N=30)	66.43	67.56	58.50	42.83

[a]See Appendix 3 for descriptive statistics.

TABLE 5

Correlation Coefficients for the Variables Graphemic Similarity, Phonemic Similarity, Syntactic Acceptability and Semantic Acceptability (N=60)[a]

	GTOT	PTOT	SYTOT	SEMTOT
GTOT	1.000			
PTOT	.603	1.000		
SYTOT	-0.098	.083	1.000	
SEMTOT	-0.206	-0.071	.784	1.000

[a]See Appendix 3 for descriptive statistics.

Correlation coefficients were calculated for the variables semantic acceptability, syntactic acceptability, graphemic similarity, and phonemic similarity. Using a formula which takes into account the degree to which each of the factors is related to each of the others, the variables semantic and syntactic acceptability, and graphemic and phonemic similarity were weighted and added together to form the two composite variables: semantic - syntactic acceptability and graphemic - phonemic similarity. Each may be thought of as semantic - syntactic and graphemic - phonemic cueing strategies.

An analysis of variance was carried out on the two new variables, described by the mnemonics SS and GP. As can be seen by the results presented on Table 6, no significant difference was found to exist between high and low comprehenders.

Hypothesis 07: As the level of difficulty increases, high comprehenders' substitution errors will reveal an increasing dependence upon graphemic and phonemic cues, and a corresponding decreasing reliance upon semantic and syntactic information.

The mean scores of the high comprehenders on the four dependent variables at each level of difficulty were plotted on graphs for observation. The results are displayed on Charts 2, 3, 4, and 5, and on Table 7.

While there is some support from the data for this hypothesis, the results do not follow the expected pattern. It can be seen from Charts 2 and 3 that the pattern is the same for both phonemic and graphemic similarity scores: They were highest at the easiest reading level, dipped considerably at level

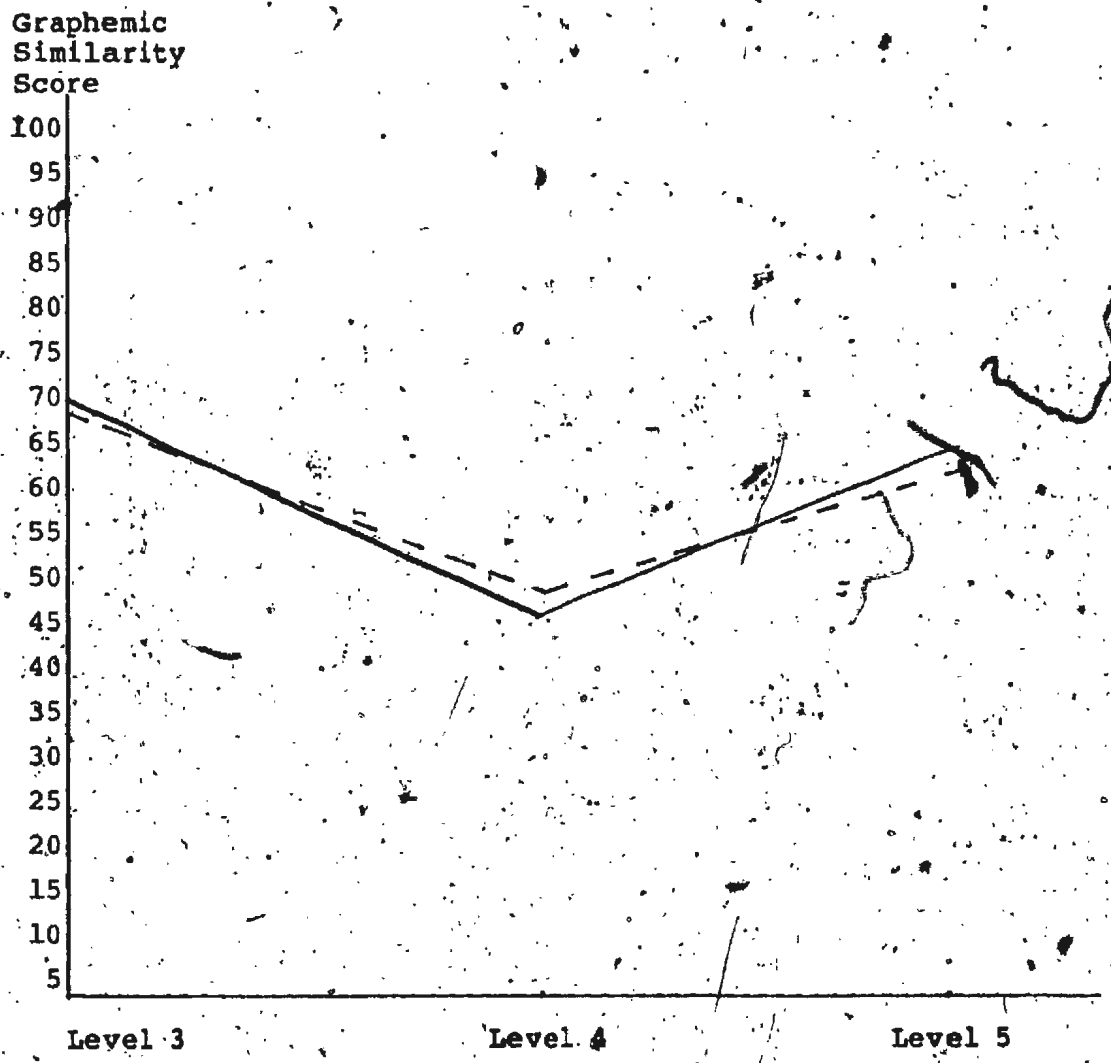
TABLE 6

One Way Analysis of Variance Results: Effects of Rank on the Composite Dependent Variables SS and GP (N=60)

Dependent Variable	Source	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level	Eta Squared
SS	Between	1.85	1	1.85	1.88	.1761	.031
	Within	54.14	58	.99			
GP	Between	.20	1	.20	.20	.6586	.003
	Within	58.78	58	1.01			

CHART 2

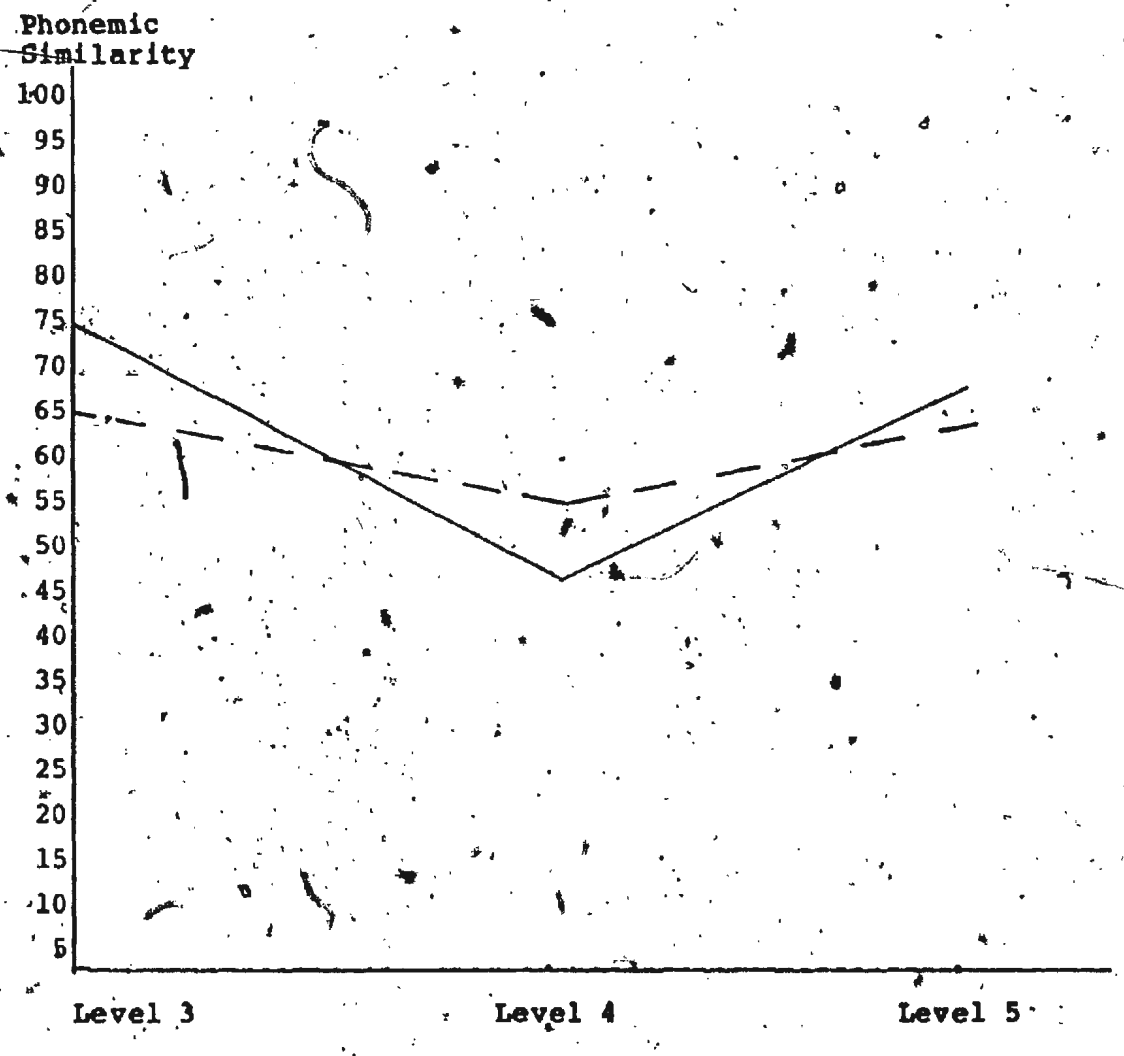
Graph Showing High and Low Comprehenders' Mean Graphemic Similarity Scores at Each Level of Difficulty (N=80)



