HOW TEXT DIFFICULTY AND READER SKILL AFFECT RELIANCE ON WORD

AND CONTENT OVERLAP IN READING TRANSFER

By

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Abstract

Rereading has been advocated as a useful technique for rehabilitating poor readers (e.g. Samuels, 1979). The purpose of this thesis was to examine what was remembered after reading a text to discover how this memory can be used to increase the fluency of reading related texts. Six experiments examined the factors that influence transfer for related texts. Transfer was indicated by increases in the reading speed and/or accuracy of reading a second text, following reading of different first texts. In Experiments 1-4, the first texts were related to the second by overlap in words only, in content only, in words and content or in neither words nor content. Results indicated that the extent to which readers benefited from word or content overlap depended on the readers' skill and the difficulty of the text. Children who read texts that were easy for them showed transfer only when pairs of stories shared content. However, when children read stories that were difficult for them, they also showed transfer when words alone were shared. In Experiment 5 children were given scrambled text to determine the effect of simple exposure to words without meaningful context. Reading scrambled words benefited only poor readers who were reading text that was difficult for them. In Experiment 6 the reading transfer of adults who read either a scrambled or a normal text was examined. Adults who were good readers benefited only when both texts were normal, as found by Levy and Burns (1990). However, when adults who were poor readers were given difficult texts, they benefited from prior exposure to the words of a text even when they were scrambled, as found by Carr, Brown and Charalambous (1989). The results are discussed in terms of how texts are represented in memory and retrieved to produce transfer.

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CHAPTER 1

*To perceive an entire new word or other combination of strokes requires considerable
time, close attention, and is likely to be imperfectly done... Practice, however,
progressively frees the mind from attention to details and makes facile the total act,
shortens the time, and reduces the extent to which consciousness must concern itself with
the process.*

(Huey, 1908/1968, p. 104)

Few would argue with the statement that practice is essential for developing skill
in any task, including reading. The debates have arisen over what type of practice is most
beneficial in producing skill that is generalizable to new reading tasks. This thesis
examines how different types of reading practice facilitate the reading of a new text.
Specifically, the question is 'how can different reading experiences be used to achieve
educational goals?' Before answering this question, an understanding of how researchers
view the reading process is necessary.

Models of Reading

Reading research has been guided by three broad philosophies. In the bottom-up
(or data-driven) approaches to reading, Gough (1972) and Laberge and Samuels (1974)
propose that readers analyze the components of text starting with letter features, letters,
and words, building up to analyzing the sentences and the message of a text. As readers
become skilled at lower levels of analysis, they are free to devote more attention to higher
levels, such as message comprehension (Perfetti & Lesgold, 1977). In contrast, the top-

down (or conceptually-driven) models of Goodman (1970, 1976) and Smith (1971, 1973) suggest that skilled readers use the message of the text to guide their analysis of the printed word. Hypotheses about word identity are formed based on the message of the text and the print is sampled to confirm the hypotheses, rather than being fully processed in a word by word fashion. Finally, the interactive model of Rummelhart (1977) espouses that both bottom-up and top-down processes contribute to reading in parallel, rather than sequentially as the top-down and bottom-up models advocate. According to the interactive model, bottom-up processes could analyze print at the same time that syntactic and semantic systems were generating hypotheses about the message of a text. Stanovich (1980) offered a variant of the interactive model with the notion that the bottom-up and top-down processes can actually compensate for each other if one or more process is deficient. In the following discussion each of these models of reading will be described in greater detail and evidence pertaining to each model will be cited.

Gough (1972) and Laberge and Samuels (1974) proposed a bottom-up model of reading in which print analysis progressed through a series of stages. In the initial stages beginning readers learn letters by attending to features such as lines, curves and intersections. Each time a feature is organized into a letter a trace is laid down in memory. When features are repeatedly seen in conjunction, a connection is formed in memory and the features are then recognized as whole letters. Once a letter can be perceived as a whole, processing of that letter becomes automatic and it can be read without conscious attention to its features. In the later stages of learning to analyze print, readers organize letters into words and with repetition words are read automatically. The goal of fluent reading is to maximize the number of words that can be read automatically. Automatic

word reading is important because Laberge and Samuels maintained that humans can consciously attend to only one level of processing at a time. Therefore if word reading is automatic, conscious attention can be focused on comprehending the message of a text (although unless directed to do so, poor readers may not use their attentional resources for comprehension, Sindelar, Monda, & O'Shea, 1990; O'Shea, Sindelar & O'Shea, 1985; 1987). A skilled reader can process words automatically which frees attention for higher level processes that produce comprehension.

Many studies have been guided by the bottom-up model of reading. The basis of this model is that all subsequent processing depends on the efficiency of lower level operations. In order for readers to comprehend a text, the lower level processes of letter and word recognition must be completed automatically. Jackson and McClelland (1979) proposed that recognizing letters and words automatically depended on efficient access to representations of letters and words that are stored in memory. Learners who were able to quickly access memory could more easily recognize groups of features as letters and clusters of letters as words. They cited evidence that university students who were average or good readers differed in the speed with which they could match letters and words, but did not differ in their speed to match meaningless dot patterns. Subsequent studies with third grade children found that good readers were faster to name words than poor readers, but no speed difference was found for naming of colors, digits or pictures (Perfetti, Finger & Hogaboam, 1978). Stanovich (1981) found that good readers were faster than poor readers at naming words but not letters. In the naming task, which is more similar to reading than the matching task, poor readers were slow only at naming

words, suggesting that their deficit is at the level of organizing letters into words, and not organizing features into letters.

Studies of good and poor readers have consistently shown a relationship between rapid word naming and reading skill. The good readers' fast naming times for words in the Perfetti et al. (1978) and Stanovich (1981) studies reflect automatic word reading. The children who can read words quickly and automatically can devote their conscious attention to comprehension which results in their classification as good readers. The Laberge and Samuels (1974) model not only suggested a framework for how the reading system was organized but also proposed that learning to read required a sequence of steps. First a reader must learn to recognize letters and then words and finally when word recognition is automatic the message of a text can be understood. In a bottom-up model of reading the sequence of steps involved in reading proceeds from lower-level processing to higher level processing.

An alternate model was proposed by Goodman (1970) and Smith (1971) who emphasized top-down or conceptually-driven processes. In a top-down model the sequence of steps involved in reading proceeds from higher-level processing to lower-level processing. They proposed that skilled readers use the message of a text to predict the identity of many of the words. The reader uses the lower-level processes of letter and word identification only as much as is needed to confirm their predictions. Accordingly, the text is merely sampled by a skilled reader. As children learn to read, they increase their ability to use semantic context to extract the message of a text , make more accurate predictions about word identity and thus need to sample less print. A good reader forms more accurate hypotheses based on less print information. A poor reader has less

knowledge of syntactic and semantic constraints in text and may have less background information and thus the poor reader is not proficient at predicting subsequent text. A poor reader is forced to sample text more than a good reader in order to understand a passage.

Evidence for the top-down model was provided by analyses of mistakes made during oral reading. Most errors made by beginning readers are syntactically and semantically appropriate, suggesting that children use context to help them guess words (Goodman & Goodman, 1977). The only conclusion that can be drawn from this study is that when a word is not known the reader may use syntactic and semantic context to make a guess. However it is not known if the same route is used when a word is familiar to the reader, which is the case for almost all skilled reading. Top-down models postulate that skilled readers are proficient because they read by making good predictions about the words in a text. For this to be true skilled readers should not only be better than poor readers at predicting words from context but must also rely more on context to identify words.

Skilled readers are more able than poor readers to guess the identity of words by using story context. However, this should not be interpreted as indicating that good readers rely more on context to facilitate word recognition (Stanovich, 1981). As explained by Perfetti and Roth (1981) a good reader is more able to use context when it is necessary, but is less dependent on it because information from other sources is available. This apparent paradox was demonstrated in an experiment by Perfetti, Goldman and Hogaboam (1979). They showed that skilled fifth grade readers could make better predictions than less skilled fifth graders. However the reading speed of poor readers was

more affected by prior sentence context than was the reading speed of good readers. In a similar study that looked at developmental differences in the use of context, West, Stanovich, Feeman and Cunningham (1983) found that second grade subjects displayed larger context effects than the sixth-grade subjects. The beginning readers had larger differences in their reading times for congruous and incongruous sentences than did the more skilled readers. The implication of these results is that although good readers are better at predicting word identity from context they do not necessarily use their predictions to aid in word recognition.

If skilled readers are proficient at predicting words from context why does it appear that they do not use this skill to recognize words? The answer is that guessing from context is a slow and effortful process compared to simple processing of the letters in a word when the letters and the word are known to the reader. As Kolers (1975) stated, fluent readers rapidly and automatically process the visual patterns of text, making the slow effortful guessing from context inefficient and unnecessary. It is unlikely that skilled readers especially would adopt a system of prediction, as espoused by the top-down models, when they are able to fluently process text in a more efficient manner. In contrast poor readers who are not able to automatically process the visual patterns of text may be forced to use the slower and more effortful process of guessing from context to identify words.

Further studies provide evidence that conflicts with the second tenet of top-down models; skilled readers do not fully process text but merely sample text to confirm their hypotheses. By studying eye movements researchers have been able to determine exactly where attention is focused during reading. Skilled adult readers do not process

only a sample of the words in a text but fixate on most of the words. When they do skip, they almost never skip more than one word and skipped words tend to be very short (Just & Carpenter, 1987). Equally important, skilled readers do not skip more words when text is easily predictable (McConkie & Zola, 1981) as would be expected when less sampling is needed to confirm hypotheses. Eye movement data has shown that skilled readers do not sample text but process almost every word, even when the words are highly predictable, results that conflict with top-down models of reading.

More evidence that conflicts with top-down models of reading was provided by Levy and colleagues in a series of proofreading studies that demonstrated how much text was processed by readers (Levy, 1983; Levy & Begin, 1984). Proofreading experiments allow the researcher to determine that a particular misspelled word was read. If the mistake in a word is found, then the word must have been read. Levy and Begin gave skilled adult readers passages of text to read repeatedly. While they were reading the subjects also had the task of crossing out any misspelled words that they found. All spelling errors were single letter substitutions that changed a word into a nonword, so they were relatively obvious errors. Some texts were repeated a number of times with no errors, before the version containing errors was given and other texts were read only once in the error version. As a text was repeated it was read faster and it could be said that the subjects became more skilled with each repetition. According to top-down theories of reading, as readers become more experienced with a text, they will get better at making predictions and need to sample less text. In other words, as readers become more skilled in reading a particular text, they will skip more words that can be 'guessed' or 'filled in' from memory or knowledge. The top-down model of reading was not supported by

Levy's results because readers did not skip more words as they gained reading skill with the repeated passages. Errors were equally well detected in the repeated passages as in the passages read only once, suggesting that the words of the familiar text were read just as thoroughly as those of the new text.

Levy and colleagues (Levy, 1983, Levy & Begin, 1984) demonstrated that even with familiar text, readers did not begin to skip words and thus fail to find spelling errors. However, the errors in this study were fairly obvious, with words changed into nonwords. Perhaps the familiar passages were scanned, and not as thoroughly analyzed as the new passages, but the errors stood out even when the reader simply scanned the text. This issue was addressed in a study by Levy, Newell, Snyder and Timmins (1986). Texts were read repeatedly with each version of a text containing different spelling errors than the others. In addition to errors that changed words to nonwords, there were also errors that changed one word to another word that did not fit the story. To find the word errors subjects could not simply scan for nonwords but were forced to read each word of the text to determine whether it fit the semantic context. Across the four or five readings of a text reading speed increased. The word errors, that could only be detected if readers were monitoring the message of the story, were detected more often in later trials. This increase in conceptual processes on later trials would be predicted by a top-down model of reading because better predictions are made with practice. The same result is predicted by bottom-up models because word recognition is improved with practice and more resources can be devoted to conceptual processes. However the critical result is that nonword errors were detected as well on the fifth reading as on the first reading. As

readers gained speed with each repetition they did not skip more words, which would be predicted by top-down models, because just as many errors were found.

The results from Levy and Begin (1984) and Levy et al. (1986) demonstrated that fluent adult readers did not skip words once they had become familiar with a text. The issue of how familiar text is read by children was addressed in a study by Levy, Nicholls and Kohen (1993). An error detection task was given to children in Grades 3, 4, and 5. The texts were read repeatedly with different errors occurring in each reading. As found in adults (Levy et al., 1986) the children increased their reading speed with repeated exposure to a text but there was no decrement in detection of spelling errors. In fact the children improved their detection of errors with repetition of text and comprehension of the text also improved. Children, like adults, do not attenuate lexical processing as reading speed increases but instead perform word recognition and comprehension more efficiently. The conclusion from both proofreading studies and eye movement studies is that skilled readers do not sample text but process text thoroughly. This is true even for predictable text that according to top-down models should be less frequently sampled. Little evidence has been found that top-down models can account for skilled reading.

The proponents of bottom-up and top-down models of reading not only offer different accounts of how skilled reading occurs but also propose different deficits as the cause of reading failure and different methods of remediation for these deficits. In bottom-up models the reading process is thought to consist of an analysis of features, letters, words, syntax and semantics in that order. Poor readers were thought to have deficits at the level of features, letters and words and thus could not proceed to gain an understanding of the text. To remedy this deficit poor readers should be trained in letter

and word identification until word recognition is quick and easy. Once words can be recognized automatically there will be an improvement in comprehension because limited resources can be directed there (Laberge & Samuels, 1974). In contrast top-down models propose that the reading process involves making hypotheses about the message of a text and only sampling enough of the text to confirm these hypotheses. Poor readers were thought to be deficient in making predictions because of a lack of background knowledge, or because of difficulty using syntactic and semantic cues. To remedy the reading difficulty poor readers need greater exposure to literature to improve their general knowledge and so that syntactic and semantic structure will be learned implicitly (Goodman, 1976). In brief, top-down models anticipate better reading when children can make better predictions and bottom-up models anticipate better reading when children can identify words faster and more easily.

While both bottom-up and top-down models of reading have merit, Rummelhart (1977) argued that neither organization captured the richness of processing during reading. Rummelhart proposed that all sources of information could contribute simultaneously to reading. Bottom-up processes could analyze features, letters, letter clusters and words while top-down processes were simultaneously producing hypotheses about the message of the text from semantic and syntactic information. Optimal reading rates and accuracy resulted from the combination of information from all processes. While this model doesn't address individual or developmental differences in reading ability, it provides an interesting framework for their exploration. Since each processor is an independent source of information it is reasonable to assume that skilled readers are proficient at all types of processing and the integration of these processes. In contrast

beginning readers may have deficits in one or more processes, or in the integration of information from different sources. Because all processes are independent and proceed in parallel, none is more important than the others in the development of an efficient reading system.

Stanovich (1980) offered a variant of the interactive model by suggesting that bottom-up and top-down processes can not only interact but can also compensate for deficiencies in each other. As with Rummelhart's (1977) model, both lower level and higher level sources of information are combined to reach the final goal of successful understanding of text. The difference in the Stanovich model is that the process doesn't necessarily break down when one source of information is missing, but other sources are given more weight in reaching the final decision about the identity of words and the meaning of the text. That is, if a poor reader has deficient word recognition skill, syntactic and semantic cues will be given more weight when deciding the identity of unknown words. Thus the reader's level of skill will depend not only on the ability to identify words and analyze the message of a text but also on the combination of these skills. Remediation of poor readers could take many forms with this model. Either the skill that is deficient (e.g. word identification) could be trained or compensatory skills could be improved (e.g. use of context cues to predict word identity). Training to the weakness or the strength of the poor reader should result in improved reading.

The three general types of models that have been described predict differing success for particular training methods. Bottom-up models predict that reading will improve the most when poor readers are given practice in individual word identification. Proponents of top-down models would predict optimal reading improvement with greater

exposure to literature and no emphasis on word training. The interactive-compensatory model would predict some success with either single word practice or literature exposure because either the deficit would be eliminated or compensatory processes would be improved.

The experiments reported in this thesis were constructed to analyze what type of practice is optimal for improving the reading of skilled and less skilled readers. Practice with words would be expected to improve reading according to proponents of the bottom-up models, but practice with the story message or content would be expected to improve reading in a top-down model. The paradigm used to test these contrasting predictions was the reading transfer study. Briefly, in a reading transfer experiment one passage of text is read and then a test passage is read. If useful information is gained from reading the first text, the second text will be read faster and more accurately than if no information was gained from the first passage. A more in depth exploration of how transfer studies have been used to gain an understanding of the reading process follows.

Description of Transfer Studies

Transfer studies use indirect tests to determine what has been gained from completing a task. In a direct test of memory the subjects are simply asked what they remember about doing a task. In an early series of experiments designed to investigate what was stored in memory while reading a text, Bartlett (1932) simply asked his subjects to recite the text from memory. On the basis of these subjects' recollections Bartlett concluded that memory for a text was reconstructed. When tested in this direct manner subjects did not simply retrieve what was stored in memory during reading but actively

reconstructed the memory. The act of direct testing changed the representation that was stored in memory. The advantage of using indirect tests is that the subjects do not need to reconstruct a memory in order to report it to the experimenter. Instead with an indirect test the subject is not instructed or encouraged to recall the previous experience but is asked to repeat the task or a variant of it (Richardson-Klavehn & Bjork, 1988). Memory for the first task is inferred based on how well the subject performs the second task. In this way the memory can be accessed and used without the contamination of reconstruction.