KEY: Low Comprehenders _ _ _ _
High Comprehenders _____

CHART 3

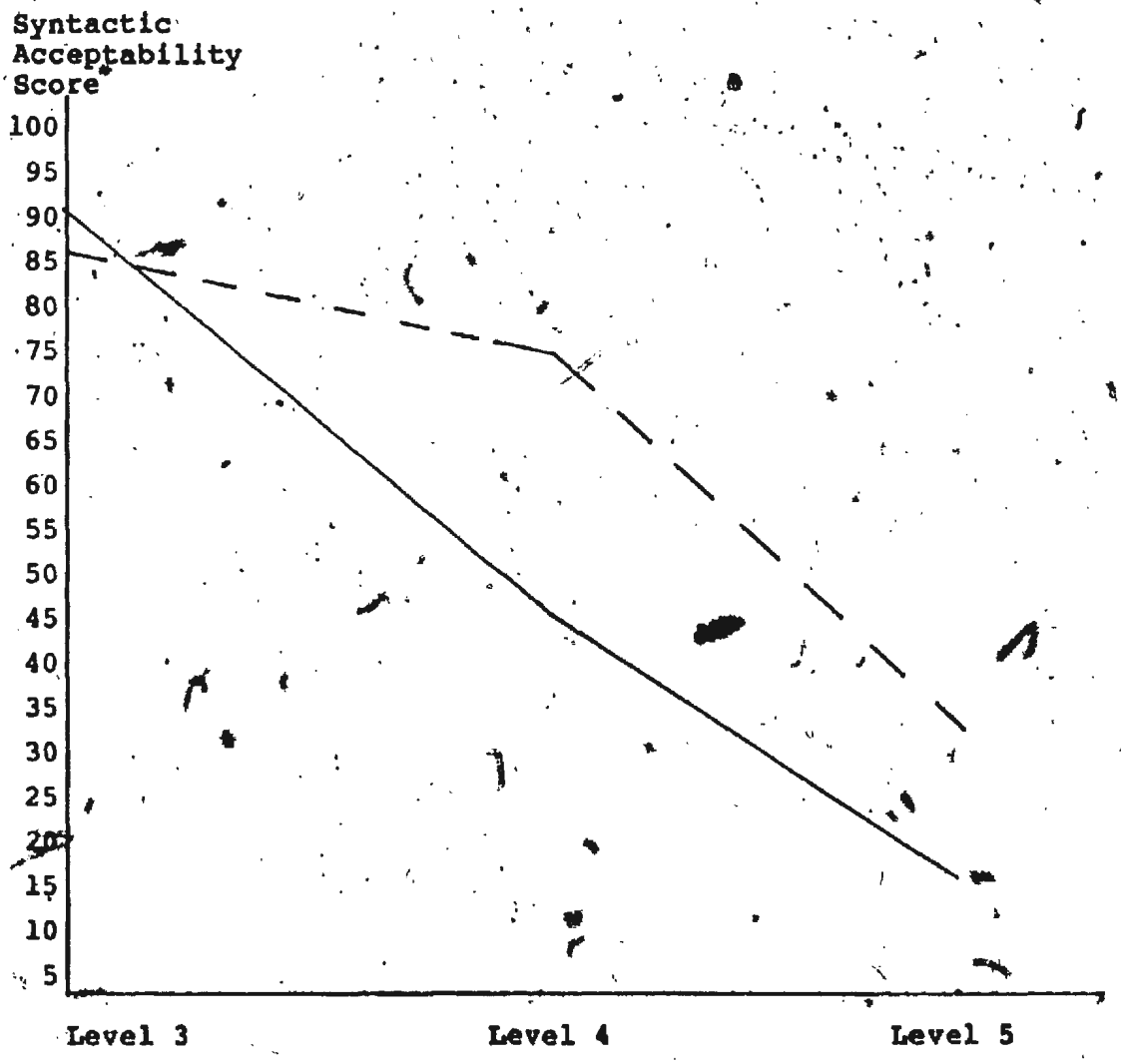
Graph Showing High and Low Comprehenders' Mean Phonemic Similarity Scores at Each Level of Difficulty (N=60)



KEY: Low-Comprehenders _ _ _ _
High Comprehenders _____

CHART 4

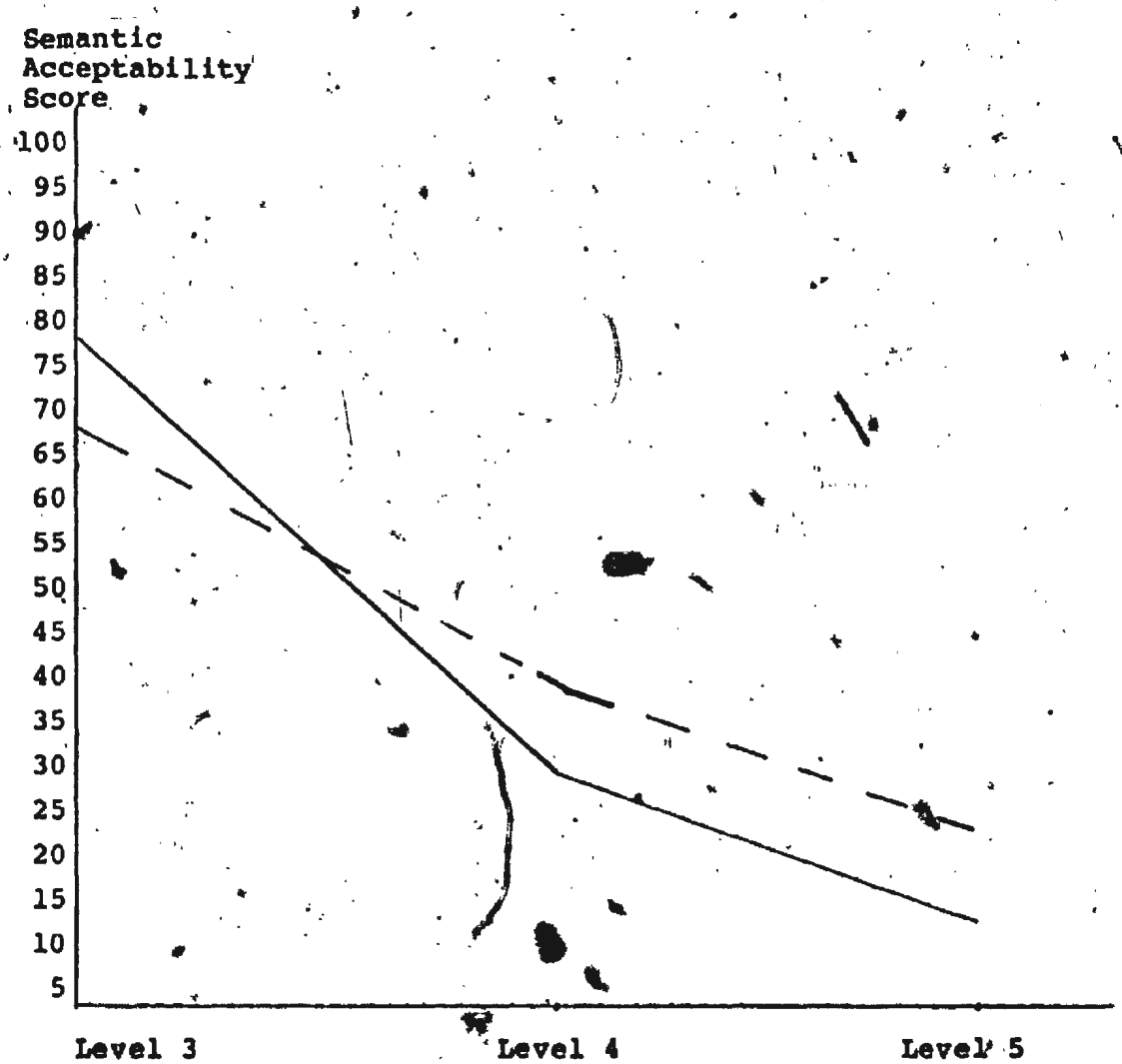
High and Low Comprehenders' Mean Syntactic Acceptability Scores at Each Level of Difficulty (N=60)



KEY: Low Comprehenders — — —
High Comprehenders ————

CHART 5

High and Low Comprehenders' Mean Semantic Acceptability Scores at Each Level of Difficulty (N=60)



KEY: Low Comprehenders — — —
High Comprehenders ———

TABLE 7

Mean Scores of High and Low Comprehenders At Each Level Difficulty for the Dependent Variables Graphemic Similarity, Phonemic Similarity, Syntactic Acceptability, and Semantic Acceptability (N=60)[a]

Graphemic Similarity

Comprehension Level	Level 3	Level 4	Level 5
Low	69.67	45.90	65.53
High	71.43	42.03	67.87

Phonemic Similarity

Comprehension Level	Level 3	Level 4	Level 5
Low	68.70	55.06	60.83
High	76.33	44.30	65.30

Syntactic Acceptability

Comprehension Level	Level 3	Level 4	Level 5
Low	81.40	69.60	32.27
High	89.27	48.03	21.67

Semantic Acceptability

Comprehension Level	Level 3	Level 4	Level 5
Low	69.80	36.90	15.57
High	78.17	28.00	12.80

[a]See Appendix 3 for descriptive statistics.

four, the actual grade level of the subjects at the time of testing, and rose again at level five, closely approaching the level 3 score.

It is interesting to note that low comprehenders' responses followed the same pattern, and were quite close to those of the high group, although their scores varied less across difficulty level. For each of the two variables, the low comprehenders' scores were lower than the high comprehenders' at levels 3 and 5, but higher at level 4.

The high comprehenders' semantic and syntactic acceptability scores decreased steadily as the level of difficulty of the reading material increased, thereby supporting the second portion of hypothesis seven. The results are displayed graphically on Charts 4 and 5, and numerically on Table 7.

Not surprisingly, the low comprehenders' scores decreased as well, and to the same degree. The relative performance of high and low comprehenders was the same for each of these two variables. At level 3, the mean score of the high comprehenders was greater, but at levels 4 and 5 the low comprehenders' mean score was higher.

The differences between the two groups was slight, with the exception of syntactic acceptability at level 4, where the difference was significant at the .0458 level, as can be seen from Table 2, row 2.25.

Hypothesis 08: As the level of difficulty increases, both high and low comprehenders will make increasingly fewer errors on violated sentences.

The results pertaining to this hypothesis were inconsistent. When reading the violated sentences both high and low comprehenders made the most errors at the lowest level of difficulty. However, the low comprehenders made the same number of errors at levels four and five, while the high comprehenders made more errors at the most difficult level than they did at level four. These results are displayed numerically on Table 8 and graphically on Chart 6.

Hypothesis 09: High comprehenders will correct a higher proportion of ungrammatical errors than will low comprehenders.

Analysis of variance results, shown on Table 2, row 2.33, provided no support for this hypothesis. From Table 9, it can be seen that while the largest difference between the two groups occurred in the category of corrections of unacceptable errors, and the difference was in the predicted direction, it did not reach significance.

The low comprehenders varied little in their correction of acceptable and unacceptable errors, whereas the proportion of unacceptable errors the high comprehenders corrected was more than twice the proportion of acceptable errors corrected.

Hypothesis 10: High comprehenders who read an inserted anomaly verbatim will be more likely than low comprehenders to change other words in the sentence in an attempt to render it meaningful.

The analysis of variance results, displayed in Table 2, row 2.35, provided no support for this hypothesis, suggesting that when each reader type becomes aware of the fact that the

TABLE 8

High and Low Comprehenders' Mean Scores on Violated Sentences at Each Level of Difficulty (N=60)[ab]

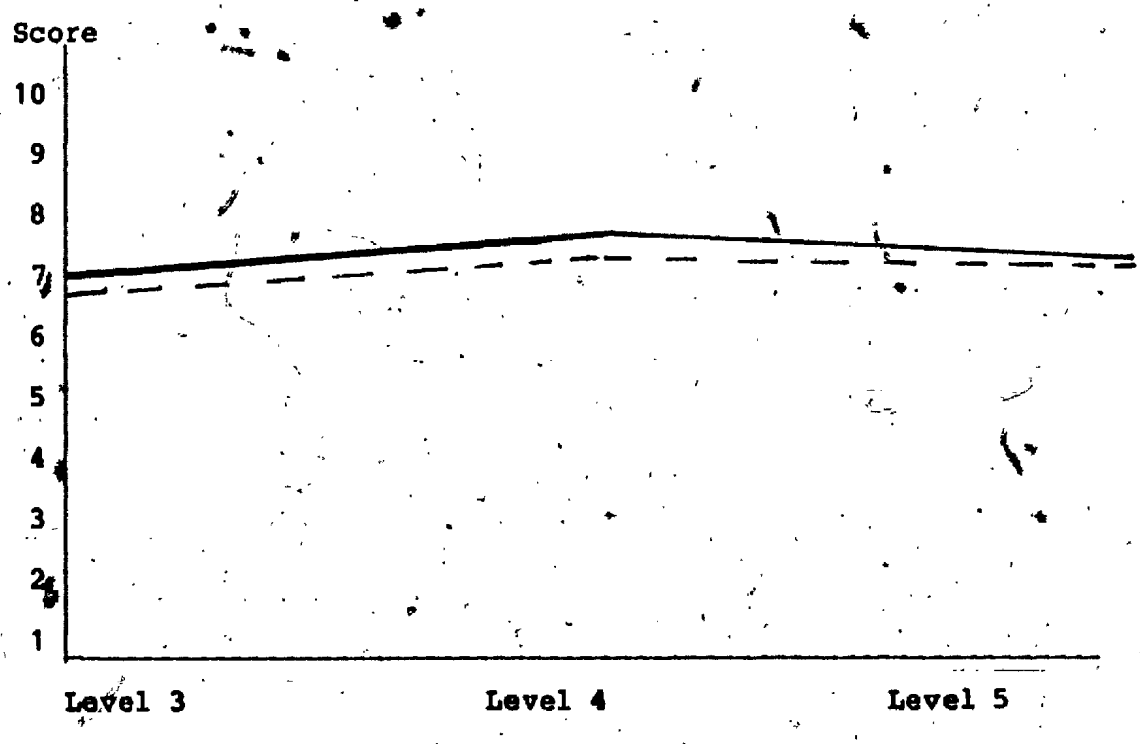
Comprehension Level	Mean Score on 10 Semantically and Semantically plus Syntactically Violated Sentences at Each Level		
	Level 3	Level 4	Level 5
Low (N=30)	6.83	7.23	7.23
High (N=30)	7.00	7.73	7.56

[a]See Appendix 3 for descriptive statistics

[b]Although the hypotheses and discussion refer to the mean number of errors made by each group, the scores presented in Table 8 represent the mean number of sentences read correctly (verbatim).

CHART 6

High and Low Comprehenders' Mean Scores on Violated Sentences at Each Level of Difficulty (N=60)



KEY: Low Comprehenders _ _ _ _
High Comprehenders _____

TABLE 9

Table of Means Showing High and Low Comprehenders' Percentage of Corrected Miscues (N=60)

Comprehension Level	Percentage of Total Corrections	Percentage of Acceptable Miscues Corrected	Percentage of Unacceptable Miscues Corrected
Low (N=30)	16.17	8.33	7.83
High (N=30)	17.93	5.00	12.90

reading is not proceeding satisfactorily, they either continue on, assuming subsequent processing will resolve the problem, or know when to stop, regress, and reassess the context.

Summary of the Findings

Of the ten hypotheses tested, only numbers one, three, and segments of numbers seven and eight were supported by the results of the statistical procedures.

1. High and low comprehenders could not be differentiated by their scores on normal and violated sentences. Good comprehenders were not shown by this measure to be more sensitive to linguistic constraints.

2. High and low comprehenders could not be differentiated by their scores on graphemic similarity, phonemic similarity, or semantic acceptability.

3. Low comprehenders' errors were significantly more syntactically acceptable than those of high comprehenders.

4. As the level of difficulty of the reading material increased, high comprehenders did not reveal an increasing dependence upon graphemic and phonemic cues.

5. The second portion of hypothesis seven was accepted. As the level of difficulty increased, the semantic and syntactic acceptability scores of both high and low comprehenders decreased.

6. Although when reading violated sentences both high and low comprehenders made the most errors at the easiest level, as expected, the subjects' scores did not increase steadily with the level of difficulty of the reading material.

7. High comprehenders did not correct a higher proportion of unacceptable errors than low comprehenders. However, the high comprehenders did correct more than twice as many unacceptable errors as ones which were acceptable in the sentence. Low comprehenders corrected slightly fewer unacceptable errors than acceptable ones.

8. Neither high nor low comprehenders attempted to make violated sentences meaningful by changing non-target words to compensate for the anomaly created by the violated word.

The features of reading behaviour identified by psycholinguistic theorists, prediction, utilization of grammatical knowledge, and lack of dependence on visual information, do not appear to differentiate high and low comprehenders.

While the results of this investigation did not follow the expected pattern, they do not necessarily contradict the psycholinguistic theory of reading nor are they necessarily inconsistent. Rather, the results suggest areas requiring further examination, research, and analysis.

A discussion of the findings will be taken up in chapter five.

Chapter 5

CONCLUSIONS, RECOMMENDATIONS, AND EDUCATIONAL IMPLICATIONS

Conclusions Arising from the Findings

The shift in emphasis from structuralist-descriptive to transformational-generative linguistic theory has had a profound effect on reading research and a significant influence on curriculum design.

Parallel developments in the field of reading have seen a turning away from the idea that a good reader proceeds methodically and accurately through the print to the notion that a proficient reader thinks as he reads, an apparently obvious point, yet one which is fundamentally contradicted by many approaches to the teaching of reading.

Psycholinguistic reading theory claims that on the basis of material already processed, a reader predicts in order to reduce alternatives and the number of decisions to be made about the nature of upcoming words and ideas. A good reader utilizes the natural redundancy of the language and his tacit knowledge of the rules of grammar to create hypotheses which are confirmed or disconfirmed by subsequent minimal attention to the visual array of letters, words, and phrases. According to top-down theorists, there is no need to identify each letter or even each word in order for accurate comprehension to take place, in fact, Smith (1973) claims comprehension <u>is</u> prediction, that comprehension must precede the identification of individual words.

The psycholinguistic theory accounts for many

observations arising from reading research as early as 1885. Brewer (1976) reports research findings in which words in prose passages can be read almost as fast as lists of letters, the immediate visual apprehension span for letters in prose is much greater than for random letters, latencies to initiate pronunciation of words are shorter than those for letters, and visual recognition thresholds for words are lower than thresholds for letters.

It is out of the psycholinguistic theory of reading that the hypotheses for this investigation arose. If prediction, utilization of contextual information to form hypotheses, lack of dependence upon visual information, and linguistic awareness are the salient features of skilled reading, then it was expected that readers whose comprehension test scores were high would exhibit greater evidence of top-down processing as they read specially designed sentences than would readers whose comprehension test scores were low.

Support for these ideas comes not only from theorists, but researchers as well. In a survey of the studies conducted in this area, Golinkoff (1975-1976) found that good comprehenders possess rapid and accurate word recognition skills, read in phrase-like units, are flexible in their pattern of reading, and made fewer uncorrected grammatically unacceptable errors. Poor comprehenders tended to read in a word-by-word fashion with a minimum of text organization.

In this investigation, it was expected that when sentences had words substituted which rendered them anomalous,

good readers, efficiently reading according to the principles described by the psycholinguistic model, would unconsciously overlook the anomalous insertions, substituting words appropriate to the meaning and syntax of the material. Further, it was expected that good readers' substitution errors would provide additional evidence of conceptually-driven reading behaviour.

The hypotheses were formulated as follows:

1. There will be no difference in the performance of high and low comprehenders reading unviolated sentences.
2. High comprehenders will make more errors than low comprehenders on violated sentences.
3. High comprehenders will make more errors on violated sentences than on those which have not been altered.
4. Type of sentence will not affect the number of errors made by low comprehenders.
5. High comprehenders' substitution errors will bear a lower degree of graphemic and phonemic similarity to the target words than those of low comprehenders.
6. High comprehenders' substitution errors will be semantically and syntactically acceptable in the context of the rest of the sentence whereas those of low comprehenders will not.
7. As the level of difficulty increases, high comprehenders' substitution errors will reveal an increasing dependence upon graphemic and phonemic cues, and a corresponding decreasing reliance upon semantic and syntactic information.
8. As the level of difficulty increases, both high and low comprehenders will make increasingly fewer errors on violated sentences.

9. High comprehenders will correct a higher proportion of ungrammatical errors than will low comprehenders.

10. High comprehenders who read an inserted anomaly verbatim will be more likely than low comprehenders to change other words in the sentence in an attempt to render it meaningful.

The findings of the data analysis did little to shed light on the many issues selected for examination, as high and low comprehenders shared nearly all facets of reading behaviour chosen for observation.

Both groups responded to inserted semantic and syntactic anomalies in the same way, with no significant difference between their performance on each of the sentence types, and both groups' scores across sentence types were similar. There was no significant difference between the two groups on the measures of graphemic similarity, phonemic similarity, or semantic acceptability of miscues, correction of ungrammatical miscues, and readings of unaltered portions of the sentence. Level of difficulty affected each group equally. These results, described in detail in chapter four, suggest that both high and low comprehenders are equally sensitive to linguistic cues, but do not necessarily demonstrate that all readers rely on grammatical information to facilitate word recognition.

While several studies have found that good and poor readers cannot be differentiated by their performance on tests of aspects of linguistic awareness or use of context (Alligton and Fleming, 1978; Allington and Strange, 1968b; Cioffi, 1982;

Hutson et al., 1980; Merrill, Sperber, and McCauley, 1980; Schvaneveldt, Ackerman and Semlear, 1977; Schwartz and Stanovich, 1981; Weber, 1970), the fact that in this investigation both groups read approximately three-quarters of the violated sentences verbatim (see Table 3) detracts from the strength of such a claim in this case. The subjects did not appear to create expectations of sufficient power to have led them to substitute meaningful words for the violations.

Additional weight could have been expected from the measure of graphemic and phonemic similarity and semantic-syntactic acceptability tested in hypotheses five and six. However, the mean scores of these variables displayed on Table 4 indicate a lack of support for this supposition. A moderate percentage of the high and low groups' errors were syntactically acceptable, sixty-eight percent and fifty-nine percent respectively, but less than half of the errors of each group were semantically acceptable. These results, especially when combined with the finding that two-thirds of the errors of each group were graphemically and phonemically similar to the original words, do not necessarily lead to the conclusion that either good readers or all readers primarily utilize top-down cueing strategies. The subjects in both categories actually appeared to be more conscious of the visual features of the target words than of their grammatical characteristics. The hypothesis that reliance upon syntactic cues is indicative of proficient reading was refuted by the fact that one of the very few findings of this study which achieved significance was that low comprehenders'

errors were more syntactically acceptable than those of high comprehenders.

It was expected that as the level of difficulty increased, the high comprehenders would find it more difficult to grasp the underlying semantic and syntactic structure of the reading material so that they could generate hypotheses about upcoming words, having instead to resort to more closely inspecting the grapho-phonic properties of the printed words.

The miscues of both good and poor readers reveal that conceptually driven processing did become more difficult as the reading material increased in difficulty (see Table 7, and Charts 4 and 5). This agrees with the findings of a study by Schwantes (1982) who found when grade three subjects read stories with a higher readability level than their own, there was a reduction in the context effect.