In the case of this thesis the task was to read a passage of text, so that memory for that passage could be indirectly measured. The basic procedure was that subjects read a passage and then they read a test passage. How well the second passage was read is an indirect test of what was learned when reading the first passage. Rereading time was used as the measure of how well the second passage was read. When the second reading of a passage was faster (or slower) than the first, it was concluded that something about the first passage was learned.

Transfer studies can be used not only to determine that learning has occurred but also to determine what exactly was remembered from reading the first text. The logic is that what was remembered from the first text can be transferred to facilitate reading of the second text, *only if the second text contains the remembered information.* For example, if the first story is remembered in its exact words and a second similar story has different wording, no facilitation would be expected. However, if only the gist of a story is represented in memory then facilitation would be expected as long as the second story had the same gist. In this way the representation that is stored in memory when the first text is

read can be inferred by looking at what characteristics must be shared by two stories for transfer to occur.

The study of transfer in reading began when Kolers (1975) introduced the use of indirect tests in the study of memory for text. This work explored how reading one text affected the reading of subsequent texts. Since this seminal work, measures of transfer have been used to examine the representation that is formed in memory while reading.

Kolers (1975) studied the issue of whether the perceptual characteristics of text were represented in memory. Kolers used inverted letters in the words he presented. The inverted letters were used so that the perceptual processing could be manipulated in different experimental conditions. By using both normal and inverted scripts Kolers could either keep perceptual processing the same when a sentence was read twice or he could vary it. In this way Kolers tried to determine if the perceptual characteristics of two sentences must be shared for transfer to occur. Kolers asked subjects to read aloud a set of sentences that were typed in either a normal (N) or inverted (I) orientation. Subjects then reread the same sentences in an inverted orientation. Thus, the two types of sentence pairs were normal-inverted (NI) and inverted-inverted (II). Finally some new sentences were read only once in an inverted orientation (I). Kolers' goal was to determine whether the second reading of a sentence was facilitated by the prior reading. He found that the second reading of a sentence (NI or II) was faster than the new sentences (I), indicating that the memory for the first reading of a sentence could be accessed and used to benefit the second reading of that sentence. Importantly, the benefit from transfer was larger when two sentences shared orientation (II) than when two different orientations were used

(NI). Kolers concluded that the orientation of text, its visual pattern, was a vital component of the memory that mediated reading transfer.

The typescript used by Kolers was unfamiliar to adults and much effort had to be used to accomplish the difficult task of reading inverted text. Thus attention was focused on simply identifying the words of a text and not on the meaning of the sentence. However, the semantic information shared by sentences in the NI condition still produced some transfer and the shared typography in the II condition provided additional benefit. Kolers argued that the message and its visual characteristics were represented together in memory. Maximal transfer benefit depended on repetition of the message and the visual pattern of the sentence. Some critics may propose that the benefits gained from the repetition of perceptual characteristics may be due to priming effects, which would mean that the transfer benefit would be short-lived. However, Kolers demonstrated that perceptual characteristics of text are maintained in memory for at least a year. A benefit for reading repeated inverted (II) sentences was found even when the first reading was a full year earlier (Kolers, 1976).

Kolers stressed the importance of visual processing in reading. However, normally a reader does not consciously remember the visual characteristics of a text but concentrates on the message. Kolers (1979) explained that skilled readers automatically decode normal text and thus little conscious visual processing is required, leaving the reader to concentrate on semantics. Extensive semantic processing leads to better memory for the meaning of text than its visual characteristics. However, in Kolers experiments with inverted text the visual processing becomes effortful and the visual pattern is encoded more strongly in memory than with normal text. The extensiveness of

processing determines how well the visual pattern and the message of a text will be encoded in memory.

Kolers originally studied rereading by using inverted typescripts because he believed that adult readers were so skilled in reading normal typescript that visual processing was virtually automatic during normal reading. The view that skilled readers accomplished visual processing automatically was easily accepted into the dominant philosophy of reading at the time, bottom-up models. The Laberge and Samuels (1975) model postulated that as skill increases, the lower levels of analysis become automatic (such as visual processing) leaving attention free to concentrate on semantic processing.

Kolers' theories about skilled reading are not compatible with top-down models such as that presented by Goodman (1970) and Smith (1971, 1973). Proponents of top down models postulated that as skill developed, less perceptual processing of text was required. However in Kolers experiment the skilled adult readers were sensitive to changes in the orientation of text showing that perceptual characteristics of text were represented in memory. The readers did not simply focus on the message of the text and sample text to confirm their prediction but processed and remembered the visual characteristics of the message as well.

The transfer paradigm first introduced by Kolers has been a valuable tool for studying the effect of experience on development of reading skill. Using rereading time as a measure of reading proficiency, researchers have demonstrated the contributions of conceptual and perceptual processes to normal skilled reading. Many researchers have used different transfer paradigms to explore other aspects of text that are processed and represented in memory.

Text Representation in Memory: Evidence from Transfer Studies

There has been an enduring debate over the nature of the text representation that is stored in memory and that mediates transfer. On one side of the debate is the view that text representations are at an abstract word level, such as logogens or word units (Morton, 1969). The opposite side of the debate rests on the proposal that the representations are stored as integrated episodes encompassing words and their context (e.g. Levy & Kirsner, 1989). Although much research on memorial representations has focused on individual words (e.g. Jacoby, 1983; Jacoby & Dallas, 1981; Masson & Freedman, 1990) this thesis is primarily concerned with text and discussion will be limited to how words in text are represented.

In an early exploration of how text is represented in memory, Oliphant (1983) used a lexical decision task in which strings of letters were judged to be words or nonwords. Some of the words were presented twice in the lexical decision task while others had been presented earlier in the context of the task instructions or in a questionnaire. Finally some of the words were only presented once in the lexical decision task. When the words were presented twice in the lexical decision task, the subjects were faster to make their decision on the second encounter than if a word was presented only once. The crucial finding however was that when the words had been presented before in a different context (in the instructions or the questionnaire) there was no benefit over words presented only once. Oliphant concluded that subjects must be aware of the repetition to receive the benefit. However, this conclusion was challenged by researchers working with amnesiacs. Cohen and Squire (1980) found benefits in reading repeated words even in amnesiac patients who did not remember seeing the words before. Levy

and Kirsner (1989) and MacLeod (1980) suggested that the important contrast between conditions in the Oliphant (1983) study is between words repeated in the same context (lexical decision task) and words repeated in different contexts (instructions or questionnaire and lexical decision task).

MacLeod (1989) completed an experiment similar to that done by Oliphant but used fragment completion as his test (e.g. WAG_ _ could be completed WAGON). Fragments could be completed by words that fell into three categories; new, previously read in a word list and previously read in a paragraph. More fragments were completed for words that were repeated than for new words. More importantly the context of the first presentation was critical. Many more fragments were completed when the first presentation of a word was in a list than if it was in a paragraph. As in Oliphant's experiment, transfer was significantly reduced if the words were originally read in context rather than individually as they were at the time of test. MacLeod further explored the effect of context by using two different contexts for his embedded words. Half of the words came from nonsensical phrases (as judged by subjects) and half were from sensible phrases. Words were more likely to be used in the fragment completion test if they were originally read in a nonsensical context than if they were read in a sensible context. MacLeod concluded that words read in context were processed differently than those read in isolation, and that transfer to a single word test was maximal for words previously read as individual words and not in a meaningful context.

Evidence quickly appeared that corroborated MacLeod's conclusion that transfer from words read in text to single word tests is limited. Levy and Kirsner (1989) used a perceptual identification task in which subjects were asked to name words that were

presented very quickly on a computer screen. The words were either new or had been presented before in a list or in text. Performance was better for the target words that were originally read in the list. The words that were originally read in a text context were not better identified than new words. As in the Oliphant and MacLeod experiments, there was transfer to a single word test only when the words were originally presented as single words. When words were first read in a text context little or no transfer was found.

A theoretical explanation of the specificity of transfer was offered by Levy (1993). She explains that the words in the single word tests have the ability to recruit certain types of representations stored in memory, but not others. When isolated words were presented in the test they accessed the memory of the first presentation of the word in isolation. Once accessed, the memory of the first presentation could be used to more quickly identify the word in the test . However, the presentation of a single word is not a good cue for accessing a memory for that word in context because the representation of the isolated word and the word in context are too different. Levy and Kirsner (1989) concluded that single word measures could not adequately reflect the influence of prior text reading because single test words were not good cues to retrieve whole text representations. To evaluate memory for text, one must use a test that enables the reader to assess the memory of the text, the reading of whole passages. Studies that evaluate what is stored in memory when a text is read are discussed in the following section beginning with the debate about how words and content are stored in memory.

Effects of Word and Content Overlap on Reading Transfer

Although the effects of word and content overlap on reading transfer have received little systematic study in the developmental literature, these issues have been addressed by experimenters working with fluent adult readers. Carr, Brown and Charalambous (1989) had adult subjects read short paragraphs of expository text that

were either arranged in a normal coherent fashion or the words were scrambled. They found that a normal second version was read faster regardless of whether it was preceded by the scrambled word or normal version. Furthermore, no difference in transfer was observed between these conditions. These results led Carr et al. to suggest that individual words are represented in memory and during reading these representations can be accessed to promote faster and more accurate reading of texts that contain the same words.

Levy and Burns (1990) failed to replicate the Carr et al. (1989) experiments. In their study, Levy and Burns varied the similarity of a pair of passages. While the second story of a pair was always well structured, it was preceded by either the same text, or that text with its paragraphs, its sentences or its words scrambled. They found that reading time for the second passage was fastest when the first passage was the same text or the scrambled paragraphs version. The benefit was less when the second passage was preceded by the scrambled sentence version. Finally, contrary to the results of the Carr et al. study there was no benefit to speed of reading the second story from reading its scrambled word version first. There was a graded loss in transfer as the structure of the first story became more different from the second story, indicating that higher linguistic concepts like sentence and paragraph meaning, did affect transfer.

A possible explanation for the differing results in the Carr et al. (1989) and the Levy and Burns (1990) studies was proposed by Carr and Brown (1990). They suggested that different strategies used by subjects accounted for the discrepant results. In the Carr et al. study subjects read aloud and were urged to read as rapidly as possible while enunciating each word clearly. These instructions could bias a subject to focus attention on lexical level processing. Subjects in the Levy and Burns study read silently and it was

stressed that they should try to understand and remember the texts. These instructions could bias a subject to focus attention on text-level processing. In a test of the focus of attention theory, Carlson, Alejano and Carr (1991) asked readers to read text word by word and not relate any two words, or to read the texts for meaning. The instructions to not relate words produced transfer at the single words level, like that found in the Carr et al. study, while the meaning instructions produced the Levy and Burns text-level transfer.

Based on the experiment by Carlson et al. (1991), it could be concluded that the reader's focus of attention can influence when transfer will occur. However, when Levy, Masson & Zoubek (1991) oriented their subjects to lexical level processing, by having them search the text for Greek letters while reading normal text, they found no transfer from scrambled words. When the passage was preceded by a scrambled word version, no increase in reading speed was found, but when the passage was preceded by a normal passage there was a speed benefit. In another experiment the subjects were oriented toward message level processing by a summarizing task after the story was read. The same results were found as in the Greek letter detection experiment; transfer from normal to normal text but no transfer from a scrambled text to a normal text. The change in focus of attention had no effect on the reading of normal texts in this experiment.

It is obvious from the discrepant data provided by Carr and colleagues and Levy and colleagues that transfer from scrambled words occurs in some situations and not others. The focus of attention theory may account for some of the discrepancies in the data but does not account for the Levy, Masson and Zoubek (1991) experiment that found no effect of focus of attention. Another possibility is that the different materials used in the experiments encouraged the use of different reading processes (McDaniel & Einstein,

1989). Texts with strong organizational structure such as the problem-based stories used by Levy and Burns (1990) lead to more relational processing whereas the expository texts used in the Carr et al. (1989) study may have led to more individual word processing (McDaniel, Einstein, Dunay, & Cobb, 1986; Einstein, McDaniel, Owen & Cote, 1990).

The challenge of this line of research is to determine when relational processing and/or individual word processing will occur. What factors influence the rereading effect? And what will happen if word representations are formed not from an abstract scrambled word display, but from reading the words in a different story? Will representations formed in a normal reading context transfer to new texts that share many of the same words?

The effect of word overlap between different stories was studied by Levy, Barnes and Martin (1993). They gave adult subjects pairs of stories to read that shared words, shared words and content, or were unrelated. Significant gains in reading speed were found only in the condition in which both words and content were shared by stories. No transfer was found when only words were shared, showing that word representations formed in the context of one story did not improve reading of another story that shared many of those words. However, the subjects in this experiment were reading silently and were instructed to concentrate on the meaning of the story so their focus of attention was at the text level. With a change in the focus of attention towards the lexical level these subjects may have shown transfer when stories shared only words. In addition to studying how story overlap and focus of attention effect transfer, researchers have examined the effect of other factors such as reading skill.

Effects of Skill Level on Reading Transfer

When studying the acquisition of reading skill, researchers have focused on

normal development and on individual differences in development Some researchers study

reading processes in children who are progressing normally and draw conclusions about

normal reading skill acquisition. Children whose reading skills are developing normally for

their age and grade in school will be referred to in this thesis as average readers. In other

reading research the aim is to identify and study children of varying skill levels relative to

their peers and to examine the nature of these differences. Readers who differ in skill level

will be called good and poor readers in this thesis.

Early studies of rereading focused on gains in word recognition skill to account

for the increased speed of reading the second text. One of the first studies that examined

rereading benefits was conducted by Samuels (1979). When children who were classified

as poor readers read texts out loud repeatedly, reading speed increased and word

recognition errors decreased. Benefits were also transferred across different passages, as

indicated by the faster reading of each new story compared with the initial reading of the

previous selection, and by the fact that fewer repetitions were needed to reach the speed

criterion, and fewer errors were made in later stories. Samuels explained his results in

terms of the Laberge and Samuels (1974) model. He proposed that rereading allowed

word recognition to become fast and automatic, which then left more processing capacity

for comprehension. Importantly, Samuels' explanation focused on individual word

representations as the mechanism of transfer. However, Samuels did not report the

amount of word overlap in the different texts, so it is difficult to assess if the transfer

between texts could be mediated at the word level. It is also not known if stories were

similar in content, so the question of whether content overlap may have contributed to transfer between texts cannot be addressed. Stories that overlap in content share elements such as theme, plot and characters.

Further evidence that word recognition may mediate reading transfer was provided by Herman (1985). She gave very poor readers in Grades 4, 5 and 6, five stories to read repeatedly. Each story was read until a speed criterion of 85 wpm was reached and then a new story was practiced. Herman found increases in reading speed and word recognition accuracy as each passage was practiced. Interestingly, she also found transfer between passages, in that story 5 was read faster on its first reading than story 1. However, the study took three months to complete, so learning outside of the experimental situation may account for some of the reading gains made between story 1 and story 5. As in the Samuels (1979) study, it was not reported whether story 1 and story 5 overlapped in content or wording. Herman speculates that the increased reading speed must be due to faster word recognition because the total number of speech pauses was fairly constant across passages, so the length of pauses must have decreased to produce the faster reading time. The shorter pauses may indicate that less time was needed to decipher the unknown words.

If faster word recognition is responsible for some of the gains seen with rereading, then practice with the words of a text, even if taken out of their story context should facilitate subsequent reading. Fleisher, Jenkins and Pany (1979) gave good and poor readers in the fourth and fifth grades a list of content words taken from a story. The poor readers practiced reading the list until they were as fast as the good readers in the study. Then the children read the passage which contained the practiced words. The poor

readers read the passage containing the practiced words faster than a control passage, but comprehension was not improved. Simple practice with word recognition did improve reading but its effects were limited to improvements in reading speed, and did not include improvement in comprehension.

Comprehension gains were not found when only the words of a text were practiced (Fleisher, Jenkins & Pany, 1979) but were found when the whole story was repeated (Herman, 1985). The first study to examine the effect of repetition of story content in addition to repetition of words was conducted by Dahl (1979). Dahl had Grade 2 poor readers select a series of passages that were each read repeatedly until a speed criterion of 100 words per minute was reached. At the end of eight months of practice with rereading, the rereading group performed better than two control groups on several word identification measures and a cloze test of comprehension. One control group received no additional reading instruction to that provided by the teacher and the second control group was given repetition training on single word identification. The success of the repeated readings group over the word identification group led Dahl to conclude that a meaningful context was necessary for repetition to be beneficial. She speculated that rereading meaningful texts allowed children to integrate subskills involved in reading. Repetition of words alone was not enough to produce transfer to the later word identification and cloze tests, leading Dahl to conclude that meaningful content is important in mediating rereading benefits.

Subsequent studies have explored both the role of content and wording in transfer across readings of different stories. For example, Rashotte and Torgesen (1985) asked reading disabled children (8-12 years old) to read passages in one of three

conditions. In the first condition, the children read 7 stories 4 times each, and the stories shared many words but did not share content (theme, plot). In the second condition, the children read 7 stories 4 times each but the stories did not share many words and again no content was shared. In the final condition, the children read 28 different stories. They found that reading speed increased for each repetition of an individual story, but there was no transfer to the reading of a new story unless that story shared many words with the practiced story. Rashotte and Torgesen concluded that transfer across texts was mediated by individual words, because transfer was observed only when many of the same words were used in unrelated stories. However, they did not covary the content similarity to see whether there was an additional benefit.