The higher level stories could be expected to contain more complex vocabulary, clauses, ideas, and concepts, inhibiting the reader's ability to quickly process what he has read in order to predict what is to follow. As a result, at the highest of the three levels tested, the miscues indicate that the subjects had very little awareness of the grammatical class or the underlying meaning of the target words.

Both high and low comprehenders' miscues show very little difference in the use of the data based cueing strategies as the level of difficulty increased, and, in fact, readers relied most heavily upon graphemic and phonemic information

while reading the easiest material, the reverse of what was expected, at least in the case of the high group.

The similar results obtained on both the graphemic and phonemic similarity measures tested under hypothesis seven suggest that graphemic and phonemic factors are highly related. This was borne out by the positive correlation ($r=.60$, Table 5) calculated for these two variables.

The results show that both good and poor readers appear to be less reliant upon bottom-up processing when the reading material is matched to their word recognition level and grade placement. When the material is either easier or more difficult the subjects required more information from the actual print to identify words.

The finding from hypothesis six, that low comprehenders' errors are more syntactically acceptable than those of high comprehenders, is congruent with the results of a study by Allington (1978). When high and low readers orally read a story and the words of that story in random word order, it was found that good readers relied more on syntax for fluency whereas poor readers relied more on syntax for accuracy.

The most interesting, and the most discriminating finding of this investigation was one related to hypothesis nine. While the hypothesis itself, that high comprehenders would correct a higher proportion of ungrammatical errors than low comprehenders, was rejected, it was found that high comprehenders corrected more than twice as many ungrammatical errors

as ones which were acceptable, whereas low comprehenders corrected approximately the same proportion of each type.

These results imply that good readers aspire to attain a grammatical rendering of the text. If, by uttering an anomalous word, they create a sentence which violates their implicit sense of linguistic propriety, they are more likely to right the situation than when the error is grammatically acceptable.

Bearing two factors in mind, firstly, that high and low comprehenders could not be differentiated by their performance on most other measures of their awareness of linguistic constraints, and secondly, that many of the corrections of ungrammatical miscues were actually corrections on words which were part of an ungrammatical, violated sentence, these findings point to an interaction between top-down and bottom-up processing.

While good and poor readers both utilize linguistic skill as they read, the good reader is able to quickly obtain additional information which signals that a mistake has been made and a correction is necessary. Visual information must indicate the necessity for rejection of the reader's hypothesis. He likely regresses, visually examines the words he has read, discovers the discrepancy, and utters the "corrected" word even though it may, in the case of this study, render the sentence ungrammatical.

Discussion

High and low comprehenders' reading of incongruous material differed only when there was a discrepancy between an utterance and the print. High comprehenders appear to be able to integrate essential information from varying sources more efficiently than low comprehenders.

When low comprehenders utter an anomalous sentence, its actual nature has no effect on their subsequent reading. High comprehenders are able to gain additional visual evidence which either verifies the correctness of the anomalous utterance or points to the need to correct a discrepancy between the print and the previous rendering of it.

There are several studies which lend support to the idea that the ability to quickly scan for and process visual information and integrate it with information from other sources is characteristic of proficient reading.

Allington and Strange (1977) had grade four subjects read a passage in which words which had been altered maintained the configurations of the originals. They found that good readers responded with the altered word forty percent of the time while poor readers responded twenty-seven percent of the time; both groups at times ignored the syntactic and semantic constraints and responded instead to the graphic information; poor readers were more likely to respond with a contextually appropriate word than good readers, ignoring the graphic information; and more than half the initial responses to target words were the originals, showing that both groups were sensitive to

contextual information. The researchers concluded that a good reader could be distinguished from a poor reader by the relative efficiency with which varying information sources could be tapped integratively.

Allington and Strange (1968) provided subjects with sentences containing blanks, while letters of the omitted words were subsequently supplied as required. They found that more skilled readers were able to use graphic information in conjunction with contextual restraints more efficiently. Murray and Maliphant (1982) found that readers with a high word recognition score were able to use context more effectively. Samuels, Begy, and Chen (1975-1976) found that good readers were superior when given a context and partial visual cues, and were better aware of having made an error.

The Instrument

The nature of the differences between the findings of this investigation and that of Isakson and Miller (1976) is both interesting and surprising. Unlike this investigation, in which there were no significant differences, in the predicted direction, at any rate, the Isakson and Miller (1976) study found high comprehenders showed a significant increase in errors across sentence type, and high comprehenders made significantly fewer errors on normal and semantically violated sentences than did low comprehenders. On semantically and syntactically violated sentences there was no difference in the number of errors made by either group.

At the very least, the research design appears to be

unreliable. It is interesting to note that the places where significant comparisons were found in this study, the measures of the effect of level of difficulty on the semantic and syntactic acceptability of readers' errors and the correction of those which were unacceptable, were less conditioned by the instrument than the measures related to reaction to sentence type.

There have been studies which have employed a version of the disruptive effect, and have achieved significant results. When good and poor grade four readers were instructed to read for meaning a story containing graphemically similar substitutions, Schwartz and Stanovich (1981) found subjects transformed ninety percent of the altered words.

Thompson (1981) created low semantic constraint passages by switching words around in a normal reading book series story so that the resulting passage was syntactically acceptable and contained the same words as the normal passage from which it was derived. The errors of the grade three subjects were found to be greater for the violated passages than normal ones, and the passages with low semantic constraints were read more slowly than normal ones.

Winograd and Johnston (1982) constructed ambiguous paragraphs on either a church or circus theme so that there was a single reference to either in sentence six and an anomalous sentence as sentence eight of the passage. Twenty grade six students of high and low reading ability, given either no preparation or material related to one situation of the other,

were asked to orally read the passage. When they were asked probe questions to discover whether they had noticed the anomaly, good readers performed better than poor readers, but the schema preparation had no effect on error detection.

In spite of the efficacy of the disruptive effect in the above cases, it does seem to be somewhat flawed, especially when used in a design in which subjects are required to read orally a set of unrelated sentences.

Firstly, readers likely approach printed material with a bias that it will be semantically and syntactically correct. On discovery that errors are present, they may very well use different strategies than they would reading unviolated material.

Secondly, use of the sentence disruptive effect to discover the effect of contextual constraints may be invalid because of a lack of sufficient context to generate predictive behaviour.

Thirdly, the unnatural reading situation may influence readers to attend more carefully to the actual print. This certainly seemed to be the case in this investigation, as both high and low subjects' errors bore a high graphemic and phonemic similarity to the target words, a finding which was not affected by the level of difficulty of the material.

Most reading occurs under conditions in which: the reader likely has some expectation of the nature of the material to be read; the material consists of at least several sentences related on a common idea; and, the reader is permitted to peruse

the print in his own manner as he reads it silently. In this investigation, as in many others previously cited, readers were brought to a room other than their familiar classroom, and introduced to a stranger who informed him/her that he/she had been selected to participate in a reading experiment. They were then presented with isolated sentences typed on file cards, and told to read them orally. It is a moot point, then, that the resulting reading strategies were representative of those used under more typical conditions.

Winograd and Johnston (1982) list several additional points relevant to this study which question the validity of what they term the "error detection paradigm":

> 1. Readers' lack of relevant background may cause him to overlook the error.
>
> 2. Readers, especially the young, may suspend disbelief because they have read much that is unbelievable.
>
> 3. Subjects may be hesitant to be critical of an experimenter in the testing situation.
>
> 4. Subjects may assume the writer made a mistake and ignore it.
>
> 5. Subjects may notice the error but assume that subsequent information will resolve the problem. (71)

They add to this list three limitations of error detection tasks, one of which is appropriate to this study, that there is a difficulty in determining which of the reasons cited above is responsible for poor performance on the task.

Criticism of oral reading error analysis can be added to that of the error detection design. Leu (1982) describes several weaknesses of the method, such as the difficulty in distinguishing which of several information sources was used in

the case of multiple-source errors. For example, when a miscue is both semantically acceptable and phonemically similar to the original word, it is not possible to judge which cueing strategy triggered the error. He also points out the general insensitivity to the effects on error patterns resulting from the type of instruction the subjects have experienced. In this study all the subjects followed the same instructional reading program, but this presents the problem of limiting the generalizability of the results.

Studies Supporting Ideas Contrary to the Hypotheses

Perhaps the instrument is the cause of the significant discrepancies in the research in the field of utilization of contextual constraints in word recognition and comprehension. While the body of research cited in this paper supports the position that better readers utilize contextual cues to facilitate word recognition, other studies have reached the conclusion that good readers are less reliant on contextual than visual information, while poor readers rely more on semantic and syntactic cues than on grapho-phonic sources.

Stanovich (1980) proposed another explanation: Experiments in which subjects are given unlimited time to provide evidence of having utilized contextual information are not representative of normal reading. The results of studies which show poor readers are more reliant on context occur because they have slower word recognition times which permit contextual facilitation to result from a conscious-attention mechanism (the cognitive activity required is described in

technical detail which need not be reported here) as well as an automatic activation mechanism. Good readers' word recognition occurs so quickly that the target word can be named before the conscious-attention mechanism is required.

In a study cited previously, Allington (1978) found poor readers rely more on syntax for accuracy than good readers.

Allington and Fleming (1978) found that when subjects were asked to read passages containing altered high frequency words in context, there was no difference between the groups. However, when the words were randomly ordered, the good readers were significantly more accurate on recognition without the context than poor readers. The good readers performed similarly under both conditions whereas the poor readers' accuracy dropped off considerably in the absence of contextual information.

In the Allington and Strange (1977) study cited previously, in which words in a passage were altered but their configurations maintained, good readers were shown to be more reliant on the visual information than poor readers in that they responded with the altered words more often than did poor readers, and poor readers were more likely to respond with a contextually appropriate word than were good readers. This finding runs contrary to expectations arising from psycholinguistic theory, but not necessarily to its underlying assumptions. Because use of context is thought to facilitate word recognition, use of well developed visual cueing strategies or an interaction between top-down and bottom-up approaches is not

automatically antithetical to fundamental psycholinguistic ideas.

In a study requiring grade two and grade four subjects to decide whether pairs of words were associated, unassociated, a word and a non-word, or two non-words, Schvaneveldt, Ackerman, and Semlear (1977) found that poorer readers use at least as much semantic context as better readers.

Stanovich, West, and Feeman (1981) devised an experiment in which twenty-four grade two subjects read sentences which were divided into two parts, the context and the target word, which was always the last word in the sentence. There were three conditions: congruous context, incongruous context, and no context, in which the target words were preceded by "the". Subjects were required to pronounce the target words as they were projected from slides. They found that there was a high negative correlation between reading ability and context use, and that the magnitude of the context effect declined through the school year.

Several other studies found that context effects decline with increasing age of the subjects (Schwantes, 1981a; Schwantes, 1981b; West and Stanovich, 1978).

Biemiller's (1970) study offers a fascinating insight into the strategic use of contextual and visual information. Using two classes of grade one students, Biemiller studied their oral reading behaviour throughout their first year of reading instruction. Observers sat in on reading groups and recorded errors on transcripts.

At the beginning of the year, the subjects' errors showed a heavy reliance on contextual cues, hardly surprising, as they were still likely to be basing their reading on their oral language experience. The first month in which fifty percent of reading errors were of the "no response" type was taken to be the beginning of the "no response phase". Biemiller found that: those who remained longest in the pre-no response phase were the poorest readers; there was a large and significant increase in the percentage of graphically similar substitution errors among the response errors occuring in the no-response phase; the earlier a child moved into the no-response phase the better was his reading performance at the end of the year; and in the post-no-response phase substitution errors became both more contextually and graphically constrained.

The results of Biemiller's (1970) study suggest that good readers are able to become proficient in bottom-up processing skills and find their use efficient. Poor readers lack of development of visual processing skills offers them no choice but to continue to rely upon contextual information.

It is Stanovich's (1980) position that a process at any level can compensate for deficiencies at any other level.

> The issue is whether good readers have a greater tendency to use contextual redundancy to facilitate ongoing word recognition, not whether given virtually unlimited time, good readers can make better predictions....The question is not whether the good readers have better predictive abilities, but whether they are actually more prone to rely on such abilities to speed word recognition. (45-46)

Stanovich (1980) argues that a good reader is utilizing his cognitive capacity for comprehension processes, such as integrating new information with old, but for word recognition he uses physical cues, achieving results more quickly than if he utilized a conscious-prediction context-based strategy. However, he made a distinction between conscious prediction processes, which are necessary only when bottom-up word recognition processes are slowed either because of developmental immaturity or inadequate stimulus information, and automatic activation, through which context acts to speed word recognition in the fluent reader.

Smith (1973) argues that comprehension precedes word recognition. Holmes (1973) supports this position, claiming reading would simply proceed too slowly for comprehension to take place if each word had to be identified.

The two contradictory positions on the role of contextual and visual information presented here appear to represent stages in an ongoing dialectical process of reading theory development. Theories in which letter and word recognition necessarily precede comprehension were supplanted by those which claim the reverse (Smith, 1971; Goodman, 1976). A synthesis between these extremes is implied by the work of Rumelhart (1977) and also Stanovich (1980), in that they are suggesting an interaction between the use of both sources of information. Stanovich's (1980) position is that a deficiency in the ability to use top-down processes, either because they are not well developed in the reader or because insufficient contextual

information is available, will result in the use of bottom-up strategies.

However, Goodman (1981) labeled Stanovich's (1980) model as being of the bottom-up type as it assumes accurate word recognition is a prerequisite to comprehension. Goodman labels his own psycholinguistic model as being, in fact, interactive, in that it requires the interactive use of grapho-phonic, syntactic, and semantic cues to construct meaning.

Thompson (1981) is critical of the Stanovich position on several counts, including the point that although the Stanovich (1980) model is consistent with evidence that a good reader is more reliant on context-free decoding, it is not sufficiently explained why this should be so.

Case Studies

Throughout this report doubt has been cast upon the validity of the assumptions of top-down reading models, bottom-up reading models, the use of the disruptive effect and of oral reading error analysis. Further, the findings of the data analysis performed on the subjects' responses to the assigned task in this investigation did not resolve the questions implied by the hypotheses.

For these reasons, it was thought that a closer examination of several of the subjects' reading would facilitate an understanding of the processes involved as the high and low comprehenders tackled the oral reading of normal and anomalous material. The researcher again listened to the recordings of four of the subjects, two of whom scored at the higher end of

the range of comprehension scores, and two of whom scored at the lower end. These subjects have been assigned fictitious names.

Anne

Anne's grade equivalent comprehension score was 7.2.

It was clear, from listening to Anne read that she is reading for meaning. She read the unviolated sentences smoothly and with appropriate intonation, except when she came upon a word she did not know.

Example: A42 And you can need for the shots at the counter on the way out.

In this violated sentence, "need" was substituted for "pay."

Anne read the first three words with confidence, paused, and regressed to the beginning. The sentence was read again, with the disruption uttered verbatim.

It appears that when Anne came upon the word "need," she realized it was incongruous with what she had read. She spent time reassessing the situation, likely looking at "need" and the first words of the sentence again, and made another attempt. The final reading was read with confidence, as Anne had made certain "need" was in fact printed on the file card.

The pause and subsequent regression, typical of her approach to anomalous material, indicate that Anne was aware of the fact that something was amiss, but the conventional oral reading analysis proves inadequate in its ability to demonstrate what the reader is actually doing. As the altered word was read verbatim, Anne's awareness of it did not appear as an error or a

correction. As no other words in the sentence were changed, there was no entry on the data scoring sheet under "CHNEG" or "CHPOS".

Anne appeared to be attempting to make sense of the sentence. Having reexamined the print, confirming that the anomaly was actually present, she was prepared to read the sentence fluently.

Example: B23 Hammer and nails eyes next, with many other things.

In this semantically and syntactically violated sentence, "eyes" was substituted for "came."

Although pausing just before the violated word "eyes", Anne read the violation verbatim and without regression, but read the second half of the sentence with a tone of uncertainty, and read "with" a second time. She read as if she expected successive reading to resolve the conflict between what she had read and what she knew to be acceptable.

Example: C32 All you need to do is wonder the combinations.

In this violated sentence, "wonder" was substituted for "remember".

In this case, Anne read the violated sentence without any hesitations until just before the final word, probably because, not knowing the word "combinations," she needed to direct her attention there.

Example: B51 Soon there was a clearing all the way round the cabin.

It is interesting to note that when Anne encountered this unviolated sentence, having experienced the two disrupted

versions previously and having unsuccessfully struggled to make sense of them, she read this version hesitantly, as if she expected to come upon an anomaly.

Anne's reading was consistent throughout the assignment. On twenty-two of the thirty disrupted sentences Anne made significant pauses just before or after encountering a violated word, while the normal sentences, except in the case described above, were read fluently.

Bert

Bert's grade equivalent comprehension score at 6.1 was also at the top end of the range. His reading pattern was similar to Anne's.

However, six times he changed other words in the sentence so that the effect of the anomalous character of the insertion was neutralized.

Example: C22 "Larry, you really begin talent," she said, putting his work on display.

In this violated sentence, 'begin' was substituted for 'have'.

Bert had read 'talent' with the accent on the last syllable in his previous two encounters, indicating the word had been sounded out but without benefit of its meaning. In this case, he made a slight pause after 'begin', the disrupted word, then substituted 'tattling' for 'talent', creating a sentence which was more acceptable.

Bert made significant pauses just before or after the altered word on twenty-three of the thirty disrupted sentences,

while the normal versions were read without hesitation. Six times Bert regressed after the stop and repeated the entire portion of the sentence up to and including the violation, as if to make certain what he thought he saw was actually there. Seven times Bert's reading of the disruption or the word following it were read very slowly, suggesting he was trying to gain time in an attempt to resolve the apparent problem.

In general, Bert appeared to be puzzled on encountering nearly all of the violations, yet when he made efforts to recheck the material and discovered the anomaly did exist, he was able to confidently carry out his reading of subsequent portions of the sentence.

Carl

Carl's grade equivalent comprehension score of 2.1, fell at the lower end of the range, and is two years below his grade placement.

Carl's pace was much slower than that of the two good comprehenders, but his reading was even. He read carefully, as if he wanted to master each word before proceeding on to the next, and he made very few errors on the overall task.

He made only five pauses while reading the thirty violated sentences. These were noticeably shorter than those of the good comprehenders, and four of them occurred before the violation. Carl's reading was not ahead of his thinking to the extent that he would utter the altered word first, then realize there was an incongruity. In several cases when he did not pause, the disrupted word was read without the proper intonation

evident in the rest of his oral reading, indicating an awareness of the insertion. Carl displayed an awareness of linguistic constraints as the following examples show:

C33 All you need to do is morning the combinations.

In this doubly violated sentence, "morning" was substituted for "remember". Carl changed "is" to "this," made a long pause before "combinations", and made several attempts at pronouncing the first syllable before getting the word right.

A33 I'll was the needle ready.

In this semantically and syntactically violated sentence, "was" was substituted for "get". Carl read the sentence as follows: "I'll...I'll will...I was the needle ready."

Syntactic considerations appear to be foremost in each of these cases as Carl attempted to make sense of the material. In three other instances, Carl changed the target word. In each case, the substitutions were appropriate syntactically but only once was the replacement semantically acceptable as well.

Carl's reading of the following sentence was typical of his approach to violated sentences:

B22 Hammer and nails cleared next, with many other things.

In this violated sentence, "cleared" was substituted for "came". "Next" was read more slowly than the other words, but otherwise the sentence was read evenly and with appropriate intonation.

In the following example of a violated sentence in which "begin" was substituted for "have," Carl indicated his

awareness of the anomaly by reading "begin talent" slowly and in a higher pitched monotone than the other words.

C22 "Larry, you really <u>begin</u> talent," she said, putting his work on display.

In not one case did Carl stop after reading an anomaly and reread the entire sentence, and only once did he repeat the target word.

<u>Debra</u>

Debra's grade equivalent comprehension score of 2.5 placed her at the lower end of the range. Her reading was the least fluent of the four cases selected for further study here. A few sentences were read smoothly, but usually words were pronounced slowly and carefully, and many were repeated, even in unviolated sentences or clauses.

Debra, like Carl, read the anomalous words much more slowly than others in the sentence in nearly every case. On only seven of the violated sentences did she pause just before or after encountering a target word, and these pauses, like Carl's, were less noticeable than those of the good comprehenders because of the more halting reading style.

In only two cases did Debra repeat an altered word in order to attempt to correct an anomaly, and in only one of these cases did she repeat the entire phrase, unlike the good comprehenders who appeared to need the preceding context to assist them in sorting out the apparent incongruity. The good comprehenders actually repeated aloud the relevant portions of the sentences nine and six times respectively, but their long pauses

before and after the disrupted word, occurring in nearly every instance, suggest that they were rereading silently.

Debra's reading of the following semantically and syntactically violated sentence in which "they" was substituted for "take," clearly shows her susceptibility to linguistic cues.

B13 "I thought you might like to they turns with the cooking," Mrs. Wilson said.

Debra first replaced "they" with "take", doing what the hypotheses predicted the good readers would do, substituting a word which was more acceptable. In this case, it was in fact the original word. She later corrected the error without the benefit of re-reading the context.

Debra sometimes uttered the altered word before noticing a discrepancy, but in general her oral reading suggests she has a short eye-voice span, and she does not read for meaning in phrasal units.

A more typical example of her reading behaviour can be seen in her reading of the following violated sentence in which "wished" was substituted for "teamed".

C52 That afternoon Larry and Brad wished up as they never had before to win the game.

Although Debra displayed no signs of having difficulty, nor did she hesitate before pronouncing any of the words, her reading was not fluent. She made a slight pause just before 'wished,' but read the word itself without error.

Throughout the exercise, Debra coped with the anomalous sentences either by pausing just before the violation or by

saying the word very slowly. Her intonation was often inappropriate.

Case Study Summary

Both the good and poor comprehenders displayed an awareness of the anomalous insertions, but each group dealt with the situation differently.