Dowhower (1987) looked more specifically at the roles of both content and words in rereading transfer. In her study, poor readers in Grade 2 read the first part of a story repeatedly and then read the second part of the story once. This procedure was repeated for five stories. Dowhower found that reading speed increased over the rereadings of the first part of a passage and there was transfer to the reading of the second part of the story. The second part of a story was read faster than the first part of the story. Transfer was also found between stories that appeared to be unrelated, since the last story of the experiment was read faster than the first story. However, subsequent analysis revealed that although each pair of stories shared few words, 77% of the words in the final story had been read in earlier stories. Thus, the transfer between the first and second parts of a story may have relied on shared content or shared words, but the benefits seen for the final story must have been a result of shared words because no content was shared. Dowhower also found improvements in prosodic reading, showing

that repetition facilitates parsing and provides cues such as intonation. Correct parsing and intonation of a story rely on an understanding of the content of the story, hence the overlap of content in stories may be important to the transfer of reading fluency. These data provide evidence that factors other than single word recognition may be involved in the rereading benefit.

In conclusion the experiments of Rashotte and Torgesen (1985) and Dowhower (1987) demonstrate that word overlap facilitates transfer between texts. The role of content overlap in reading transfer is still unclear because none of the researchers have manipulated content overlap independently of word overlap. In the experiments of this thesis word and content overlap were manipulated independently to determine their effect on transfer. In addition to reader skill and overlap between texts, the effect of text difficulty on transfer was also addressed in this thesis.

Effects of Text Difficulty on Reading Transfer

The final issue addressed in this thesis is the influence of text difficulty on transfer. Few reading studies have examined the effect of text difficulty on reading transfer. Text difficulty has been shown to affect the performance of good and poor readers on a wide range of variables including; type of oral reading errors made (Blaxall and Willows, 1984), self-correction rates (Share, 1990) and the extent to which context is used to aid word recognition (Biemiller, 1979; Kibby, 1979; Schwantes, 1981). The role of text difficulty in reading transfer was examined in a rereading paradigm by Levy et al. (1993). They gave good and poor readers in Grades 3, 4, and 5 texts to read that were below, above or at their grade level. The children were told to cross out errors in the text

as they read, but it was stressed that children should read for meaning in order to answer comprehension questions. Text difficulty (above, below or at grade level) had little effect on transfer of reading skill, since it did not differentially affect the transfer of reading speed or error detection ability. However, the range in text difficulty was quite limited compared to the large differences in reading ability of the children. The good and poor readers were chosen because their reading level was 2 grades above or 2 grades below their school grade level. The effect of text difficulty variation (one grade above or below the school grade of the children) may have been overshadowed by the large difference in childrens' reading ability. It is not know if a wider range of difficulty in text would produce effects on transfer. However, the effects of text difficulty on word recognition errors, and context utilization suggest that text difficulty should be taken into account when studying readers of differing skill levels.

Description of Experimental Measures

The reading ability of all subjects described in this thesis was measured with the reading subtest of the Wide Range Achievement Test-Revised (WRAT-R). The WRAT-R is a test of word identification which begins with simple words such as 'cat' and progresses gradually to more difficult words such as 'itinerary'. Form 1 is appropriate for ages 4 - 12 and was used in Experiments 1 - 5. The children in Experiment 1 that were over 12 years old and the adults in Experiment 6 were given Form 2 which contains more difficult words. In Experiments 1 - 4 the WRAT - R was used to divide the children into groups of good, poor and average readers. Poor readers were defined as at least 1.5 reading levels below their grade. For example a child in Grade 6 reading at a grade 4 level would be

considered a poor reader. Good readers were at least 1.5 reading level above their grade. Thus the good and poor reader groups were at the ends of the distribution and there was no overlap of groups. The adults in Experiment 6 were also classified as good and poor readers using the WRAT-R. However the adults were simply divided by a median split with those scoring 104 and above (100 is considered average) classified as good readers and those scoring at or below 103 classified as poor readers.

Reading time was the principle dependent measure in all experiments reported in the thesis. In Experiments 1-5 the total time taken to read a text was measured with a millisecond timer. In this way the reading time for an entire text was obtained. In Experiment 6 reading time was measured line by line during reading so that the time taken to read each line of text was recorded.

In addition to reading time, accuracy was measured in Experiments 1-4. To collect these data, the number of errors made when reading a story was recorded. Both mispronunciations and word omissions were considered errors. These errors were corrected while the child was reading, when possible.

Overview of experiments

The first four experiments of the thesis used a paradigm similar to that of Levy, Barnes and Martin (1993) to explore how transfer is mediated for beginning readers. If transfer is mediated by individual words, as proposed by Rashotte and Torgesen (1985), there should be transfer in all conditions in which words are shared, regardless of whether content is also shared. However, if content (plot, theme) mediates transfer, there will be benefits in all conditions in which content is shared by stories. Finally if transfer is

mediated by a mental representation that includes both words and content, some transfer may be found in conditions in which either words or content are shared but maximal transfer will occur only when both words and content overlap. How reading skill affects reliance on word and content overlap of stories will be explored in Chapter 2 with two experiments involving good and poor readers in Grades 3 and 6. Chapter 3 contains an investigation of how text difficulty influences reading transfer.

Finally, Experiments 5 and 6 described in Chapter 4 used the scrambled word paradigm introduced by Carr et al. (1989). The effect of reader skill on reading transfer for children was explored in Experiment 5, and Experiment 6 investigated the roles of both reader skill and text difficulty on the reading transfer of adults.

CHAPTER 2

Experiment 1: The Effect of Skill Level on Reading Transfer for Grade 6 Children

The first experiment examined the benefits of shared words and shared content for the reading transfer of children. The children, who were classified as good or poor readers, were given pairs of stories to read. The first story of a pair differed in each of the four conditions described below. The stories that were read second were the same for all conditions and have been called transfer stories because they are used to measure transfer. A comparison of reading times for the transfer stories showed how much their reading benefited from the prior reading of the different first stories. If the transfer story was read more quickly under one condition than under the baseline (unrelated) condition then it can be said that there was transfer from the first to the second story.

Pairs of stories were read that were related in various ways. In the Unrelated condition stories shared neither content nor many words. Because stories in this condition were unrelated, transfer was not expected and this condition was used as a baseline against which to compare the other conditions. In the Repetition condition, the same story was read twice so that both words and content were shared. This condition should provide the maximal amount of transfer because everything about the pair of stories was the same. In the Word Overlap condition, the first story had a different theme than the second story, but it contained many of the same words; thus the stories of a pair differed in content but had high word overlap. If transfer is mediated by individual word representations, there

should be transfer in this condition compared to the unrelated condition. However, if

higher-order linguistic information is important for transfer there will be better transfer in

the repetition condition, in which the stories in a pair shared both words and content, than

in the word overlap condition in which only words are shared by a pair of stories. Finally,

in the Paraphrase condition, stories shared content but few words. One story was a line by

line paraphrase of the other, with many words replaced with synonyms. If transfer

occurred in this condition it would indicate that only the meaning or plot of the stories

must be kept constant to ensure transfer. However, if word overlap in addition to content

overlap is important for transfer there should be better transfer in the repetition condition,

in which stories of a pair shared words and content than in the paraphrase condition in

which stories of a pair shared only content.
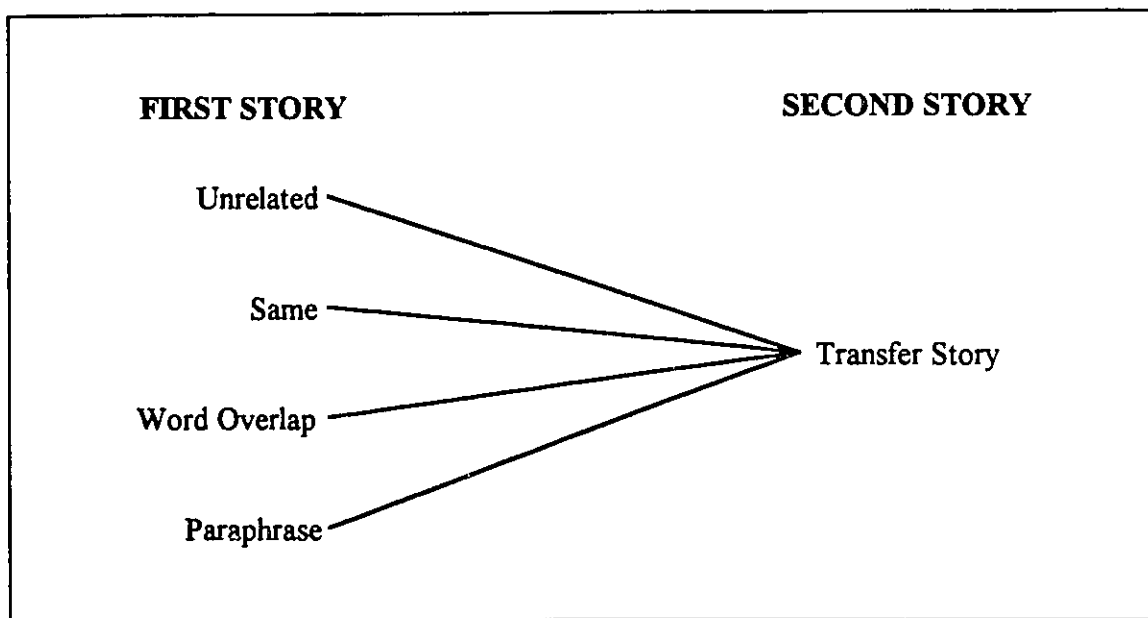
Figure 1: Outline of Experimental Conditions in Experiment 1

Stories in each of these four conditions were given to children who were good or poor readers for their age. Children of different skill levels were used to determine whether transfer was mediated differently in good and poor readers. Past studies with children who were poor readers (Rashotte & Torgesen, 1985; Dowhower, 1987) have found transfer when stories shared only words, indicating that transfer can be mediated by individual words. However studies with fluent reading adults have not found transfer when only words were shared (Levy & Burns, 1990). There was transfer when content but not words were shared (Levy, Barnes & Martin, 1993; Levy, Campsall, Browne, Cooper, Waterhouse & Wilson, 1995) indicating that content mediates transfer in skilled adult readers. Interpretation of these results suggests that the rereading transfer of good and poor readers may by mediated by different mechanisms, with poor readers relying more on word overlap and good readers relying more on content overlap.

Method

Subjects. Forty-eight Grade six students participated in this study. The good reader group consisted of 24 students (10 females, 14 males) with standard scores on the reading subtest of the Wide Range Achievement Test - Revised (WRAT-R) of 109 and above. Their mean score was 117.54 (SD = 6.55, range = 109-133). The poor reader group consisted of 24 students (12 females, 12 males) whose standard scores on the WRAT-R were below 90, but above 60. Their mean score was 77.29 (SD = 6.39, range = 67-90). The Grade 6 good readers were reading at approximately the Grade 8 level and poor readers were at the Grade 4 level. One hundred twenty-six children were screened to select this population.

Materials and Design. Children in this study read one pair of stories in each of the four conditions. To meet the requirements for the four conditions, four story sets were constructed. Each story set consisted of one second story and four first stories (one for each of the word overlap, paraphrase, same story and unrelated conditions) that could be paired with the transfer story. Each set of stories was tested equally often in each experimental condition and the order of experimental conditions was counterbalanced across subjects. All stories were 200 words long and typed on a single page. The stories were adapted from passages found in the Starting Points in Reading series and analyzed by the Flesch-Kincaid formula to be at the Grade 6 level.

In the word overlap condition, the first passage for each story set had a different theme, setting and characters than the transfer stories. However, on average 72.06% of the content words in the transfer story also occurred at least once in the first story (this 72% overlap involved 64-77 individual words per text, some words occurring several times in each story). Content words were defined as nouns, verbs, adjectives and adverbs. In the paraphrase condition the first stories were made by replacing as many of the words as possible from the transfer text with synonyms. Although the story unfolded in the same way in both stories, with each line being paraphrased, an average of only 30.44% of the content words in the second story also occurred in the first story (16-36 individual words). First stories for the unrelated condition consisted stories adapted from the same source as the second story. These pairs of unrelated stories had different themes and settings. An average of only 11.18% of the content words in the transfer stories also appeared in the unrelated first stories (9-11 individual words). These stories had no content and little

word overlap and thus provided a baseline for comparison of the other conditions. Appendix A contains one story set that was used in Experiment 1.

Procedure. Subjects were tested individually in two one-hour sessions. The students were instructed to read each story out loud quickly and accurately, while also reading for meaning in preparation for comprehension questions. Timing began when the child read the first word of the text and stopped when the last word was read. The children were given feedback and were encouraged to beat their previous time. As each child read a story, the experimenter recorded the words that were read incorrectly or were not read at all, and corrections were made whenever possible. After each pair of stories was read, five comprehension questions were asked about the transfer story and then five questions were asked about the first story to encourage the children to read for meaning. The questions were asked to ensure careful reading, and will not be discussed further. A short practice passage was read and four comprehension questions were answered prior to testing the experimental conditions.

Results and Discussion

Reading Times for Transfer Stories. Reading times for the transfer stories are presented in Table 1. Remember that the transfer stories are the same and the labels, such as unrelated and paraphrase refer to the relationship between the different first stories and the transfer stories. Two different factors were examined in the first ANOVA, reading skill and story condition. The effect of reading skill was measured by comparing two groups of children, the good readers and the poor readers, so this was a between subject factor. Good readers read the transfer stories faster than poor readers, $F(1, 46) = 107.68$, $MS_e = 1.69$, $p < .001$.

The second factor analyzed in the ANOVA was story condition. All of the children involved in this study received all of the story conditions so this factor was manipulated within subjects. The story conditions described how a pair of stories related to each other. The four conditions were: unrelated, word overlap, paraphrase, repetition. There was a reliable effect of condition, $F(3, 138) = 40.25$, $MS_e = .09$, $p < .001$, meaning that transfer stories were read faster in some conditions than others. However, before we examine the nature of the conditions effect it must be reported that the story conditions factor interacted with the reading skill factor, $F(3, 138) = 7.53$, $MS_e = .089$, $p < .001$. This means that the differences between story conditions were not the same for good and poor readers. For this reason the story condition factor will be examined separately for good and poor readers.

Story condition had a reliable effect on the speed of good readers, $F(3, 69) = 24.52$, $MS_e = .027$, $p < .001$. The effect of story condition on reading time was analyzed by a Newman-Keuls test with alpha set at .05. A Newman Keuls test is a post hoc test that allows for the comparison of all of the different story conditions with each other without increasing the chance of making a Type 1 error (rejecting the null hypothesis when, in fact, it is true) above the alpha level that has been set. For this experiment, and the ones to follow, alpha was set at .05, so there is less than a 5% chance of rejecting the null hypothesis when it is true. When all story conditions were compared, it was found that the transfer story was read faster by good readers in the repetition condition than in all other conditions, suggesting that the most transfer is found when both words and content are shared by two stories. Further comparisons revealed that the paraphrase condition, which was slower than the repetition condition, was significantly faster than the

unrelated condition that was the baseline. Thus, for the good readers transfer was found when the content of the first and second stories was shared regardless of whether words were also shared. No advantage was found for reading words in a different context (word overlap condition) compared with reading two unrelated stories.

Table 1. Mean Reading Times (in seconds) and Word Errors for Transfer Stories in Experiment 1.

		Repetition	Paraphrase	Word Overlap	Unrelated
Reading Time					
Good Readers	Mean	66.88	74.80	77.12	78.93
	SD	10.43	12.79	15.81	15.22
Poor Readers	Mean	119.21	140.34	135.9	148.22
	SD	22.84	28.33	27.37	32.87
Word Errors					
Good Readers	Mean	.54	.38	.58	.63
	SD	.78	.82	.93	1.06
Poor Readers	Mean	4.96	7.54	5.42	8.79
	SD	2.90	3.51	2.77	3.58

These results can be contrasted with those obtained for poor readers. Again the story condition had a reliable effect on reading time, $F(3, 69) = 23.78$, $MS_e = .151$, $p <$ .0001. A Newman-Keuls test (alpha $< .05$) was used to compare all story conditions with

each other. The transfer story was read faster in the repetition condition than in all other conditions. As with good readers, the best transfer was found when stories of a pair shared both words and content. Further, like the good readers, poor readers were faster to read the transfer story in the paraphrase condition that in the unrelated condition, demonstrating transfer when stories shared content. However, in contrast to the good readers, the poor readers were faster in the word overlap condition than in unrelated condition. Thus the poor, unlike the good readers, showed large decreases in reading time when given prior experience with many of the words of the text.

Accuracy of Reading the Transfer Passages. The mean number of errors made in reading the transfer passages are also shown in Table 1. An error represents a word that was read incorrectly or was not read at all. These data were submitted to the same type of mixed ANOVA that was used in analyzing the reading times of the transfer passages. The between subject factor was reading skill with children divided into groups of good and poor readers. The poor readers made more errors overall than the good readers, $F(1,46) = 135.74$, $\underline{MS}_e = 13.36$, $\underline{p} < .001$.

The second factor analyzed in the mixed ANOVA was the within subject factor of story condition (unrelated, word overall, paraphrase and same story). Story condition had a reliable effect on the number of errors, $F(3, 138) = 13.22$, $\underline{MS}_e = 2.95$, $\underline{p} < .0001$. The factors of reading skill and story condition interacted, $F(3, 138) = 13.33$, $\underline{MS}_e = 2.95$, $p < .001$, with good and poor readers exhibiting different patterns of errors across the story conditions. To discover the patterns of errors in the different story conditions, good and poor readers' data were analyzed separately.