The high comprehenders' reading was marked by a good pace, appropriate intonation, pauses just before or after the altered word on nearly all the violated sentences, and repetitions of the relevant portions of many of them.

The low comprehenders' reading speed was considerably slower, their style more halting, and their intonation often inappropriate. Their preferred method of treating anomalous material was to slowly pronounce the altered word, but sometimes they paused before or after it. Their pauses, when they occurred, were much shorter than those of the good comprehenders.

The good readers appeared to employ the context in an attempt to render the anomalous sentences meaningful. The poor comprehenders appeared to be attempting to resolve the anomalies by looking carefully at the incongruous word alone.

This unscientific yet careful examination of the reading of these four subjects raised some questions while answering others. Reading speed appears to be significant, but it is not clear whether the cognitive processes at work affect the readers' pace, or if the readers' pace restricts the type of cognitive activity permitted. The role and limits of the short

term memory may be significant, as may the organizational component of the long term memory. Unfortunately, current systems of oral reading analysis do not take reading speed into consideration.

Reading is obviously a complex cerebral activity which is difficult to describe even under quasi-experimental conditions. The points on which the two reader types differed were able to be measured, yet the mental processes which prompted their disparate behaviour remain unknown.

The good readers seem to be integrating new and old information as they read. They realize quickly that the anomalous word presents a problem, and they appear to take time to seek assistance from the material read previously.

The fact that poor comprehenders read the altered words more slowly than the others indicate they are equally sensitive to a violation of linguistic constraints.

General Conclusions

The hypotheses of this study, grounded in psycholinguistic theory, suggested that because utilization of contextual information to reduce the amount of visual imput necessary to achieve comprehension is a feature of proficient reading, then good comprehenders would demonstrate a reliance primarily on contextual cues to identify words. This reliance was expected to manifest itself in several ways: 1) the good readers would create such strong predictions about the upcoming material that they would unconsciously overlook deliberately inserted anomalous words; 2) good readers would make substitution errors which

would be semantically and syntactically acceptable but not phonemically or graphemically similar to the target words; and, 3) good comprehenders would correct a higher percentage of ungrammatical miscues than poor comprehenders.

Poor comprehenders were expected to be less dependent on the context as demonstrated by a tendency to detect the presence of altered words, but when substitution errors were made, they were expected to be graphemically and phonemically similar to the original words.

In fact, the good comprehenders were shown to be better users of both contextual and visual information than the poor comprehenders, at least under quasi-experimental conditions.

The error analysis demonstrated that good and poor comprehenders' reaction to the utterance of anomalous words differed only when the anomaly was actually present in the print.

When this was not the case, only the good readers made a correction, even though the resulting sentence may have been of the violated type. The corrections must have been made on the basis of visual information, as contextual information was incongruent, and would have led to a grammatically acceptable substitution. It was found that good and poor comprehenders were equally sensitive to linguistic cues.

The observations arising from the case studies showed how good readers are also more reliant on contextual information. While both reader types displayed an awareness of the

contravention of linguistic rules by making significant pauses before or after a target word or by saying the word more slowly, only the good comprehenders repeated preceding portions of the sentence in order to resolve the difficulty. The length of their pauses suggest that even when they did not repeat the context aloud, they were reviewing it silently.

Observations from the case studies helped to resolve a problem which arose from the oral reading error analysis. The findings of the latter suggested that good and poor comprehenders were equally sensitive to semantic and syntactic cues, but as nearly three-quarters of the violated sentences were read verbatim the observation was shrouded in doubt. The evidence that both the high and low readers treat anomalous words differently from others in the sentence lends support to the original claim, and shifts the doubt to the efficacy of the instrument. It appears that the unrelated sentences did not provide sufficient context to enable readers to demonstrate their ability to utilize context to facilitate word recognition.

It may be, however, that until the act of reading is more clearly understood, research results will continue to illustrate the apparent paradox that while good readers are better at exploiting context cues, context effects are most notable with poor readers (van Dijk and Kintsch, 1983). As in this investigation, Carr (1981) found that many recent studies show good readers to be better at both top-down and bottom-up processing, rather than having well developed abilities in one

However, the substantial problems which surround the use of the disruptive effect suggest that even with modifications, more reliable and valid results would be obtained through an alternative design.

Educational Implications

As good readers were shown to be better users of both contextual and visual information, reading instruction ought not to sacrifice one for the other.

Smith (1978) argued that the complexity of the spelling-to-sound correspondences render phonics instruction unreliable; that phonics requires reading from right to left, that is, the pronunciation of letters is determined by those which come next; that phonics works if you know what the word is likely to be in the first place.

Although both good and poor readers were shown to utilize phonemic information, its source was not revealed. Knowledge of letter sounds may have been the result of direct phonics instruction or indirect learning from exposure to meaningful reading material. Similarly, the subjects' utilization of graphemic information may have resulted from flash card drills or frequent opportunities to read the same words in sentences. Ability to utilize contextual cues almost certainly was developed indirectly from reading experience.

While instructional methods are not specifically indicated by the findings, an awareness that good readers employ varying strategies and sources of information integratively should suggest to teachers that students will benefit from the development of both top-down and bottom-up abilities.

area at the expense of the other. Thus, as van Dijk and Kintsch (1983) point out, there are well designed studies which have shown good readers to be better users of context, good readers not to be reliant on the context, and poor readers to be most reliant on the context.

> ... people actually do all these diverse and contradictory things... people will do almost everything and its opposite given the right conditions. A theory, therefore, has to take into account this diversity and be ready to explain X as well as not-X. It is nonvacuous insofar as it specifies the precise conditions under which X and not-X occur, or under which an observation is evidence for X or its opposite. An observation may have many causes and it may confirm X under some circumstances and not-X under others. Theories have to be complex because the world is complex, but they must not be arbitrary. (27)

Discovering the ways in which readers exploit available information and integrate it with existing knowledge is still the challenge it was in Pillsbury's time.

Suggestions for Further Research

The good readers appeared to use the two sources of information integratively, but the processes involved remain a mystery. The data arising from this study do not reveal whether there is a continuous switching back and forth nor what cues would prompt a change of approach; whether one strategy is preferred until it proves to be ineffective; or whether one necessarily precedes use of the other.

More studies in which altered words are constructed so that the configuration of the original word is maintained could be illuminating, but only if sufficient and typical context were provided so that the effects of each source could be compared.

BIBLIOGRAPHY

Allington, Richard L. Effects of contextual restraints upon rate and accuracy. Perceptual and Motor Skills, 1978, 46, 1318.

Allington, Richard L. & Fleming, James T. The misreadings of high frequency words. Journal of Special Education, 1978, 12, 4, 417-421.

Allington, R.L. & Strange, M. Word Prediction of good and poor readers. In P.D. Pearson (ed.), Reading: Disciplined Inquiry in Process and Practice. Clemson, S.C.: National Reading Conference, 1968, 56-60.

Allington, R.L. & Strange, M. Effects of grapheme substitutions in connected text upon reading behaviors. Visible Language, 1977, 11, 285-297.

Beebe, M.J. "A Model of the Relationships Between Reading Strategies and Reading Comprehension." Unpublished Ph.D. Dissertation, University of Alberta, 1981.

Bennett, Annette. An analysis of errors in word recognition made by retarded readers. Journal of Educational Psychology, 1942, 33, 25-38.

Bever, G., Garrett, M.F., & Hurtig, R. The interaction of perceptual processes and ambiguous sentences. Memory and Cognition, June 1973, 1, 277-286.

Biemiller, Andrew. The development of the use of graphic and contextual information as children learn to read. Reading Research Quarterly, 1970, 6, 75-96.

Biemiller, Andrew. Relationships between oral reading rates for letters, words, and simple text in the development of reading achievement. Reading Research Quarterly, 1977, 13, 2, 223-253.

Brewer, William F. Is reading a letter-by-letter process? In Harry Singer and Robert Ruddell (eds.), Theoretical Models and Processes of Reading. 2nd Edition, Newark, Delaware: International Reading Association, 1976, 536-543.

Brown, Eric, & Miron, Murray S. Lexical and syntactic predictors of the distribution of pause time in reading. Journal of Verbal Language and Verbal Behavior, 1971, 10, 658-667.

Burke, Carolyn. The three cue systems. In P. David Allen and Dorothy J. Watson (eds.), Findings of Research in Miscue Analysis: Classroom Implications. NCTE, Urbana, Illinois, 1976.

Carey, Robert F, Harste, Jerome C, and Smith, Sharon L. Contextual constraints and discourse processes: A replication study. Reading Research Quarterly, 1981, 16, 2, 201-212.

Carr, Thomas. Research on reading: Meaning, context effects, and comprehension. Journal of Experimental Psychology: Human Perception and Performance, 1981, 7, 3, 592-603.

Chafe, Wallace L. Meaning and the Structure of Language. Chicago, University of Chicago Press, 1970, 97-98.

Chomsky, Noam. Syntactic Structures. The Hague: Mouton, 1957.

Chomsky, Noam. A Review of B.F. Skinner's Verbal Behaviour in J.A. Fodor and J.J. Katz, The Structure of Language. Englewood Cliffs, New Jersey: Prentice-Hall, 1964, 547-578.

Chomsky, Noam. Aspects of a Theory of Syntax. Cambridge, Mass.: The M.I.T. Press, 1965.

Chomsky, Noam. Current Issues in Linguistic Theory. The Hague: Mouton, 1970.

Christie, J.F. Syntax: a key to reading comprehension. Reading Improvement, 1980, 17, 313-317.

Christie, J.F. The effects of grade level and reading ability on children's miscue patterns. Journal of Educational Research, 1981, 74, 6, 419-423.

Cioffi, G. Recognition of sentence structure in meaningful prose by good comprehenders and skilled decoders. Journal of Reading Behaviour, 1982, 14, 1, 87-92.

Clark, L.A. The eye-voice span in reading Japanese. Unpublished paper, 1972. Cited by Eleanor J. Gibson & Harry Levin in The Psychology of Reading. Cambridge, Mass.: M.I.T. Press, 1975, 336.

Conrad, Carol. Context effects in sentence comprehension, a study of subjective lexicon. Memory and Cognition, January, 1974, 2, 130-138.

Cooper, Roger M. The control of eye fixation by the meaning of spoken language. Cognitive Psychology, 1974, 6, 84-107.

Courtney, R., Garry, M., Graves, C., McInnes, J. Evaluation Resource Books: Three, Four, and Five. Don Mills, Ontario: Nelson, 1979.

Cromer, W. The difference model: A new explanation for some reading difficulties. Journal of Educational Psychology, 1970, 61, 471-483.

DiStephano, P., & Valencia, S. The effects of syntactic maturity on comprehenion of graded reading passages. Journal of Educational Research, 1980, 73, 5, 247-251.

Epstein, William. Some conditions of the influence of syntactical structure on learning: Grammatical transformation, learning instructions, and "chunking." Journal of Verbal Language and Verbal Behaviour, 1967, 6, 415-419.

Fodor, J.A., & Garrett, M., & Bever, T.G. Some syntactic determinants of sentential complexity. II. Verbal Structure. Perception and Psychophysics, 1968, 3, 453-461.