When the effects of words and content were pulled apart it was found that poor readers benefited in both speed and accuracy from a prior reading of the words of a text, even if the content of the two stories differed. This result for poor readers resembles that reported for reading disabled children in the Rashotte and Torgesen (1985) and Dowhower (1987) papers in which transfer was found when stories shared many words. More surprisingly a similar result was found in adults with undetermined reading ability in a study by Carr et al. (1989) in which adults who read a scrambled version of a story (that by definition had no coherent content to share with a second story) transferred reading speed to a second story that was not scrambled.

In contrast, good readers in Experiment 1 did not benefit from word overlap when the content of two stories differed, as in the studies of adult text transfer by Levy and her colleagues (Levy & Burns, 1990; Levy, Barnes & Martin, 1993; Levy et al., 1994). Carlson, Alejano, and Carr (1991) have argued that the difference between the Carr et al. (1989) result and the Levy and Burns (1990) result may be due to the use of a different focus of attention during reading. The word level transfer was due to the word by word focus during reading and the transfer based on shared message was due to a focus on comprehension during reading. The poor versus good reader differences observed here illustrate a similar effect. The differences in reading transfer for good and poor readers could have occurred because the poor readers may have focused on the words of a text, while good readers focused on the content of the text.

As in Experiment 1, Experiment 2 explored the differences between good and poor readers. However, the subjects in Experiment 2 were children in Grade 3. The purpose of the experiment was to examine the differences between good and poor readers

in even younger children, to see whether differences in reliance on words and content for transfer occurs even at the beginning of reading development when the contrast in focus on words versus content may be less sharp.

Experiment 2: The effect of skill on reading transfer for beginning readers in Grade 3.

The goal of Experiment 2 was to examine individual differences in reading ability on the reading transfer of children in Grade 3. If a similar pattern of transfer is found for the younger children as was found with the older Grade 6 children, in Experiment 1, it would indicate that individual differences in reading ability influence the nature of transfer. In other words poor readers transfer reading skill at different linguistic levels than good readers, and the transfer differences between good and poor readers persist even when more reading experience is gained. If the Grade 3 children all demonstrate the same pattern of transfer as the poor readers in Grade 6, it would indicate that developmental differences (which may be related to amount of reading experience), as well as individual differences (invariance in the linguistic level of transfer), influence the nature of reading transfer.

Method

Subjects. Fifty-six children in Grade 3 participated in this study. Twenty eight students with standard scores of 109 or above on the reading subtest of the WRAT-R formed the good reader group. Their mean score was 115.68 (SD =5.07, range 109-129). Twenty-eight students with standard scores between 60 and 90 on the WRAT-R formed the poor reader group. Their mean score was 82.82 (SD = 5.09, range 72-89). There

were 19 females and 9 males in each group. One hundred twenty five children were screened on the WRAT-R to find the fifty six children who participated.

Design and Materials. The design of this experiment was the same as Experiment 1. The materials were constructed in the same manner but were written at the Grade 3 level. Again all stories were 200 words long and typed on a single page.

As in Experiment 1, the four conditions were repetition, word overlap, paraphrase, and unrelated. In the repetition condition, the same story was read twice so that content and words were the same. The word overlap stories shared many words but differed in content. On average each pair of stories in the word overlap condition shared 79.39% of their content words, (repetitions of 60-68 individual words). In the paraphrase condition the stories had the same themes, plots and characters with the first story being a line by line paraphrase of the second story. On average each pair of stories in the paraphrase condition shared only 44.84% of their content words (22-29 individual words that may have been repeated). Finally the unrelated stories shared no content and few words. On average the pairs of stories in this condition shared only 21.56% of their content words (repetitions of 11-21 words).

Procedure. The same procedure was used as in Experiment 1. Subjects were tested individually in two sessions and each story reading was timed and the number of word errors noted. Feedback was given to subjects for both reading time and errors.

Results and Discussion

Reading Times for Transfer Passages. Table 2 contains the mean reading times of good and poor readers for the transfer passages read in the four conditions. The reading times for transfer passages were subjected to a mixed analysis of variance

(ANOVA) to determine the effect of two factors; reading skill and story condition.

Reading skill was a between subject variable with the subjects divided into good and poor

readers. Overall the good readers were faster than the poor readers, $F(1, 54) = 97.74$,

$MS_e = 2.52$, $p < .001$.

The second variable evaluated in the ANOVA was story condition which had

four levels; unrelated, word overlap, paraphrase, repetition. There was a reliable effect of

story condition on reading time, $F(3, 162) = 20.13$, $MS_e = .28$, $p < .001$. However, the

factors of skill and condition interacted, $F(3, 162) = 5.39$, $MS_e = .28$, $p < .01$, meaning

that the story condition factor affected good and poor readers differently. To understand

how the story condition factor influenced the reading time of good and poor readers, the

conditions effect was analyzed separately for good and poor readers.

For good readers there was a significant effect of condition, $F(3, 81) = 10.42$,

$MS_e = .07$, $p < .001$. A Newman-Keuls test (alpha $< .05$) was performed to determine the

where the differences between conditions occurred. Reading was faster in the repetition

condition than in all other conditions, and the paraphrase condition was faster than the

unrelated condition. The word overlap condition ($t=1.47$) did not differ from the

unrelated condition. Like the good readers in Grade 6, the good readers in Grade 3

benefited from both repeating the story and from repeating the content of the story with

different words (paraphrase). No benefit was seen for reading the words of the story in a

different context.

The pattern of results for the good readers can be contrasted with that obtained

for poor readers. Story condition had a significant effect on the reading times of poor

readers, $F(3, 81) = 13.10$, $MS_e = .50$, $p < .001$. A Newman-Keuls test (alpha $< .05$)

showed that reading was faster in the repetition condition than in all other conditions. In addition, the word overlap and paraphrase conditions were faster than the unrelated condition. Unlike the good readers, the poor readers were faster in both the word overlap and the paraphrase conditions than in the unrelated condition. The pattern of transfer found for poor readers in Grade 3 was exactly the same as the pattern found with poor readers in Grade 6 in Experiment 1.

Table 2: Mean Reading Times (in seconds) and Word Errors for Transfer Stories in Experiment 2.

		Repetition	*Paraphrase*	*Word Overlap*	*Unrelated*
Reading Time					
Good Readers	Mean	75.29	79.49	82.69	86.22
	SD	16.11	14.12	18.08	20.67
Poor Readers	Mean	131.66	152.84	147.79	165.67
	SD	34.65	39.18	38.13	39.39
Word Errors					
Good Readers	Mean	.21	.25	.08	.38
	SD	.41	.61	.41	.77
Poor Readers	Mean	3.33	6.67	5.21	9.00
	SD	3.29	5.44	4.23	5.79

Accuracy of Reading the Transfer Passages. Table 2 also presents the mean

number of word errors made in each condition for the transfer stories. The number of

errors in each condition were submitted to the same type of mixed ANOVA used for the

reading times. The between subjects factor was skill level (good and poor readers). Poor

readers made more errors than the good readers, $F(1,54) = 58.98$, $MS_e = 29.95$, $p < .001$.

The within subject factor was story condition (unrelated, word overlap, paraphrase and

repetition). The story condition had a reliable effect on the number of errors made when

reading a story, $F(3, 162) = 17.78$, $MS_e = 4.57$, $p < .001$. However, skill level and

condition interacted, $F(3, 162) = 14.64$, $MS_e = 4.57$, $p < .001$, meaning that the story

condition factor had different influences on the good and poor readers. In order to

interpret this interaction, the effect of the story condition factor was analyzed separately

for good and poor readers.

The good readers made few errors, with an average of less than one error in four

stories. The accuracy of good readers was at ceiling and the story condition had no

reliable effect on the number of errors made.

The poor readers made more errors than the good readers and the story

condition did influence the number of errors made, $F(3, 81) = 16.90$, $MS_e = 8.73$, $p <$

.001. A Newman-Keuls analysis was used to compare all of the story conditions. The

least number of errors was made in the repetition condition which was read significantly

more accurately than all other conditions. In addition, there were fewer errors in the word

overlap and paraphrase conditions than in the unrelated condition. The decrease in word

errors in the paraphrase condition that was found with poor readers in Grade 3 was not

found with the poor readers in Grade 6 in Experiment 1. One possible explanation for this

result is that there was higher word overlap in the paraphrase condition in Experiment 2 than in Experiment 1 (45% vs. 30%).

To summarize the results of Experiment 2, the good and poor readers had different patterns of reading transfer. For the good readers there was transfer of reading speed in the repetition and paraphrase conditions. Good readers' accuracy was at ceiling and there was no effect of story condition on the number of errors made. For the poor readers there was transfer of reading speed in the repetition and paraphrase conditions as there was for the good readers, but the poor readers also transferred reading speed in the word overlap condition. The poor readers transferred accuracy in the same story conditions that supported transfer of reading speed with fewer errors in the repetition, word overlap and paraphrase conditions than in the unrelated condition.

The results of the experiments with Grade 6 and Grade 3 students were very similar with only one difference in transfer. When reading time was the measure of transfer, good readers in both Grade 3 and Grade 6 showed the same pattern with transfer in the paraphrase and repetition conditions. For the good readers overlap in content or both words and content was essential for transfer. In contrast to the good readers, the poor readers in Grades 3 and 6 also transferred reading speed in the word overlap condition. For poor readers, the overlap of words was enough to support transfer, even when the words occurred in different contexts. When the measure of transfer was accuracy, the good readers in both Grades 3 and 6 were at ceiling and there was no effect of condition. In contrast to the good readers, story condition did influence the number of errors made by poor readers. In Grade 6 and Grade 3 the poor readers were more accurate in the word overlap and repetition conditions. The only difference found

between the poor readers in Grade 6 and Grade 3 was that the younger poor readers transferred accuracy in the paraphrase condition but the older children did not benefit in this condition. Poor readers in Grade 3 were able to benefit from a prior experience with the content of a story to make them more accurate, but this experience did not help the older poor readers. One explanation for the different results is that the stories in the paraphrase condition for the younger children contained more word overlap (45% vs. 30%). In addition, the younger poor readers were only beginning to read and because their word recognition skills were weak (as shown by low scores on the WRAT-R) they may have used context to help them guess the identity of words (Perfetti & Roth, 1981; Stanovich, 1981). By increasing the poor readers ability to make accurate guesses as to a word's identity, repetition of content helped the young poor readers to read more accurately but it did not help the older poor readers whose word recognition skills were better. Furthermore, the older poor readers may have been less willing to guess at unknown words even when the context gave them clues because of the fears of being wrong.

The differences in the transfer of good and poor readers change little between Grade 3 and Grade 6. The patterns of transfer were very similar for good and poor readers in Grades 3 and 6, suggesting that the absolute level of reading skill per se may not be the controlling factor in these differences. The reading skill of the children relative to their peer group seems to be the controlling factor in determining the pattern of reading transfer. However, there is another factor that may have influenced reading transfer in the first two experiments, that of text difficulty. The good and poor readers in each experiment read the same materials. The materials were created to be at the children's

grade level, i.e. at the Grade 6 level in Experiment 1 and at the Grade 3 level in Experiment 2. Thus, the stories were easy for the good readers but difficult for the poor readers at each grade level. Story difficulty in relation to reading skill may have mediated the differences in transfer found in the first two studies. The role of text difficulty is investigated in Chapter 3.

CHAPTER 3

Experiment 3: The Effect of Skill on Transfer when Text Difficulty is Matched to Reader Ability

Experiments 1 and 2 demonstrated that transfer varied with reading skill. Good readers benefited from prior experience with the content of stories, while poor readers also benefited from prior exposure to the words of a passage even if they were in a different context. The patterns of transfer were very similar for good and poor readers in Grades 3 and 6 suggesting that the skill of the reader relative to their peer group is an important factor in reading transfer. Experiment 3 was designed to examine the role of text difficulty in determining transfer of skill.

In Experiments 1 and 2, good and poor readers were given the same grade-appropriate stories to read, resulting in the good readers finding the stories easy and the poor readers finding the same stories difficult. Both reading skill and how difficult the materials were for the children to read were varied. Conclusions about whether reading skill or material difficulty produced the different patterns of results for good readers (easy materials) and poor readers (difficult materials) can not be drawn until the influence of each factor is examined in isolation.

To test the hypothesis that reading skill determines how transfer will be mediated, reading skill must be varied while the difficulty of reading materials is held constant. To accomplish this goal a reading level match will be used. Children in Grade 6

and Grades 2 and 3 will be matched on their reading skill. As in Experiments 1 and 2, reading skill will be measured on a standard test so that the classification of skill is relative to the subjects' peers of the same age. In other words, a good reader is above average for their age and a poor reader is below average for their age. To obtain a reading level match poor readers in Grade 6 (reading at a Grade 4 level) and good readers in Grades 2 and 3 (reading at a Grade 4 level) will be used as subjects. In this way children with different levels of skill can be given the same set of reading materials which will be at the appropriate reading level for their ability (Grade 4).

Table 3: Description of reading level match.

School Grade	Relative Reading Skill	Reading Level	Material Difficulty
Grade 6	poor	Grade 4	Grade 4
Grades 2 and 3	good	Grade 4	Grade 4

If differences between good and poor readers occur even when difficulty is held constant, the hypothesis that reading skill is an important factor in reading transfer is supported. However, if the differences in transfer found in Experiments 1 and 2 are not present when the materials are at the child's reading level, then the hypothesis that reading skill influences transfer is not supported and text difficulty will be implicated as responsible for differences in transfer found in Experiments 1 and 2.

Method

Subjects. Twenty-four poor readers in Grade 6 and 24 good readers in Grades 2 and 3 participated in this study. The good reader group consisted of 18 Grade 2 students (7 females, 11 males) and six Grade 3 students (3 females, 3 males) whose standard scores on the reading subtest of the WRAT-R were 109 and above. Their mean score was 116.13 (SD = 4.88, range = 109-127). One hundred twenty-seven Grade 2 children and 88 Grade 3 children were screened to find the good readers who participated in this study. The poor reader group consisted of 24 Grade 6 students (10 females, 14 males) whose standard scores on the WRAT-R were below 91, but above 60. Their mean score was 82.29 (SD = 8.01, range = 61-91). Eighty-four Grade 6 children were screened to find the poor readers who participated in this study. The good and poor readers were matched on reading ability according to their raw score on the WRAT-R. The mean raw score for the young good readers was 63.54 (SD = 4.78, range = 54-73) and for the older poor readers was 63.79 (SD = 5.63, range = 47-71). Thus the two groups read at the same absolute level, though they differed in ability compared with peers of their own age. All children in this experiment were reading at approximately the Grade 4 level.

Materials and Design. As in Experiments 1 and 2, the children in this study read pairs of stories. The second story of a pair was the same in all conditions, with the first story changing to create the four conditions of the experiment. The four conditions were the same as in the previous two experiments with the stories adapted from the first experiment to be at the Grade 4 level of difficulty according to the Flesch-Kincaid formula. Grade 4 is the average reading level of the children in this experiment.

For the <u>Repetition</u> condition the first story and the second story were the same. In the <u>Word Overlap</u> condition the first story contained many of the same words as the second story but the theme was different. An average of 77.39% of the content words in the transfer story occurred at least once in the first story (61-65 individual content words per text, with some words occurring several times in each story). For the <u>Paraphrase</u> condition, the first story had the same theme and plot as the second story, but many of the content words of the second story were replaced by synonyms in the first story. After replacing as many words as possible, an average of 36.25% of the content words in the second story occurred at least once in the first story (16-21 individual words). For the <u>Unrelated</u> condition, the first story had a different theme and plot than the second story and few words were shared by them. On average, only 15.48% of the content words in the second story occurred in the first story (9-12 individual words). The number of words shared by stories of a pair is a continuum decreasing from the repetition condition in which all words are shared to word overlap with 77.39%, paraphrase with 36.25% and unrelated with 15.48%.

<u>Procedure.</u> The same procedure as in Experiments 1 and 2 was employed. Subjects were seen individually in 2 sessions. The reading times and the number of errors made in each story were recorded. Feedback on reading times and errors was given.

Results and Discussion

<u>Reading Times for Transfer Passages</u>. The mean reading times for the good and poor readers in each condition of the experiment are presented in Table 3. Reading times for the transfer passages were subjected to a mixed analysis of variance. The between subject factor was relative reading skill (good, poor). It is important to note that although

the children differed in reading skill relative to same age peers, they were matched on absolute reading ability. As expected, there was no effect of skill level (F < 1) showing that the relatively good and poor readers were well matched at the Grade 4 level.

Table 4: Mean reading times (in seconds) and word errors for second stories in Experiment 3.

		Repetition	*Paraphrase*	*Word Overlap*	*Unrelated*
Reading Time					
Good Readers	Mean	99.77	118.20	114.50	128.30
(Grade 2/3)	SD	31.84	41.75	35.09	47.45
Poor Readers	Mean	101.80	111.95	114.65	126.88
(Grade 6)	SD	36.12	45.70	41.50	55.80
Word Errors					
Good Readers	Mean	0.96	2.96	1.75	3.67
(Grade 2/3)	SD	1.52	4.57	1.82	4.28
Poor Readers	Mean	1.42	2.38	2.04	3.63
(Grade 6)	SD	3.30	4.20	2.94	3.18

The story condition was varied within subject with all children reading stories in each of the four conditions; unrelated, word overlap, paraphrase and repetition. Story condition had a reliable effect on reading time, $F(3,138) = 6.21$, $MS_e = .265$, $p < .01$. However, most importantly, there was no interaction of reading skill and condition (F < 1). The lack of interaction indicates that good and poor readers did not differ in their patterns of transfer. When stories were equally difficult for the good and poor readers, no

differences in transfer were found for the good and poor reader groups. A Newman Keuls analysis compared the reading times of the four story conditions for the good and poor readers. The repetition condition was faster than all other conditions. In other words, the most benefit occurred when both the words and the content of the stories were be repeated. However, the Newman Keuls analysis also indicated that stories were read faster in the word overlap and paraphrase conditions than in the unrelated condition. When stories were matched to the readers' skill level, the children benefited equally from repetition of either words or content.

Accuracy of Reading the Transfer Passages. The mean number of word errors made by good and poor readers in each condition are presented in Table 3. The error data were subjected to the same 2 x 4 ANOVA (skill x condition) that was used to analyze reading times. Once again there were no differences between the good and poor readers ($F < 1$) showing that the groups were equated in absolute reading ability. Condition had a reliable effect on reading accuracy, $F(3, 138) = 6.80$, $MS_e = 7.85$, $p < .01$. Importantly, there was no skill by condition interaction ($F < 1$) indicating that good and poor readers did not have different patterns of transfer across the story conditions. The benefits in word recognition accuracy seen in the good readers in this experiment contrast with the lack of benefit found in the previous two experiments. It is important to remember that the good readers in this experiment were given stories that were at their reading level and in previous experiments the materials were easy for the good readers.

The differences between story conditions were illuminated by a Newman-Keuls analysis. The good and poor readers made fewer errors in the repetition and word overlap conditions than in the unrelated condition. No evidence for transfer in the paraphrase condition was found as there was no reliable difference in the number of errors made in the paraphrase condition and the unrelated condition. When there was a high number of

words overlapping transfer of accuracy was found. However, content overlap had little influence on transfer as no transfer was found when only content was shared by stories (paraphrase condition) and no extra transfer was seen when content in addition to words was shared (repetition condition was not better than word overlap alone).

The results of Experiment 3 demonstrate that reading skill, at least as measured relative to same age peers, does not determine the pattern of transfer. Once the materials were the same level of difficulty for all children there was no interaction of reading skill and story conditions when the dependent measure was reading time and when it was reading accuracy. The lack of interaction means that the pattern of transfer was the same for good and poor readers in Experiment 3. The differences between good and poor readers in Experiment 1 and 2 remain unexplained. The relative difficulty of the reading materials for the good and poor readers is implicated as the factor determining when transfer is found.

Experiments 3 and 4 were designed to separate and examine the effects of reader skill and text difficulty. The design of Experiment 3 was to vary skill and keep text difficulty constant. The complimentary experiment of constant skill and varying text difficulty was run as Experiment 4. If the interaction of text difficulty and reader skill determines the pattern of transfer observed, there should be different patterns of transfer for easy and difficult stories. For easy stories the pattern should resemble that found with good readers in Experiments 1 and 2; transfer when content is repeated, but no transfer when only words are repeated. For difficult stories the pattern should be like that found for poor readers; transfer when either words or content are repeated.

Experiment 4: The Effect of Text Difficulty on the Reading Transfer of Average Readers

The results of Experiment 3 indicate that good and poor readers do not process text in fundamentally different ways. In fact, the patterns of transfer for good and poor readers were the same once the texts being read were at an appropriate level of difficulty for each child's reading level. In Experiments 1 and 2 both reading skill and the difficulty of a text were varied and different patterns of reading transfer were found. Experiment 3 found that differences in reading skill (when measured relative to same age peers) alone did not produce different patterns of transfer. This leads to the speculation that text difficulty, relative to reading ability, produced the different patterns of transfer found in Experiments 1 and 2. The main difference in the transfer of good and poor readers was that there was transfer for poor readers but not good readers in the word overlap condition.

Experiment 4 was designed to test the hypothesis that variations in text difficulty, relative to reading ability, could produce different patterns of reading transfer. All of the children in this experiment were of average reading skill and were tested to be at a Grade 4 level of reading ability. Half of the materials read by the children were difficult for them (at the Grade 7 level) and half of the materials were easy for them (at the Grade 2 level). This design allows for reading level to be kept constant while text difficulty was varied. If text difficulty relative to reader ability determines how transfer is mediated, then easy stories should produce a "good reader" pattern, with transfer in the repetition condition but not the word overlap condition. In contrast, the difficult stories should produce the "poor reader" pattern found in Experiments 1 and 2. The "poor reader"

pattern included transfer for shared words in the word overlap condition even when the content of stories was different, in addition to transfer in the repetition and paraphrase conditions. Prediction of when word overlap will produce transfer is the purpose of Experiment 4.

Method

Subjects. Thirty-two children in Grade 4 participated in this study. All children (17 females, 15 males) were classified as average readers according to the WRAT-R, with scores between 91 and 107. The mean score was 99.91 (SD = 3.61). One hundred twenty-eight children were screened to find the 32 average readers for this study.

Materials and Design. As in the previous three experiments, the children in this study read pairs of stories in four conditions: repetition, word overlap, paraphrase and unrelated. However, in this experiment the children read both an easy (Grade 2 by the Flesch Kincaid formula) and a difficult (Grade 7) pair of stories in each condition. The order of the easy and difficult stories was blocked, with half of the children reading all of the easy stories first and half of the children reading the difficult stories first. Each transfer story was read equally often in each experimental condition, and order of receiving experimental conditions was counterbalanced across subjects.

The easy stories were adapted from the Grade 3 and 4 stories used in Experiments 2 and 3. All stories were simplified and difficult words were removed so that the stories were at a Grade 2 level according to the Flesch-Kincaid formula. In the repetition condition the two stories were exactly the same. For the word overlap condition the passages had different plots and themes but an average of 79.13% of the content words in the transfer story occurred at least once in the first story (repetitions of

58-66 individual content words). For the paraphrase condition the plot and themes of the stories were the same. Although the story unfolded in the same way in both stories, with each line being paraphrased, only 34.71% of the content words were shared (repetitions of 13-18 individual words). Finally in the unrelated condition the stories did not share theme, plot or characters and only 16.32% of their content words overlapped (repetitions of 9-14 individual words).

The difficult stories were adapted from the Grade 6 stories used in Experiment 1. The stories were made a little more difficult so that they were at a Grade 7 level according to the Flesch-Kincaid formula. The amount of word overlap between pairs of stories was carefully matched with that for the easy stories, so that both set of materials had approximately equivalent amounts of word overlap. Once again, in the repetition condition the same story was repeated, so the plot and words were exactly the same in this condition. For the word overlap condition the plot or themes of the two stories differed, but 75.60% of the content words in the second story occurred at least once in the first story (repetitions of 77-80 individual words). For the paraphrase condition, the stories were the same but shared only 28.28% of their words. When the stories were unrelated, only 12.85% of the words in the second story also appeared in the first. These proportions of word overlap were the same for conditions in both easy and difficult story sets.

Procedure. The procedure for Experiment 4 was the same as for Experiments 1, 2 and 3. Subjects were seen individually for up to 3 one-hour sessions. Reading times for each story read were recorded and the number of errors noted. Feedback on reading times and errors was provided.

Results and Discussion

Reading Times for Transfer Passages. The mean reading times for difficult and easy passages in each story condition are presented in Table 4. Reading times for the transfer stories were submitted to a within-subject analysis of variance, with the factors of text difficulty (easy, difficult) and condition (unrelated, word overlap, paraphrase, repetition). The easy stories were read faster than the difficult stories, $F(1, 31) = 272.48$, $MS_e = .29$, $p < .01$. Story condition had a reliable effect on reading time, $F(3, 93) = 93.72$, $MS_e = .17$, $p < .001$. Text difficulty and condition interacted reliably, $F(3, 93) = 5.25$, $MS_e = .17$, $p < .01$, meaning that there were different patterns of transfer across the story conditions for the easy and the difficult stories. In order to understand this interaction, the conditions effect was analyzed separately for the easy and difficult stories.

For the easy stories there was a reliable effect of condition, $F(3, 93) = 15.83$, $MS_e = .08$, $p < .001$. Newman Keuls analysis compared the different story conditions with each other. When comparing easy stories, it was found that the repetition condition was faster than the word overlap, paraphrase, and unrelated conditions, with no differences between the latter three conditions. The pattern of transfer of reading speed was the similar to that shown by good readers in the first two experiments. The pattern for good readers or with easy texts was that transfer was found in the repetition condition but not in the word overlap conditions. The only difference between the good readers in previous experiments and the easy stories in this experiment was that no transfer was found in the paraphrase condition with easy stories, as had been found with good readers. The lack of transfer in the paraphrase condition with easy stories is problematic and thus represents a failure to reproduce exactly the same pattern found with good readers in

Experiments 1 and 2. However, it is the word overlap condition that was used to differentiate the patterns of transfer for good and poor readers in Experiments 1 and 2. Good readers and easy stories both produced no transfer in the word overlap condition. The average readers in Experiment 4 who were reading easy texts reproduced the main part of the pattern that defined good readers in Experiments 1 and 2 -- no transfer when only the words but not the content of stories was shared.

Table 5: Mean Reading Times (in seconds) and Word Errors for Transfer Stories in Experiment 4.

		Repetition	*Paraphrase*	*Word Overlap*	*Unrelated*
Reading Time					
Easy Stories	Mean	79.25	88.65	91.72	93.09
	SD	24.04	24.35	30.82	28.95
Difficult Stories	Mean	105.66	129.62	123.40	134.60
	SD	29.17	41.14	39.29	40.46
Word Errors					
Easy Stories	Mean	.22	.53	.53	.84
	SD	.79	.84	1.08	1.08
Difficult Stories	Mean	2.75	5.56	3.72	6.44
	SD	2.74	3.97	3.52	4.91

The results for easy passages can be contrasted with those obtained for difficult passages. Once again the story condition had a reliable effect on reading time $F(3, 93) = 28.34$, $MS_e = .18$, $p < .001$. Newman-Keuls analysis of the difficult stories showed that

the repetition condition was faster than all other conditions and the word overlap was faster than the unrelated condition. When the average readers were given difficult passages to read they showed transfer in the repetition and word overlap conditions, as did the poor readers in Experiments 1 and 2. The transfer found in the word overlap condition defined the poor reader pattern found in Experiments 1 and 2 and this result was reproduced with average readers when given difficult texts.

Unfortunately no transfer in the paraphrase condition was found for either the easy or difficult stories in Experiment 4. Both the good and poor readers in Experiments 1 and 2 transferred reading speed in the paraphrase condition, so transfer was expected in both the easy and difficult stories. This failure to find transfer in the paraphrase condition may be due to differences in the quality of the paraphrases used. The meaning overlap may have been compromised in this experiment in the effort to lower the word overlap in the paraphrase condition compared to the previous experiments (28% in this experiment vs. 45% in Experiment 1 and 30% in Experiment 2). However with no objective measure of the quality of a paraphrase, it is impossible to say if paraphrase quality is the true reason for the lack of transfer.

Accuracy of Reading the Transfer Passages. Table 4 also presents the mean numbers of word errors made in each condition of the easy and difficult stories. The number of errors made in a story were submitted to the same 2 x 4 (difficulty x condition) ANOVA that was used in analyzing the reading times. More errors were made in reading the difficult than the easy stories, $F(1, 31) = 69.20$, $\underline{MS_e} = 15.44$, $p < .001$. Story condition had a reliable effect on the number of errors made, $F(3, 93) = 27.10$, $\underline{MS_e} = 2.17$, $p < .001$. The effect of story condition interacted with the difficulty level of the stories, $F(3, 93) = 15.69$, $\underline{MS_e} = 2.17$, $p < .001$, such that the pattern of transfer was

different for the easy and difficult stories. To understand the interaction the easy and difficult stories were analyzed separately.

Analysis of the errors made when reading the easy stories revealed a reliable effect of condition, $F_{(3, 93)} = 5.83$, $MS_e = .36$, $p < .01$. This result must be interpreted with some caution because the number of errors made in the easy stories was small and the amount of variance quite large. Newman-Keuls analysis (alpha = .05) showed that the repetition and paraphrase conditions had fewer errors than the unrelated condition. Even though the paraphrase condition shared few words with the transfer story, the transfer story was read more accurately due to the repetition of story content. The shared content of the stories may have allowed the children to decode unfamiliar words more accurately, perhaps by guessing from the surrounding context. The increased accuracy in the repetition and paraphrase conditions in the easy stories can not be compared to the data from good readers in Experiments 1 and 2 because the good readers performance was at ceiling in the previous experiments and no effect of condition on number of errors was found.

Story condition also had a reliable effect on the number of errors made when reading the difficult stories, $F_{(3,93)} = 22.78$, $MS_e = 3.98$, $p < .001$. Newman-Keuls analysis (alpha < .05) showed that both the repetition and word overlap conditions were read more accurately than the unrelated and paraphrase conditions. When reading difficult stories there was a benefit only when the stories shared many words. Shared content alone (paraphrase condition) was not enough to increase accuracy. The average readers with difficult text transferred accuracy in the word overlap and repetition conditions, as did the poor readers in Experiments 1 and 2. The poor readers in Experiment 2 also made

fewer errors in the paraphrase condition but this result was not found for the poor readers in Grade 6 studied in Experiment 1 nor the average readers with difficult texts in Experiment 4.

The results of Experiment 4 are interpreted to indicate that text difficulty is an important factor in reading transfer. Texts that are more difficult produced transfer when only words were shared, but easier texts do not produce transfer when only words were shared. By giving average Grade 4 readers easy and difficult texts we have been able to produce patterns of transfer that are similar to those found with good and poor readers in Experiments 1 and 2. In other words by manipulating text difficulty we have made the transfer of average readers similar to that of both good and poor readers. These results again speak to the debate in the cognitive psychology literature over whether prior experience with the words of a story in a different context will produce transfer. When Carr et al. (1989) found transfer between scrambled and normal texts it may have been because the texts were difficult for their adult subjects to read. Levy and Burns (1990) did not find transfer from scrambled words to normal text, perhaps because their texts were easier fro their subjects.

CHAPTER 4

Experiment 5: Reading Transfer from Scrambled and Normal Texts in

Beginning Readers

The purpose of Experiment 5 was to determine if the first story of a pair must be

meaningful for transfer to occur. In the previous four experiments, both stories in a pair

were normal. That is both stories had a coherent plot development. One of the most

interesting findings of these four studies was that children could benefit from previous

exposure to the words of a text, whether in the same story context (repetition condition)

or a different story context (word overlap condition). The fact that the word benefit was

found even when the context of the words changed lead to the question asked in

Experiment 5, Is transfer possible if the words of the first story have NO coherent

context?

In Experiment 5 the words or the sentences of a story will be scrambled so that

there is no coherent context in the first story of a pair. Then the normal story containing

the same words will be read. If transfer occurs under these conditions from scrambled

text to normal text, it will demonstrate that it is not necessary to embed words in a story

format to achieve transfer. Drill of the content words of a story before reading that story

has been shown to increase reading speed. Fleisher, Jenkins and Pany (1979) found that

prior practice with the words of a text when seen in list form did increase the speed of

reading that text. Children were able to transfer the knowledge gained from reading a list

to reading a text.

A debate over whether adults can transfer the skill gained from reading words to reading normal text has recently appeared in the cognitive psychology literature. Carr et al (1989) found transfer from scrambled words to normal text and in fact there was equivalent transfer from scrambled words to normal text and from two readings of a normal text. These researchers concluded that word overlap was crucial for transfer but overlap in story content was not necessary for transfer. In contrast, Levy and Burns (1990) did not find transfer when scrambled words preceded a normal story. Further, there was a graded loss in transfer as the first story was made more incoherent by scrambling, resulting in less and less overlap in story content. Levy and Burns concluded that shared content was vital for transfer. Many differences between these two sets of experiments could account for the disparate results and conclusions. One possibility is that there were differences in text difficulty in relation to reader skill. In Experiment 5 the materials will be the same for all readers but children will be divided into groups of good and poor readers. The materials will be relatively difficult for the poor readers and easy for the good readers. When reading material that is difficult, the children in Experiments 1, 2 and 4 benefited from word overlap, whereas when the material was easy for the children, limited or no benefit from word overlap was detected. If text difficulty relative to reading ability influences transfer from scrambled text as it does from coherent text, then it is expected that the good readers in Experiment 5 will not benefit when words, but not the content, of stories are shared. The good readers are expected to exhibit a pattern of transfer similar to that found by Levy and Burns with no benefit when the first passage is scrambled at the word level, little transfer when the first passage is scrambled at the sentence level and maximal transfer when the first passage is normal. However, the poor

readers who are reading texts that are difficult for them may benefit from word overlap

even when story content is not shared and thus will exhibit equivalent transfer in all

conditions as found in the Carr et al. experiment.

Method

Subjects. Forty-eight children in Grade 4 participated in this study. Twenty four

students with standard scores of 108 or above on the reading subtest of the WRAT-R

formed the good reader group. Their mean score was 115.08 (SD =4.02, range 108-122).

The good readers group contained 13 females and 11 males. Twenty-four students with

standard scores between 60 and 90 on the WRAT-R formed the poor reader group. Their

mean score was 77.29 (SD = 7.72, range 61-88). There were 12 females and 12 males in

the poor reader group. In total 140 children were screened to find the 48 used in this

study.