Foss, Donald J. Some effects of ambiguity upon sentence comprehension, Journal of Verbal Learning and Verbal Behaviour, December, 1970, 9, 699-706.

Foss, Donald J., and Jenkins, Charles M. Some effects of context on the comprehension of ambiguous sentences. Journal of Verbal Learning and Verbal Behaviour, October, 1973, 12, 577-589.

Foss, Donald J., and Lynch, Richard H. Jr. Decision processes during sentence comprehension: Effects of surface structure on decision times. Perception and Psychophysics, 1969, 5, 145-148.

Gates-MacGinitie Reading Tests, Canadian Edition. Don Mills, Ontario: Thomas Nelson and Sons, 1979.

Gibson, Eleanor J., & Levin, Harry. The Psychology of Reading. Cambridge, Mass.: M.I.T. Press, 1975.

Gilmore, J.V. The relationship between certain oral reading habits and oral and silent reading comprehension. Unpublished doctoral dissertation, Harvard University, 1947. Cited by R.M. Weber in The study of oral reading errors: A survey of the literature. Reading Research Quarterly, 1968, 4, 96-119.

Golinkoff, R.M. A comparison of reading comprehension processes in good and poor comprehenders. Reading Research Quarterly, 1975-1976, 11, 4, 623-659.

Goodman, K.S. A Linguistic Study of Cues and Miscues in Reading. Elementary English, 1965, 42, 639-643.

Goodman, Kenneth S. Reading: A psycholinguistic guessing game. In Harry Singer & Robert B. Ruddell (eds.), Theoretical Models and Processes of Reading, 2nd edition. Newark Delaware, International Reading Association, 1976, 497-508.

Goodman Taxonomy of Reading Miscues. In P. David Allen, and Dorothy J. Watson (eds.), Findings of Research in Miscue Analysis: Classroom Implications. Urbana, Illinois, NCTE, 1976, 157-245.

Goodman, K.S. What we know about reading. In P. David Allen & Dorothy J. Watson (eds.), Findings of Research in Miscue Analysis. Urbana, Illinois: NCTE, 1976, 57-70.

Goodman, K.S. Letter to the editor. Reading Research Quarterly, 1981, 16, 477-478.

Gough, Philip B. One second of reading. In Harry Singer and Robert B. Ruddell (eds.), Theoretical Models and Processes of Reading, 2nd edition. International Reading Association, Newark, Delaware, 1976, 509-535.

Halle, Morris, and Stevens, Kenneth N. Speech recognition: A model and program for research. In J.A. Fodor and J.J. Katz (eds.), The Structure of Language. Englewood Cliffs, New Jersey, Prentice-Hall, 1964, 604-612.

Hamilton, Helen W., & Deese, James. Comprehensibility and Subject - Verb relations in complex sentences. Journal of Verbal Learning and Verbal Behaviour, April 1971, 10, 2, 163-170.

Healy, Alice F., & Miller, George A. The verb as the main determinant of sentence meaning. Psychonomic Science, 1970, 20, 6.

Hochberg, Julian. Components of literacy: Speculations and Exploratory Research. In Harry Levin & Joanna Williams (eds.), Basic Studies on Reading. New York: Basic Books, 1970, 74-90.

Hogaboam, Thomas W., and Perfetti, Charles A. Lexical ambiguity and sentence comprehension. Journal of Verbal Learning and Verbal Behaviour, June, 1975, 14, 3, 265-274.

Holmes, V.M., Arwas, R., and Garrett, M.F. Prior context and perception of lexically ambiguous sentences. Memory and Cognition, January, 1977, 5, 1, 103-110.

Hutson, B.A., Cowger, D.E., Wallbrown, F.H. Assessing psycholinguistic strategies for remedial and non-remedial readers. Journal of the School Psychologist, 1980, 18, 263-270.

Isakson, Richard L., & Miller, John W. Sensitivity to Syntactic cues in good and poor comprehenders. Journal of Educational Psychology, 1976, 68, 6, 787-792.

Kolers, Paul. Three stages of reading. In Harry Levin & Joanna P. Williams (eds.), Basic Studies on Reading. New York: Basic Books, 1970, 90-119.

Leu, D.J. Oral reading error analysis: A critical review of research and application. Reading Research Quarterly, 1982, 17, 3, 420-437.

Levin, H. and Cohn, J.A. Studies of oral reading - XII. Effects of instructions on the eye-voice span. Cornell University, Ithaca, N.Y. July, 1967, ERIC, No. ED 017 401.

Levin, H. Ford, B.L., and Beckwith, M. Homographs in grammatical frames. In H. Levin, E.J. Gibson, and J.J. Gibson (eds.), The analysis of reading skill. Final report, Project No. 5-1213, from Cornell University to the U.S. Office of Education, December, 1968, 157-167. Cited by Eleanor J. Gibson & Harry Levin in The Psychology of Reading. Cambridge, Mass.: M.I.T. Press, 1975, 376.

Levin, Harry, & Ford, Boyce L. Homographs in a Semantic Context. Studies in Oral Readings, VII. January, 1967, Report No. BR-5-1213-7. ERIC No. ED 011 956.

Levin, Harry, Grossman, Jean, Kaplan, Eleanor, & Yang, Raymond. Constraints and the eye-voice span in right and left embedded sentences. Language and Speech, 1972, 15, 30-39.

Levin, Harry, & Kaplan, Eleanor. Eye-voice span (EVS) within active and passive sentences. Language and Speech, 1968, 11, 251-258.

Levin, Harry, & Turner, Elizabeth Ann. Sentence structure and the eye-voice span. Studies in Oral Reading, IX. Report No. BR-5-1213-9, September, 1966. ERIC No. ED 011 957.

Levin, H., and Turner, Elizabeth Ann. Eye-voice span for simple active sentences. In H. Levin and E.L. Kaplan, Grammatical structure and reading. In H. Levin and J.P. Williams (eds.) Basic Studies on Reading. New York: Basic Books, 1970, 122-124.

Liles, Bruce L. Linguistics and the English Language, A Transformational Approach. Pacific Palisades, California: Goodyear, 1972.

Mackinnon, A:R. How do Children Learn to Read? Vancouver: Copp Clark, 1959. Cited by R.M. Weber in The study of oral reading errors: A survey of the literature. Reading Research Quarterly, 1968, 4, 96-119.

Martin, E., and Roberts, K.H. Grammatical factors in sentence retention. Journal of Verbal Learning and Verbal Behaviour, 1966, 5, 211-218.

McClelland, J.L. & O'Regan, J.K. Expectations increase in the benefit derived from parafoveal visual information in reading words aloud. Journal of Experimental Psychology: Human Perception and Performance, 1981, 7, 3, 634-644.

McConaughy, S.H. Word recognition and word meaning in the total reading process. Language Arts, 1978, 55, 946-956.

McConkie, George W., & Rayner, Keith. An on-line computer technique for studying reading: Identifying the perceptual span. In H. Singer and R.B. Ruddell (eds.), Theoretical Models and Processes of Reading, 2nd edition. Newark, Delaware: International Reading Association, 1976a, 163-175.

McConkie, George W., and Rayner, Keith. Identifying the span of the effective stimulus in reading: Literature review and theories of reading. In H. Singer and R.B. Ruddell (eds.), Theoretical Models and Processes of Reading, 2nd edition. Newark, Delaware: International Reading Association, 1976b, 137-162.

Mehler, J., Carey, P., and Bever, T.G. What we look at when we read. Perception and Psychophysics. 1967, 2, 213-218.

Merrill, E.C., Sperber, R.D., & McCauley, C., The effects of context on word identification in good and poor readers. Journal of Psychology, 1980, 106, 2, 179-192.

Meyer, D.E. and Schvaneveldt, R.W. Facilitation in recognizing pairs of words: Evidence of a dependence between retrieval operations. Journal of Experimental Psychology, 1971, 90, 227-234.

Miller, G.R., and Coleman, E.B. A set of 36 prose passages calibrated for complexity. Journal of Verbal Learning and Verbal Behaviour, 1967, 6, 851-854.

Morton, John. The effects of context upon speed of reading, eye movements, and the eye-voice span. Quarterly Journal of Experimental Psychology, 1964, 16, 340-354.

Morton, John. The effects of context on the visual duration threshold for words. British Journal of Psychology, 1964, 55, 165-180.

Murray, L.A., & Maliphant, R. Developmental aspects of the use of linguistic and graphemic information during reading. British Journal of Educational Psychology, 1982, 52, 155-169.

Neisser, Ulric. Cognitive Psychology. Appleton-Century-Crofts, New York, 1967.

Nie, Norman H., Hull, C. Hadlai, Jenkins, Jean G., Steinbrenner, Karin, and Bent, Dale H. Statistical Package for the Social Sciences, 2nd edition. New York: McGraw Hill, 1975.

Pierce, J.R., and Karlin, J.E. Reading rates and the information rate of a human channel. Bell Systems Technical Journal, 1957, 36, 497-516.

Pillsbury, W.B. The reading of words: A study in apperception. American Journal of Psychology, 1897, 8, 315-393.

Resnick, Lauren B. Relations between perceptual and syntactic control in oral reading. Journal of Educational Psychology, 1970, 61, 382-385.

Rumelhart, David E. Toward an interactive model of reading. In S. Dornic (ed.), Attention and Performance VI. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1977; 573-603.

Sadoksi, M.C. Right forest, wrong tree? A critique of Carey, Harste, & Smith's research. Reading Research Quarterly, 1981, 16, 4, 600-603.

Samuels, S.J., Begy, G., & Chen, C.C. Comparison of word recognition speed and strategies of less skilled and more highly skilled readers. Reading Research Quarterly, 1975-1976, 11, 1, 72-87.

Sawyer, D.J. Intra-sentence grammatical constraints in readers' sampling of the visual display. Unpublished doctoral dissertation, Department of Education, Cornell University, 1971. Cited in E.J. Gibson and H. Levin, The Psychology of Reading. Cambridge, Mass.: M.I.T. Press, 1975.

Schuberth, Richard E., and Eimas, Peter, D. Effects of context on the classification of words and nonwords. Journal of Experimental Psychology: Human Perception and Performance, 1977, 3, 1, 27-36.

Schvaneveldt, R., Ackerman, B.P., Semlear, T. The effect of semantic context on children's word recognition. Child Development, 1977, 48, 2, 612-616.

Schvaneveldt, Roger W., Meyer, David E., and Becker, Curtis A. Lexical ambiguity, semantic context, and visual word recogniton. Journal of Experimental Psychology: Human Perception and Performance, May 1976, 2, 243-256.

Schwantes, F.M. Effect of story context on children's ongoing word recognition. Journal of Reading Behaviour, 1981, 13, 4, 305-313.

Schwantes, F.M. Locus of the context effect in children's word recognition. Child Development, 1981, 52, 3, 895-903.

Schwantes, F.M. Text readability level and developmental differences in context effect. Journal of Reading Behavior, 1982, 14, 1, 5-13.

Schwantes, F.M., Boesl, S., and Ritz, G. Children's use of context in word recognition: a psycholinguistic guessing game. Child Development, 1980, 51, 730-736.