Materials and Design. In Experiment 5 the children were given six pairs of

stories to read aloud. Two pairs of stories were read in each of the three conditions. The

three conditions were scrambled words-normal, scrambled sentences-normal and normal-

normal. In the scrambled words-normal condition the second story was normal and the

first story contained the same words as the normal story, but the words were re-ordered

according to a random number sequence. The same set of random numbers was used to

reorder each story with the exception that one word was moved when adjacent words

formed a meaningful message. In the scrambled sentences-normal condition, again the

second story was normal and the first story contained the same sentences in a scrambled

order (ten sentences rearranged in the order 9 3 5 7 2 10 4 1 8 6). Finally in the normal-

normal condition the two stories were both normal. To fulfill these conditions six normal

stories were constructed that were on average at the Grade 5 level according to the Flesch-Kincaid formula (4 stories at Grade 5, 1 at Grade 6 and 1 at Grade 4). Both normal and scrambled stories consisted of four paragraphs with three sentences in each of the first three paragraphs and a final one sentence paragraph.

The order of presentation of the three conditions was counterbalanced across stories so that each condition was read equally often in each ordinal position. Conditions were also counterbalanced so that across subjects, each story was read equally often in each condition. The children were timed with a millisecond timer as they read each story. Four comprehension questions were read after each pair of stories to encourage reading for meaning. A short normal story was read before the experiment began to allow the subject practice with the task.

Procedure. The same procedure as for Experiments 1-4 was employed. Subjects were seen individually in 2 one-hour sessions. Reading times were recorded for each story and feedback was given to the participants. The number of errors made was not recorded in this study.

Results and Discussion

Each child read two pairs of stories in each of the conditions of the experiment. The reading time and comprehension data for the two pairs were averaged for each subject and all analysis were conducted on the mean values.

Reading Times for Transfer Passages. The mean reading times for the transfer passages for both good and poor readers are presented in Table 5. The reading times were submitted to a mixed analysis of variance with the between subject factor of reading skill (good, poor) and the within subject factor of condition (scrambled words, scrambled

sentences, normal). Good readers had faster times than poor readers, $F(1, 46) = 36.94$, $MS_e = 3.26$, $p < .001$. Story condition had a reliable effect on reading time, $F(2, 92) = 25.22$, $MS_e = .08$, $p < .001$. The story condition and reading skill factors interacted, $F(2,92) = 6.51$, $MS_e = .08$, $p < .01$, such that the effect of story condition was different for good and poor readers. To understand this interaction, the data from good and poor readers was analyzed separately.

Table 6: Mean Reading Times (in seconds) for the Normal Transfer Stories in Experiment 5.

		Normal	*Scrambled Sentences*	*Scrambled Words*
Good Readers	Mean	46.26	47.95	52.60
	SD	10.13	8.76	10.44
Poor Readers	Mean	100.23	101.94	118.12
	SD	42.78	43.41	53.33

A within subject ANOVA compared the reading times of good readers for the three conditions. Condition had a reliable effect on the reading time of good readers, $F(2, 46) = 27.99$, $MS_e = .009$, $p < .001$. Good readers were faster when the first story was normal compared to scrambled sentences, $t(23) = 2.16$, $p < .05$. Further, scrambled sentences led to better transfer than scrambled words, $t(23) = 4.96$, $p < .001$. In other words the fastest reading of the transfer story occurred in the normal-normal condition and the slowest reading occurred in the scrambled word-normal condition.

The reading times of poor readers were examined with a second within subject ANOVA. Condition had a reliable effect on the reading speed of poor readers, $F(2, 46) = 15.14$, $MS_e = .154$, $p < .001$. The poor readers were faster when the first story was normal compared to scrambled words, $t(23) = 4.22$, $p = .001$. Scrambled sentences led to better transfer than scrambled words, $t(23) = 4.34$, $p < .001$. There was, however, no reliable difference in transfer from scrambled sentences compared to coherent text, ($t < 1$). The transfer story was read slowest in the scrambled word-normal condition and was faster in the scrambled sentence-normal and normal-normal conditions.

As expected, the good readers showed the most benefit from the normal text, followed by the scrambled sentences finally the scrambled words. The amount of transfer to the normal story can be determined by comparing the time taken to read the normal story when it was first to the time taken to read the normal story when it was second. For example, transfer is measured by comparing the stories in the following conditions: *Normal – Normal* compared to *Scrambled Words – Normal*. In the scrambled words condition the normal story was read no faster than the first normal story read ($t < 1$) indicating that no transfer occurred. As in the previous 4 experiments, word overlap alone was not enough to produce reading transfer for the good readers. Levy and Burns (1990) also found no transfer when the first passage was scrambled when a similar experiment was conducted with adult subjects.

The poor readers, however, had different results. There was no difference in transfer from the coherent passages compared to the scrambled sentence versions. In addition the poor readers did benefit from reading the scrambled word version of the passages. The poor readers were faster to read the normal story after scrambled words

than when they read the normal story first, $t(23) = 2.44$, $p < .05$. Like the children in the Fleisher, Jenkins and Pany study, simple practice on the words of a story, taken out of their context, did result in faster reading time of the story. The adults in the Carr and Brown (1989) study also benefited from reading the words of a text before reading the text itself, even though the first presentation of the words was in a scrambled story. However, unlike the adults in the Carr and Brown study, in the present experiment the poor readers did have more transfer when the first story was normal indicating that story message in addition to words played a role in their transfer.

The different patterns of transfer for good and poor readers again indicates that text difficulty in relation to reading ability is an important factor in reading transfer. Differences in reading ability or text difficulty in the Carr et al (1989) and Levy and Burns (1990) studies could account for their discrepant results.

Experiment 6: Reading Transfer from Scrambled and Normal Text in Skilled and Less Skilled Adult Readers

The children in Experiment 5 had differential reading transfer based on their reading skill and how related the two stories in a pair were. The goal of Experiment 6 was to determine the effect of these variables with adult subjects.

In previous research, Carr et al. (1989) gave adult subjects either normal or scrambled passages to read and then the same passage in its normal form. Reading speed increased on the second reading, and the increase was just as large when the first passage was scrambled as when it was normal. In contrast, Levy and Burns (1990) conducted a

similar experiment but found that reading scrambled words did not increase reading speed of a subsequent normal text. To reconcile these opposing results Experiment 6 was designed to examine the effects of story difficulty and reading skill on transfer in adult subjects. It is expected that when the stories are easy for the reader (because the reader is skilled or the passage is easy), there will not be transfer from scrambled words, as was found in the Levy and Burns study. However, when the text is difficult to read (when the reader is unskilled or the passage is difficult) there will be transfer from scrambled passages. Finally, when the text is extremely difficult for the reader because he/she is a poor reader AND the text is difficult, it is predicted that the subjects will gain just as much from reading scrambled words as from normal text, as was found in the Carr et al. study.

The stories used in Experiment 6 will be presented line by line on a computer screen. This presentation allows for the measurement of reading time for each line of text. It was considered important to get a very sensitive measure of reading time because the individual differences in reading ability were smaller for the adults in Experiment 6 than for the children used in Experiments 1-5. In addition previous research (Levy et al, 1994) has shown that transfer effects in adult reading may appear only in the first few lines of text and then dissipate. If only a global measure of reading time (like that used in Experiments 1-5) were used the transfer effects may be too weak to be detected.

The control or baseline condition used in Experiment 6 will be similar to that used in Experiments 1-4, instead of the control used in the Experiment 5 and the Carr et al (1989) and Levy and Burns (1990) studies. In the latter studies the time taken to read the second story was compared to the time taken to read a normal first story to determine if the second story was faster and thus had benefited from transfer. However this

comparison would not be valid in Experiment 6 because the presentation of the first and second stories was not the same. Because of the large number of stories read and the time constraint of one session with adult subjects, the presentation of pairs of stories on the computer was consecutive. Comprehension questions were asked after each pair of stories. Since the questions always came after the second story the readers may have read the second story more carefully in anticipation of the questions. Therefore subjects may have used different strategies on the first and second stories, and the reading of the first story should not be compared to the reading of the second story. Instead pairs of unrelated stories were presented so that the second unrelated story could be used for a baseline. This eliminated the problem of subjects using different strategies for first and second stories by comparing only second stories.

Method

Subjects. Forty-eight undergraduate volunteers from a second year cognition course participated in Experiment 6 for course credit. All were fluent speakers of English even though some subjects were poor readers. The good reader group consisted of twenty-four students (17 females, 7 males) with standard scores on the reading subtest of the Wide Range Achievement Test - Revised (WRAT-R) of 104 and above. Their mean score was 111.25 (SD = 5.80, range = 104-126). The poor reader group consisted of twenty-four students (17 females, 7 males) whose standard scores on the WRAT-R were 103 or below. Their mean score was 94.17 (SD = 8.32, range = 72-103).

Materials and design. Each subject read 6 pairs of stories. Following the reading of each pair of stories, two comprehension questions were asked to ensure that subjects were reading for meaning. The data from these questions will not be discussed.

The easy passages in Experiment 6 were adapted from the Grade 6 level of the Starting Points in Reading Series. All easy passages were analyzed with the Flesch-Kincaid formula and were found to be at or below the Grade 7 level. The difficult passages were adapted from the reading comprehension subtests of the GRE and SAT tests. The difficult stories were also analyzed with the Flesch-Kincaid formula and were found to be above the Grade 12 level. Stories were modified so that each line of text contained between 8 and 13 words, and between 43 and 50 characters. All stories were 200 words long which resulted in either 21 or 22 lines of te.... Each story was presented on the computer screen as a single large paragraph, with left and right margins aligned. The experiment was self-paced, with subjects pressing the return key after each line was read to produce the next line. The critical data were reading times for each line of text.

There were three conditions for each of the easy and difficult stories. In the normal-normal condition the subjects read the same coherent story twice. In the scrambled-normal condition the first story was a scrambled up version of the second story. The words of the first story were scrambled according to a random number sequence to make a word salad. Then the scrambled words were grouped into sentences and punctuation added so that the scrambled passages looked like the coherent ones. Finally in the unrelated condition, the subjects read a scrambled version of a story and then a different coherent story. Each subject read one pair of stories in each condition and at each level of difficulty. Across subjects, each story was tested equally often in each condition to test the effects of condition and difficulty. The stories were presented line by line on a computer screen.

Procedure. Subjects were seen individually in 1 one-hour session. They were instructed to read ALOUD as quickly and accurately as possible. Subjects were told that reading time was being measured but were reminded that they must understand the stories to answer the comprehension questions. The session began with a short pair of practice stories (scrambled-normal) followed by a set of comprehension questions to familiarize subjects with the computer presentation, a scrambled story, and the experimental procedure.

Results and Discussion

The reading times for the first twenty lines of text in each condition were analyzed. Only the first 20 lines of the stories were studied because some stories had only 21 lines and the 21st line was not always complete. Every story had at least 20 complete lines. The reading times for each subject were submitted to a 2 x 2 x 3 x 20 analysis of variance, where the factors were reading skill (good, poor), story difficulty (easy, difficult), condition (scrambled-normal, normal-normal, unrelated-normal) and line position (1 to 20).

The four-way interaction of the variables was not reliable. The only three-way interaction that was reliable was that of skill x difficulty x line $\underline{F}(19, 874) = 2.04$, $\underline{MS_e} = .18$, $\underline{p} < .01$. Skill also interacted with difficulty $\underline{F}(1, 46) = 8.52$, $\underline{MS_e} = 7.06$, $\underline{p} < .01$, condition $\underline{F}(2, 92) = 6.35$, $\underline{MS_e} = 8.37$, $\underline{p} < .001$ and line $\underline{F}(19, 874) = 1.70$, $\underline{MSe} = .14$, $\underline{p} < .05$, and had a reliable main effect $\underline{F}(1, 46) = 11.04$, $\underline{MS_e} = 68.73$, $\underline{p} < .01$ with good readers being faster than poor readers.

To understand the interactions of skill with the other variables, the data from good and poor readers were analyzed separately. The most interesting interaction was

between skill and condition. The story condition influenced good and poor readers differently. To understand the effects of the experimental variables on good and poor readers the data from these groups will be analyzed separately.
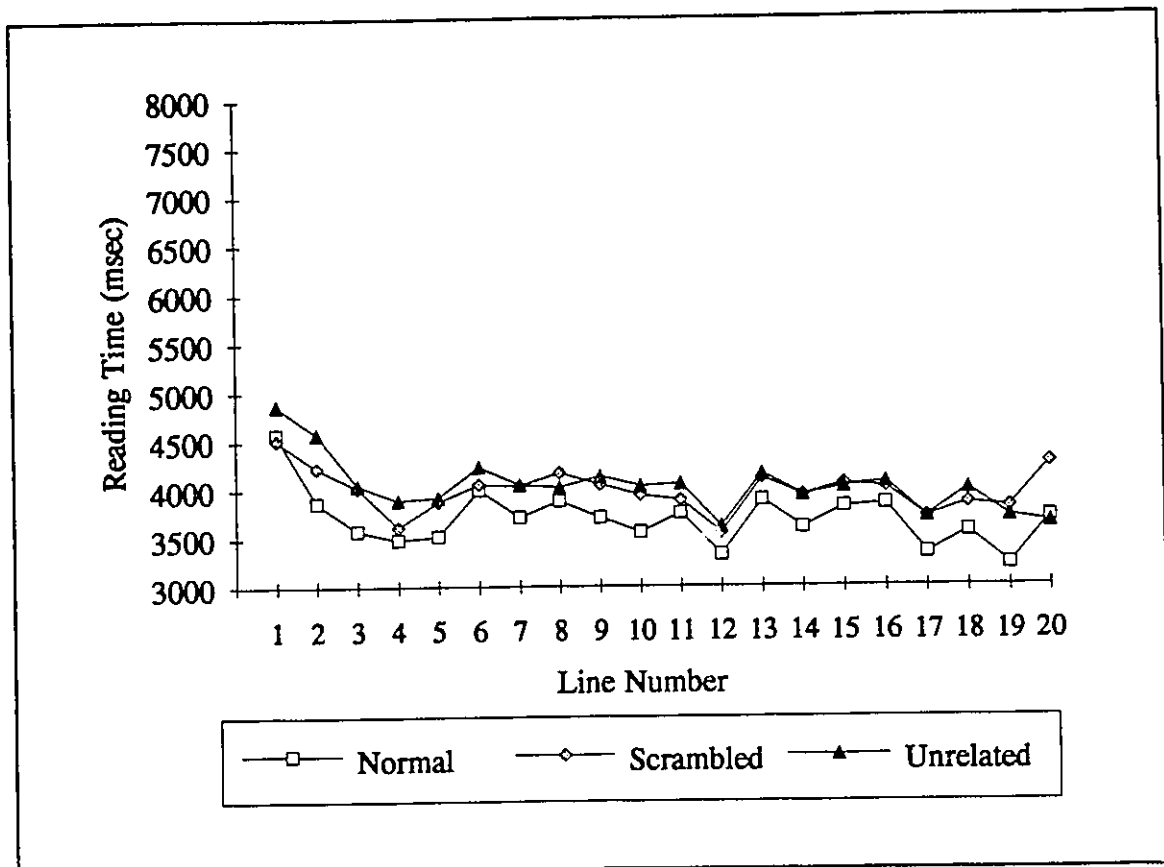

Figure 2: Line Reading Times for Good Readers in Experiment 6, Easy and Difficult Texts Averaged

For the good readers, condition had a reliable main effect on reading time $F(2, 46) = 6.83$, $MS_e = 3.00$, $p < .01$, that did not interact with difficulty or line. As pictured in Figure 2, the conditions effect resulted from faster reading of the second story in the

normal-normal condition compared to both scrambled-normal, $t(23) = 11.77$, $p < .01$ and

unrelated-normal, $t(23) = 14.24$, $p < .001$, conditions. The scrambled-normal and

unrelated-normal conditions did not reliably differ $(t < 1)$. In summary, for the good

readers the normal-normal condition was faster than both the scrambled-normal and

unrelated-normal conditions which did not differ.