Schwartz, R.M. & Stanovich, K.E. Flexibility in the use of graphic and contextual information by good and poor readers. Journal of Reading Behavior, 1981, 13, 3, 263-269.

Smith, Frank. Psycholinguistics and Reading. New York: Holt, Rinehart and Winston, 1973.

Smith, Frank. Reading without Nonsense. New York: Teachers College Press, Winston, 1973.

Smith, Frank. Reading. Cambridge: Cambridge University Press, 1978.

Smith, Frank, and Holmes, Deborah Lott. The independence of letter, word, and meaning identification in reading. Reading Research Quarterly, Spring 1971, 6, 394-413.

Stanovich, K.E. Toward an interactive-compensatory model of individual differences in the development of reading fluency. Reading Research Quarterly, 1980, 16, 1, 32-71.

Stanovich, K.E. Letter to the Editor. A reply to Goodman, Reading Research Quarterly, 1982, 17, 1, 157-159.

Stanovich, K.E. Letter to the Editor: Reply to Thompson's commentary. Reading Research Quarterly, 1982, 17, 2, 301-303.

Stanovich, K.E., West, R.F., and Feeman, D.J. A longitudinal study of sentence context effects in second grade children: Tests of an interactive-compensatory model. Journal of Experimental Child Psychology, 1981, 32, 2, 185-199.

Swinney, David A., and Hakes, David T. Effects of prior context upon lexical access during sentence comprehension. Journal of Verbal Learning and Verbal Behaviour, December 1976, 15, 681-689.

Taylor, S.E., Frankenpohl, H., and Petter, J.L. Grade level norms for the components of the fundamental skill. Educational Development Laboratories Bulletin, Huntington, New York, 1960, 3, cited in Frank Smith and Deborah Lott Holmes, The independence of letter, word, and meaning identification in reading. Reading Research Quarterly, Spring 1971, 6, 394-413.

Thompson, G.B. Semantic context and graphic processing in the acquisition of reading. British Journal of Educational Psychology, 1981, 51, 291-300.

Thompson, G.B. Commentary: Toward a theoretical account of individual differences in the acquisition of reading skill. Reading Research Quarterly, 1981, 16, 4, 596-599.

Tinker, Miles. Bases for Effective Reading. Minneapolis: University of Minnesota Press, 1965, 59.

Tulving, E., and Gold, C. Stimulus information and contextual information as determinants of tachistoscopic recognition of words. Journal of Experimental Psychology, 1963, 66, 319-327.

van Dijk, T.A., and Kintsch, W. Strategies of Discourse Comprehension. New York: Academic Press, 1983, 21-27.

Wanat, Stanley F. Relations between language and visual processing. In H. Singer and R.B. Ruddell (eds.), Theoretical Models and Processes of Reading, 2nd edition. Newark, Delaware: International Reading Association, 1976, 108-136.

Wanat, Stanley, & Levin, Harry. Studies of Oral Reading XI. The eye-voice span - Reading efficiency and syntactic predictability, June 1967. ERIC No. ED 017 402.

Weber, R.M. The study of oral reading errors: A survey of the literature. Reading Research Quarterly, 1968, 4, 96-119.

Weber, Rose Marie. First Graders' Use of Grammatical Context in Reading. In Harry Levin & Joanna P. Williams (eds.), Basic Studies on Reading. New York: Basic Books, 1970, 147-164.

Weinstein, Rhona, & Rabinovitch, M. Sentence structure and retention in good and poor readers. Journal of Educational Psychology, 1971, 62, 1, 25-30.

West, R.F., and Stanovich, K.E. Automatic contextual facilitation in readers of three ages. Child Development, 1978, 49, 3, 717-727.

Wildman, Daniel M., & Kling, Martin. Semantic, syntactic, and spatial anticipation in reading. Reading Research Quarterly, 1978-1979, 14, 2, 128-164.

Winograd, P., and Johnston, P. Comprehension monitoring and the error detection paradigm. Journal of Reading Behavior, 1982, 14, 1, 61-76.

Wisher, Robert A. The effects of syntactic expectations during reading. Journal of Educational Psychology, October 1976, 68, 597-602.

APPENDIX 1

THE SET OF FORTY-FIVE SENTENCES

APPENDIX 1

Test Sentences[a]

A43 And you can hat for the shots at the counter on the way out.

C52 That afternoon Larry and Brad wished up as they never had before to win the game.

B41 "In this kind of weather we could get bush fires."

C33 All you need to do is morning the combinations.

B52 Soon there had a clearing all the way round the cabin.

A31 I'll get the needle ready.

B43 "In this kind of weather we could brother bush fires."

A42 And you can need for the shots at the counter on the way out.

C41 Everyone would laugh if he ran onto the field in the Raiders' colours instead of his own!

A33 I'll was the needle ready.

C12 If she didn't, he might tell out wearing an orange sweater and blue slacks with one red sock and one green.

B31 Their mother was delighted with the food.

A13 "I don't what needles," he said.

B22 Hammer and nails cleared next, with many other things.

C21 "Larry, you really have talent," she said, putting his work on display.

C53 That afternoon Larry and Brad somebody up as they never had before to win the game.

B32 Their mother have delighted with the food.

A51 "What have you been waiting to say?"

C23 "Larry, you really pair talent," she said, putting his work on display.

A22 Crackle Toes and Cream Puff tried into the animal hospital.

B11 "I thought you might like to take turns with the cooking," Mrs. Wilson said.

B23 Hammer and nails eyes next, with many other things.

C32 All you need to do is wonder the combinations.

A21 Crackle Toes and Cream Puff went into the animal hospital.

B13 "I thought you might like to they turns with the cooking," Mrs. Wilson said.

A12 "I don't talk needles," he said.

C11 If she didn't, he might go out wearing an orange sweater and blue slacks with one red sock and one green.

B53 Soon there safe a clearing all the way round the cabin.

A52 "What have you been waiting to purr?"

C51 That afternoon Larry and Brad teamed up as they never had before to win the game.

C13 If she didn't, he might was out wearing an orange sweater and blue slacks with one red sock and one green.

C42 Everyone would fling if he ran onto the field in the Raiders' colours instead of his own!

B51 Soon there was a clearing all the way round the cabin.

A53 "What have you been waiting to must?"

B42 "In this kind of weather we could ask bush fires."

A41 And you can pay for the shots at the counter on the way out.

B33 Their mother chop delighted with the food.

A32 I'll say the needle ready.

C31 All you need to do is remember the combinations.

A23 Crackle Toes and Cream Puff well into the animal hospital.

C22 "Larry, you really begin talent," she said, putting his work on display.

B21 Hammer and nails came next, with many other things.

C43 Everyone would matter if he ran onto the field in the Raiders' colours instead of his own!

B12 "I thought you might like to arrive turns with the cooking," Mrs. Wilson said.

A11 "I don't like needles," he said.

[a]The symbols preceding each sentence refer to the level of difficulty, type of sentence, and the placement of the sentence within the reading selection.

The letters refer to the level of difficulty: "A" represents level 3, "B" represents level 4, and "C" represents level 5. The first numeral refers to the placement of the sentence within the selection: "1" represents the first sentence selected; "2", the second, and so on.

The second numeral refers to the type of sentence: "1" represents a normal sentence, "2" and "3" represent sentences which have been violated semantically or semantically and syntactically simultaneously.

APPENDIX 2

LIST OF SCHOOLS

APPENDIX 2

List of Schools

School	Gates MacGinitie Test Date	Experiment Date	Number of Subjects	
			High	Low
Morris Academy	May 1981	Sept. 9, 1981	7	3
MacDonald Drive Elementary	May 1981	Sept. 10 and 11 1981	5	10
Pouch Cove Elementary	May 1981	Sept. 10	2	1
Cowan Heights Elementary	May 1981	Sept. 12	3	6
St. Mary's Elementary	May 1981	Sept 11 and 15	1	2
Park Avenue Elementary	May 1981	Sept. 15	1	1
St. Michael's Elementary	May 1981	Sept. 15	8	1
Virginia Park Elementary	May 1981	Sept. 16	3	2
St. Philip's Elementary	June 1981	Sept. 16	-	2
Dawson Elementary	May 1981	Sept. 12	-	2

APPENDIX 3

DESCRIPTIVE STATISTICS (N=60)

APPENDIX 3

Descriptive Statistics for All Variables (N=60)

	Variable	Mean	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum	Range
3.01	WORDREC	38.82	3.53	-1.3	.25	34	44	10
3.02	RDGCOMP	41.45	12.15	-1.01	.29	21.00	72.00	51
3.03	CORSENT	14.02	1.02	2.85	-1.34	10.0	15.0	5
3.04	VIOLTOT	21.80	3.03	0.05	-0.35	13.0	28.0	15
3.05	GTOTAL	35.82	3.65	0.17	-0.55	25	43	18
3.06	L3TOT	11.53	1.68	-0.94	-0.26	8	14	6
3.07	L3COR	4.57	0.59	0.10	-1.02	3	5	2
3.08	VIOL3	6.92	1.45	-0.94	-0.23	4	9	5
3.09	L4TOT	12.22	1.52	-0.18	-0.56	8	15	7
3.10	L4COR	4.73	.52	2.58	-1.82	3	5	2
3.11	VIOL4	7.48	1.40	0.20	-0.62	3	10	7

	Variable	Mean	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum	Range
3.12	L5TOT	12.15	1.60	.77	-. 79	7	15	8
3.13	L5COR	4.73	.52	2.58	-1.82	3	5	2
3.14	VIOL5	7.40	1.33	-0.34	-0.29	4	10	6
3.15	GTOT	67.13	11.33	1.56	- .72	26	89	63
3.16	G3	70.70	20.50	5.29	-2.32	0	89	89
3.17	G4	43.97	27.42	-1.05	- .47	0	89	89
3.18	G5	66.70	27.79	.85	-1.35	0	89	89
3.19	PTOT	67.87	13.74	- .05	- .39	30	89	59
3.20	P3	72.52	23.44	2.47	-1.64	0	89	89
3.21	P4	49.68	32.72	-1.27	- .33	0	89	89
3.22	P5	63.07	28.70	- .03	-1.03	0	89	89
3.23	SYTOT	63.15	18.31	1.42	- .72	0	100	100
3.24	SY3	85.33	24.18	3.63	-1.89	0	100	100
3.25	SY4	58.82	42.00	-1.55	-0.39	0	100	100

	Variable	Mean	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum	Range
3.26	SY5	26.97	31.90	- .35	- .87	0	100	100
3.27	SEMTOT	44.10	16.14	- .24	- .27	0	72	72
3.28	SEM3	73.98	27.81	.05	- .87	0	100	100
3.29	SEM4	32.45	30.72	- .53	.72	0	100	100
3.30	SEM5	14.18	16.61	- .65	.78	0	50	50
3.31	PCORTOT	17.05	17.20	.88	1.13	0	67	67
3.32	PACC	6.67	12.32	2.83	1.88	0	50	50
3.33	PUNACC	10.37	13.35	3.77	1.62	0	66	66
3.34	CHNEG	6.11	3.46	- .58	.37	0	15	15
3.35	CHPOS	.58	.78	4.69	1.76	0	4	4