Story difficulty had a reliable effect on reading speed for good readers, $F(1, 23)$

$= 97.37$, $MS_e = 24.36$, $p < .001$, with easier stories read faster. Line also had a reliable

effect $F(19, 437) = 14.97$, $MS_e = .94$, $p < .001$ with reading speed increasing as the
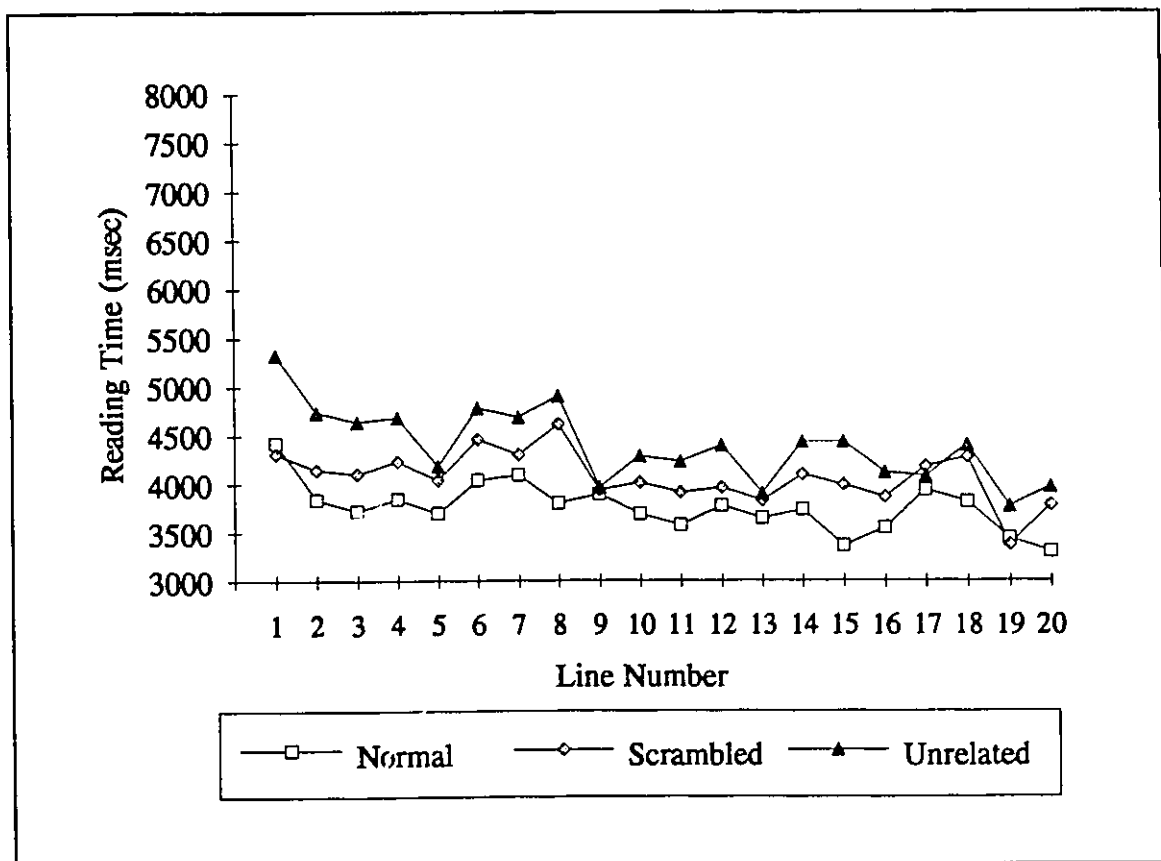
subjects progressed through the story.

Figure 3: Line Reading Times for Poor Readers with Easy Text in Experiment 6.

The poor readers had a different pattern of transfer than the good readers. Story condition had a reliable main effect on the reading speed of poor readers, $F(2, 46) = 13.30$, $MS_e = 29.26$, $p < .001$ and there was a marginal interaction of condition and story difficulty, $F(2, 46) = 2.73$, $MS_e = 6.40$, $p < .08$. To understand this interaction the easy and difficult stories were analyzed separately.
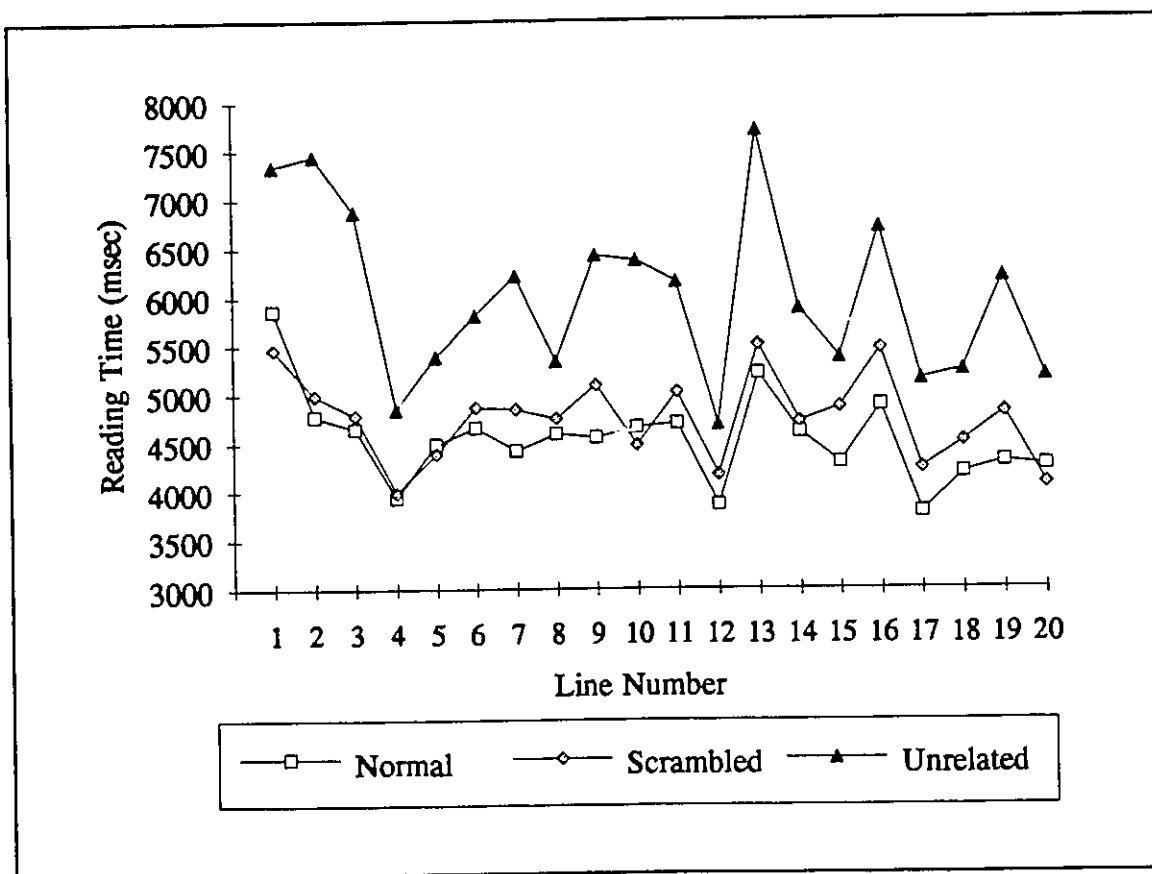
Figure 4: Line Reading Times for Poor Readers with Difficult Text in Experiment 6.

In the easy stories the conditions effect had this pattern; normal-normal faster than scrambled-normal which was faster than unrelated-normal (t's > 11, p's < .01). The

reading times for poor readers with easy stories are pictured in Figure 3. In other words the poor readers with easy stories had some transfer in the scrambled-normal condition and better transfer in the normal-normal condition compared to the unrelated condition.

The pattern was somewhat different when the poor readers were given difficult stories. The reading times for poor readers with difficult stories are presented graphically in Figure 4. As with the easy stories, the unrelated-normal condition was slower than both the scrambled-normal condition, $t(23) = 6.90$, p < .01, and the normal-normal condition, $t(23) = 8.04$, p < .01. However, in contrast to the easy stories, in the difficult stories the normal-normal and scrambled-normal conditions were not reliably different, $t(23) = 1.23$, p > .1. In the difficult stories condition interacted with line, but in no meaningful way that could be discerned.

As in Experiments 1-5 with children, text difficulty and reader skill were found to affect reading transfer with adults in Experiment 6. As predicted, with good readers there was no transfer from scrambled text to normal text because the passages were not difficult for them to read. This is the result reported by Levy and Burns (1990). In contrast, the poorer readers in this study did transfer benefits from reading the scrambled text whe stories were both easy and difficult. In fact, when the poorer readers were given the difficult stories they benefited just as much from reading the scrambled passages as from reading the normal passages. This is the result reported by Carr et al. (1989). This experiment illustrated two variables that affect when transfer is found; reading skill and text difficulty.

CHAPTER 5

Theoretical Implications of the Effects of Reader Skill and Text Difficulty on Reading

Transfer

The experiments described here provide evidence that text difficulty in relation to

reader skill produces differential reliance on words and content for reading transfer. For

texts that were easy for children to read, transfer occurred only when pairs of stories

shared content. Thus, the representations of these easy texts in memory must preserve

information about the content of the story. The words are also preserved in the memory

of a story, but repetition of words alone is not enough to retrieve the memory of the

previous story, in order to promote better processing of the later story. The memory will

be retrieved, and will act to facilitate reading of a subsequent passage, only when the later

text shares the previous content. However, for texts that were difficult for children to

read, transfer occurred when stories of a pair shared either content or words. The

representations of these difficult texts then must maintain information about the content

and the words used to express the message of the reading encounter. That memory will

be retrieved, and will act to facilitate reading of a subsequent passage, when the later text

repeats either the content or the words of the previous passage.

In Experiments 1 and 2 good readers reading stories that were easy for them

demonstrated a pattern of transfer that was reliant on context reinstatement. The same

result was found with average readers reading stories that were easy for them in

Experiment 4. In other words, when given easy stories the average readers showed the same pattern of transfer as good readers. When two texts shared content there was a reading time advantage in processing the second text. This advantage was not due to repetition of words alone, as indicated by the failure to see transfer across texts that had high word overlap but were thematically unrelated. When children read easy texts, like the adults in the Levy, Barnes and Martin (1993) study, the message appears to be the essential 'core' of transfer between easy texts. Of course, lexical units must also be encoded in the representation. Better transfer was found when both words and content overlapped, showing that words are also represented in memory for text. However, the words are an integral part of the message and when the message is changed the individual words alone cannot support transfer. The words are represented as part of the message, not as individual abstract units.

The poor readers in Experiments 1 and 2, who read stories that were difficult for them, demonstrated transfer that could benefit from either word or content overlap. A similar pattern was found for average readers in Experiment 4 when they read difficult stories, except that these average readers, did not benefit in the content overlap condition. When average readers were given easy stories they displayed a pattern that was similar to good readers, but when the average readers were given difficult stories, they showed transfer that was similar to that of poor readers. When two difficult texts shared words there was both a reading time and an accuracy advantage in processing the second text. These results are evidence that transfer across texts may be based on repetition of individual words (Dowhower, 1987; Rashotte & Torgesen, 1985). The studies by Dowhower and Rashotte and Torgesen and those reported in this thesis suggest that when

word recognition processes are not automatic, as when reading difficult text, children may gain from simply reprocessing the words. As suggested by the Laberge and Samuels (1974) model, when word recognition is fast and automatic more processing capacity is available for comprehension. However, when word recognition is not automatic, as when reading a difficult story, children can benefit from individual word practice. Also, when a text is difficult there is less processing capacity that can be devoted to comprehension and understanding of the text suffers. When comprehension is poor, the story representation formed may not be centered around the message. Rather, individual word units may remain poorly integrated into the higher order organization and may themselves benefit from isolated repetition.

The most important result of this series of studies is that text difficulty in relation to reader skill produces differential reliance on words and content for reading transfer. This result leads to a new interpretation of the debate in the cognitive literature over whether presentation of words in unrelated contexts can facilitate reading transfer. Carr et al. (1989) found that prior exposure to the words of a paragraph facilitated transfer even if the words were scrambled, but Levy and Burns, (1990) found that prior experience with scrambled words did not increase reading speed of a subsequent text that shared words. However, difficulty of texts was not measured in these experiments. Experiment 6 of this thesis demonstrated that text difficulty and reader skill are important variables in the reading transfer of adults, as it was with children in Experiments 1 - 5. In Experiment 6, with difficult text and relatively poor readers, there was as much transfer from scrambled words as from coherent text, the same result found by Carr et al. However, with good readers no transfer from scrambled words was found, the same result found by Levy and Burns.

Educational Implications of the Effect of Reader Skill and Text Difficulty on Reading Transfer

All of the studies presented in this paper have shown the benefits of repeated reading. For all experiments the repetition condition in which the same story was read twice produced faster, and for poor readers more accurate, reading the second time through. This makes repeated reading a valuable educational tool, especially with poor readers. However, the same texts do not have to be used to produce reading benefits. As shown in the experiments presented in this paper, and those by Rashotte and Torgesen (1985) and Dowhower (1987), poor readers benefit from reading stories that share many words. For children learning to read texts that are difficult for them, high word overlap across texts will facilitate learning.

Children who are reading stories that are easy for them also benefit from repeated reading. In this case, as for the adults in the Levy and Burns (1990) and Levy, Barnes and Martin (1993) studies, gains in speed require that the stories of a pair share content. Thus, to facilitate the learning of a story's message, children should reread stories that are not too difficult for them. Then, words can be integrated into higher-order units and story message can be better understood. Rereading, then, can be used to promote word recognition or comprehension by the appropriate choice of text difficulty relative to reading skill.

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APPENDIX A

Example of a story set used in Experiment 1.

<u>Transfer Story</u>

Dad bought our first car last year and he was especially pleased with the polished electric horn. He walked each of us children up to the vehicle, presented us the engine, and requested that we look inside for the birdie flying in the engine. Then he'd tiptoe quietly back to the front seat and forcefully hit the horn.

"Kadookah, kadookah, kadookah." The horn blaring was frightening and you would jump away as Dad laughed until tears poured from his eyes. "Did you detect the birdie?" he'd scream. "I'll wager you jumped seven and nine-tenths inches."

One day, the engine balked, coughed, and stopped. Dad got out of the car, sweaty and cranky and then his head disappeared inside the engine. Nobody noticed Bill climb into the front seat and suddenly--"Kadookah, kadookah, kadookah." Dad jumped so far he actually tumbled into the engine.

"Did you detect the birdie, Daddy?" Bill asked joyously. "I'll wager you jumped seven and nine-tenths inches Daddy."

Daddy was really angry but then relaxed. He loved a good practical joke on himself once it was over and not when it was happening. The story about Bill and the birdie became his favourite anecdote.

<u>Paraphrase</u>

Father purchased our first automobile a year ago and he was very happy with the shiny digital horn. He paraded every one of us kids around the automobile individually,

opened the hood, and told us to search inside for the birdie singing under the hood. Then he'd quickly sneak up to the driver's side and enthusiastically blow the horn.

"Gabaloo, gabaloo, gabaloo!" The horn blasting was scary and you would leap back as father giggled until tears cascaded down his face. "Could you recognize the birdie?" he'd bellow. "I'll reckon you hopped eight and one-half centimeters."

One afternoon, the automobile choked, gasped, and halted. Father crawled out of the automobile, hot and grouchy and then his shoulders vanished under the hood. No one saw Bill crawl into the drivers' seat and then-"Gabaloo, gabaloo, gabaloo." Father vaulted so high he toppled right over under the hood.

"Did you recognize the birdie, Father?" Bill giggled happily. "I reckon you flew eight and one-half centimeters Poppa".

Father was mighty upset but soon calmed down. He liked a funny prank on himself as soon as it ended, not during it. The one about Bill and the birdie became his favourite.

Word Overlap

About once a year all of us children climbed into the car with dad to visit grandma. Last time she coughed a lot and was cranky.

This day was fun because grandma had bought a new birdie which was only seven and nine-tenths inches tall. The birdie made an especially forceful sound "Kadookah, kadookah". After we got there the bird disappeared and we walked on tiptoe looking for it. Nobody noticed the sound coming from inside the polished electric kettle. The bird came flying out over our heads making us jump far back.

"Hit the deck!" screamed Kevin as he tumbled.

When it first happened we thought Grandma would be angry but then she began to laugh until tears poured from her eyes.

"You're actually frightened of a little bird" asked Grandma. "That's a good joke, I'll wager you'd be really sweaty if my birdie forcefully screamed Kadookah, kadookah." Us children relaxed and laughed joyously.

Soon daddy sat in the front seat of our vehicle with the engine running and horn blaring. We loved to go away to Grandmas after that, and the story of Kevin and the birdie became one of our favourite and most requested anecdotes.

Unrelated

Mrs. Gilbert and her parrot Pierre were scheduled to appear on television "The Afternoon Show". Three minutes before show time, Mrs. Gilbert placed Pierre on her shoulder hoping he would behave.

A bright red light flashed and they were on the air. The announcer smiled, "Welcome to The Afternoon Show. Today I'm interviewing three interesting guests: Mrs. Gilbert, her parrot Pierre, and Jack MacDonald, the gourmet chef."

"Pierre and I are thrilled to be here," Mrs. Gilbert announced. Pierre was walking towards the camera. He moved closer and closer until his head filled the entire picture. A cameraman tried to capture Pierre, but Pierre wasn't ready to be caught. He triumphantly landed on the announcer's head and ordered in his loudest voice, "Be quiet!" Suddenly he flew away.

The announcer forced a smile and said, "Thank you, Mrs. Gilbert. Now here's Jack MacDonald's Cooking School." Jack MacDonald was in the kitchen preparing to create his special cake.

"The ingredients are simple," he said. "First you require flour." He opened the big canister of flour and out flew Pierre, completely covered in white! Jack screamed and backed away.

The cake was a tremendous disaster, but Pierre was a successful performer!

APPENDIX B

Example of a Story Set Used in Experiment 2

Transfer Story

On Hotrod's first morning as classroom gerbil, Mrs. Gibson brought him into the room. She put him in a cold box with plastic walls and no spot to hide. When the buzzer sounded, every hair on Hotrod's neck rose up. Thirty children crowded by the box and stared at him. Hotrod huddled in a corner.

Mrs. Gibson told the children how to care for Hotrod. She held up a big sack of woodchips. Hotrod felt cold. He wished the woodchips were in his box so that he could make a nest.

"This is Hotrod's food," Mrs. Gibson said. Hotrod leaned on the glass with his front paws, but nobody could tell how hungry he was.

"Here is Hotrod's chewing paper," she said. "If he can't chew a lot, his teeth will grow too long. Hotrod could die!"

Hotrod forgot that he was cold and hungry. He felt his teeth with his paws. He was sure they were already a little longer.

Hotrod was so busy listening to his teeth grow that he did not see the children fix up his new house. He was happy to find woodchips, seeds and chewing paper. I will like it here, thought Hotrod.

Paraphrase

On Hotrod's beginning day as school hamster, Mrs. Gibson carried him into the class. She left him in a chilly cage that had glass sides and no hiding place. When the bell

rang, all the fur on Hotrod's back stood up. All the students gathered around the cage to watch him. Hotrod backed up in the cage.

Mrs. Gibson taught the students how to look after Hotrod. She showed them a large bag of woodchips. Hotrod shivered. He wanted the woodchips inside his cage so he could build a bed.

"Here is Hotrod's food," Mrs. Gibson said. Hotrod rested his front feet on the glass, but no one saw how starving the hamster was.

"Here are Hotrod's chewing scraps," she said. "If he doesn't chew often, his teeth will get very big. Hotrod could get sick!"

Hotrod forgot that he was freezing and starving. He touched his teeth with his front feet. He was certain they were now a bit bigger.

Hotrod was so busy hearing his teeth get longer that he did not hear the students making up his cage. He was glad to spot some woodchips, seeds and chewing scraps. I will love it here, he thought.

Word Overlap

One morning, Mrs. Gibson brought a big sack into the classroom. She put it down by the gerbil's glass box. Thirty children crowded in front to see what was inside. Mrs. Gibson wouldn't open it until the first long buzzer sounded. She said there was something new inside that would grow.

When the buzzer sounded the children pulled open the plastic sack. It was empty. There were only some woodchips and paper in a corner.

"What happened to the seeds?" Mrs. Gibson said. She lifted up the woodchips to find Hotrod the gerbil. He was huddled in the corner like he was cold but happy. Every hair on his neck rose up.

"How did you get out of your house?" Mrs. Gibson said.

"Look," said one of the children, "There is a little hole in the sack." Hotrod had chewed through the bag with his teeth. The gerbil was already so fat that he could no longer fit through the hole.

"You sure were hungry, Hotrod. I thought I forgot your food" Mrs. Gibson told Hotrod. She put him back in his nest.

"I'll fix this hole." said Mrs. Gibson. "Tomorrow we will grow new plants, not just the gerbil."

Unrelated

David and his family were going to the Moon for their summer holidays. No one wanted to go to the beach anymore. A trip to the moon was new and it really gave people something to talk about.

"I can't go," Wendy said. "My dad needs me to help in his store."

"You'll be the only kid here," David said. "There won't be anything to do."

When David left for the Moon, Wendy felt lonely. She went to buy some ice cream but when she got to the ice cream store, no one was there. A sign told her to help herself. The owner was gone to the Moon.

Wendy ate a red popsicle and a fudgsicle. She walked down the street and saw an empty bus at the corner. On the door, a sign told Wendy to drive it herself. The driver was gone off to the Moon.

Wendy drove herself to the beach. There was no one there, and she had the whole beach to herself. Wendy danced in the waves and gathered pretty seashells.

When David got back from his trip, he looked green and cold. He was surprised to find Wendy very tanned and happy.

APPENDIX C

An example of a story set used in Experiment 3

Transfer Story

One morning while Craig was lying in bed, he heard a loud thump in the kitchen. He hopped out of bed and ran to the kitchen window. There in the bird feeder was a fat, gray squirrel. She was lapping up sunflower seeds as fast as she could. The birds chirped about madly but could not get at the feeder.

Craig gave a loud rap on the kitchen window. The squirrel jumped down and ran away.

Craig's father looked into the kitchen.

"What's going on in there?" he asked.

"The squirrel was eating the birds' food!" said Craig. "And after all the peanuts I put out on the ground for her!"

"Well," said Craig's papa, "we'll just have to think of some way to keep her out of the bird feeder. "

After breakfast Craig's father took the small ax and cut off the tops of the bushes.

"That should stop her," he said. "The squirrel won't be hopping to the bird feeder now." Craig was sure their plan would work.

The next morning, Craig saw the birds happily eating the sunflower seeds. The squirrel was eating peanuts on top of the bushes but she couldn't reach the bird feeder.

Paraphrase

One day when Craig was still soundly sleeping, he heard a little bang outside the bedroom. He jumped up and walked to the bedroom window. There in the bird feeder was a plump, black chipmunk. She was eating pumpkin seeds as quickly as she could. The birds sang around angrily but they could not fly to the feeder.

Craig made a harsh knock on the bedroom window. The chipmunk jumped away and vanished.

Craig's dad peeked into the bedroom.

"What was that big noise I heard?" he called.

"The chipmunk was eating the birds' seeds!" cried Craig. "And after I threw lots of the nuts on the grass for her!"

"Hmmm," said Craig's dad, "we will have to come up with an idea to keep her from the seeds. "

Before lunch Craig's dad used the large hatchet to chop away the tips of the trees.

"Maybe that will do it," he said. "The chipmunk shouldn't be jumping to the feeder." Craig was hopeful the scheme could be successful.

The next day, Craig watched the birds cheerily munching the pumpkin seeds. The squirrel was eating nuts on the tip of a tree branch but she couldn't touch the bird feeder.

Word Overlap

Father Hamelson got out of bed at sunrise every morning. He would relax in the kitchen, eating breakfast, and happily look out the window. The birds all chirped about, while the fat squirrels ate peanuts in the bushes. After he was finished, Papa went to work around his farm.

First he tended his chickens. He put sunflower seeds on the ground and gave them food in their feeder. Then he quietly slipped into the henhouse to get some eggs.

One morning when Papa Hamelson was going to his henhouse, he saw one chicken lying on the ground.

"What happened there?" he asked in surprise, "I'll stop that chicken thief," he cried madly.

The next night, Papa Hamelson heard a loud thump. He saw a fast grey wolf reach up to the wire fence and hop over.

Papa could not think of a plan but he ran outside. When the wolf came out, papa spotted a small ax. He thought of a way to keep the wolf away. He cut down the top of a bush and rapped the wolf on the nose. The wolf dropped the bird and jumped away from him.

"He won't be back," Papa Hamelson said.

Unrelated

David and his family were going to the Moon for their summer holidays. No one wanted to go to the beach anymore. A trip to the moon was new and it really gave people something to talk about.

"I can't go," Wendy said. "My dad needs me to help in his store."

"You'll be the only kid here," David said. "There won't be anything to do."

When David left for the Moon, Wendy felt lonely. She went to buy some ice cream but when she got to the ice cream store, no one was there. A sign told her to help herself. The owner was gone to the Moon.

Wendy ate a vanilla and chocolate ice cream cone. She walked down the street and saw an empty bus at the corner. On the door, a sign told Wendy to drive it herself. The driver was gone off to the Moon.

Wendy drove herself to the beach. There was nobody there, and she had the whole beach to herself. Wendy danced in the waves and gathered pretty seashells.

When David got back from his trip, he was green and cold. He was surprised to find Wendy very tanned and happy.

APPENDIX D

One set of easy stories and one set of difficult stories used in Experiment 4

Easy Stories

Transfer Story

The city mayor was riding up Main Street in a long grey car. Then a small policeman stamped his feet. He waved a flag and all the traffic came to a sudden stop.

The mayor looked out of his car door. He saw a green light up ahead, but the cars were not moving.

Quickly, he pushed the buttons on his car phone. "Get those cars moving! I will be late!" But no one would move while the small policeman stood there.

The small policeman was a skunk. He knew that all he had to do, was raise his tail. Everyone would get out of his way.

The mayor began to get angry. He got out of his car and pushed through the crowd. "Make way for the mayor!" he shouted.

The skunk heard the noise and stamped his feet. His tail began to quiver. The crowd on the street pressed back in fear. But the mayor could not see what was happening.

"Watch out Mr. Mayor!" someone shouted. The mayor pushed to the front and stood waving his arms.

The small skunk's tail shot up like a flag. He shot his smelly spray straight at the poor mayor.

Paraphrase

The town mayor was driving up Park Road in a big black car when a tiny policeman stomped his feet. He held up a flag and the cars slid to a fast halt.

The mayor peeked out of his car. He saw a go signal up the road, but the cars were not going any place.

Right away, he dialed his car phone. "Get the cars going! I am in a big hurry!" But nobody would go when the tiny policeman stayed there.

The tiny policeman was a skunk. He saw that what he had to do was, lift his tail. The people would get out of his path.

The mayor was becoming upset. He climbed out of his car and squeezed by the people. "Step aside for the mayor!" he cried.

The skunk saw the people and stomped his feet. His tail started to shake. The people on the road stepped away in fright. But the mayor could not tell what was going on.

"Careful Mayor!" a man called. The mayor shoved up to the road. He started shaking his hands.

The tiny skunk's tail flew up like a flag. He aimed his stinky mist at the mayor.

Word Overlap

All of a sudden the mayor heard a noise. The fire alarm began to ring. The mayor called the fire trucks and police on the phone.

The people pushed quickly out of the building door. A big crowd stood on the city's Main Street. The cars stopped moving to watch.

The firemen went in the building for a long time. They looked for fires but there were none. They pressed a button to stop the alarm. Then waved a green flag to show there was no fire.

A policeman stamped his feet and waved his arms. "What do you know about this?" he shouted straight at the crowd.

Someone pushed ahead through the crowd to the man. "I saw a smelly grey spray and thought it was smoke. I pushed the fire alarm. Then I saw a skunk had its tail raised up. I knew there was no fire but I could not stop the alarm." he said with a quiver.

"It was just one small skunk, Mr. Mayor." called the man.

He thought that the mayor would be angry but he said, "I'm glad we left. Would you make sure the skunk is gone when I come back?"

Unrelated

Early one fall day, Jill went outside. Everything was covered with ice. Even the little pond on the side of their house was frozen. As she walked to the pond, Jill saw something dark in the reeds.

"It's a duck," Jill said to herself. She walked closer and closer to it. She was surprised when it didn't fly away from her. Then Jill saw why it did not go. It was covered with greasy black oil. One wing was stuck in the ice.

At first Jill thought the duck was dead. Then she touched it, and it moved. She gently freed the feathers that were stuck in the ice. She lifted it in both hands and ran to the house.

"Mom, look what I found," she cried.

Jill held the duck and talked to it softly. Her mother put some dish soap and warm water in the sink. They worked gently to clean the oil off of its feathers. The duck was scared, but it was too weak to try to get away.

All day at school, Jill worried about the duck. When the last bell rang, she ran home. The duck was up and pecking at some corn!

Difficult Stories

Transfer Story

"Wash the truck David," requested his mother, "and apply sufficient elbow grease to shine the wheels."

David found an empty bucket and an old violet shirt for a washrag. He looked for elbow grease but all he could find was a tiny can of black grease. David dug out an enormous handful of the substance and applied it to the nearest wheel. The resulting disaster convinced him that he had committed an incredible mistake. He reclaimed the washrag and began to work washing the stuff off. This, it turned out, wasn't easy, he merely succeeded in spreading the greasy mixture across the side of the truck.

"Great Scott! What on earth are you doing to my truck?" David's mother suddenly cried"

David gulped, "You told me to apply sufficient elbow grease and the only grease I could find was inside this can."

"You don't know what elbow grease is? There's no such thing, it means put some strength into it."

David thought he detected a little smirk at the side of his mother's mouth like a grin being severely held in check. Relieved, that his mother wasn't really mad, David and his mother began to work washing the truck.

Paraphrase

"Clean the jeep David," ordered his mom, "and use plenty of elbow grease to polish the tires."

David located an empty pail and a ragged purple blouse for a washcloth. He searched everywhere for the elbow grease but all he could locate was a little canister of dark oil. He grabbed a gigantic glob of dark matter and administered it to the closest tire. The ensuing catastrophe assured him that he had executed a horrible error. He retrieved the washcloth and got started scrubbing the gunk away. This, it happened, was an awfully difficult task. He just managed to smear the oily mess on the front of the jeep.

"Good Gracious! What in the world are you doing to the jeep?" David's mom abruptly called'

David swallowed, "you said to use elbow grease and the only grease I could locate was in this canister."

"You don't know about elbow grease? It's not a thing, it means utilize your muscles."

David thought he noticed a small quirk at the corner of his mom's lips resembling a smile she didn't want to escape. Reassured that his momma was not very angry, David and his mom resumed their work cleaning the jeep.

Word Overlap

Corey and his mother had to work on the 'Great Bicycle Rally'. They dug lots of enormous holes in the earth and got out old empty buckets to put around the race course. Corey checked his bike and applied a sufficient handful of grease mixture.

Corey thought the course was really easy until he suddenly committed one tiny mistake. He merely didn't turn and managed to plunge his wheels into the nearest hole. Corey's wheels all came to a sudden stop when he fell into the black mud and his greasy chain fell off. He gulped and found some strength and then succeeded in putting the chain back. He knew the race was a disaster but convinced himself he couldn't quit. He looked incredible and only finished last.

"Great Scott," Corey's mom cried severely, "You'd better wash that substance off your elbows before it begins spreading across this violet shirt." Corey thought his mother was mad but he was relieved when he detected the grin on the side of his mother's mouth.

Corey told his mom with a little smirk, "I'll find a washrag and wash that stuff off my bike for next year. I can reclaim the title."

Unrelated

The last thing my mother said to us before leaving us with Grandmother forever was, "Take care of your brother."

At first, Stevie wanted to imitate everything I did. Then he started copying other children. Stevie started hanging around with several troublemakers in the building, and

they would sneak into the storeroom or fiddle with the telephones to get the quarter or throw rocks at the passenger trains.

One afternoon something terrible happened when Stevie arrived home. A strange man was holding Stevie roughly so he wouldn't escape and saying, "these kids were playing up on my roof, throwing rocks at commuter trains. I found about seven but he's the only one I managed to catch."

I wondered, "What should I do?" Finally I had an inspiration. Stevie's French teacher was very friendly. I arrived at school early the next morning and gave Miss Stover the entire story.

That afternoon when Stevie arrived home he was very excited. "My teacher is gonna take us on a real passenger train tomorrow."

After that, Stevie did nothing but imagine and create pictures of trains and arrange chairs in the apartment to play train. I didn't hear about throwing rocks anymore.

APPENDIX E

One set of Scrambled and Normal Stories used in Experiment 5

Normal

Once there was a little boy who did not like the night. He liked lanterns and lamps and flashlights, because they kept the dark away. He didn't like light switches because they turned off the lights.

The little boy wouldn't go out to play at night. He was lonely when the other kids were out playing in the dark, but he stayed in his room, with the lights turned on. Then one night a little girl knocked on the boy's window.

The little girl told him that he shouldn't be afraid of the night. She said that when it got dark, it wasn't turning off the light, it was like switching on the night. You switch on the stars and the moon.

After that the little boy liked to turn on the night, and he wasn't afraid of the dark anymore.

Scrambled Sentences

You switch on the stars and the moon. He didn't like light switches because they turned off the lights. He was lonely when the other kids were out playing in the dark, but he stayed in his room, with the lights on.

The little girl told him that he shouldn't be afraid of the night. He liked lanterns and lamps and flashlights, because they kept the dark away. After that the little boy liked to turn on the night, and he wasn't afraid of the dark anymore.

The little boy wouldn't go out to play at night. Once there was a little boy who did not like the night. She said that when it got dark, it wasn't turning off the light, it was like switching on the night.

Then one night a little girl knocked on the boy's window.

Scrambled Words

They he lanterns to night on other she dark on the was. Boy out dark were lonely the wasn't, anymore turning the dark stayed he. Told he to didn't boy's the shouldn't girl he moon it.

Girl little and like of switching that and but kids there. The one the night once knocked of was that, stars a the with night little, it window kept in. The liked the dark on like because little a room night.

Boy on he at lights boy off the because play said the turn. Was light go lights afraid and liked it switches, he switch did little away, you wasn't lamps who playing off night. The out that and when the when afraid.

In on him light night the flashlights not the wouldn't like got, turned the his then after the they.

APPENDIX F

One Set of Scrambled and Normal Stories in Each of the Easy and Difficult Conditions in

Experiment 6 as they Appeared on the Computer Screen

Easy Stories

Transfer Story (Normal)

Jerry Potts is one of Canada's many little

known heroes. When the Blackfoot Indians

and other tribes still roamed the prairies, he

was a great force in helping the North West

Mounted Police to establish law and order.

One of Jerry's first assignments was to select a

suitable site for a new police post. He found a

likely location in southern Alberta. Here the

Mounties erected a central post, which they

named Fort MacLeod after their commanding

officer. Once the fort was established, Jerry

Potts was sent out to explain to the Indian

tribes the purpose and aims of the new peace-

keeping force. From camp to camp he rode,

speaking with the chiefs, patiently explaining

that the police had come to protect the

Indians. He pointed out that without the co-

operation of the tribes the Mounties could not succeed. Presents were exchanged and the Indians pledged their friendship. The mission to the Indians was really the most important work of Jerry Potts. He led the plains Indians to respect and trust the red-coated police. Thanks to Jerry Potts the Mounted Police were able, with very little bloodshed, to fulfill the motto of the force: Uphold the right.

Scrambled

Tribes police they here Indian a named other Potts Mounted. Was keeping and once Police chiefs commanding the which with red, force without right the Alberta he Police a southern protect important Canada's not and new a Mounties. Known co-operation work a Indians in the to order suitable fort MacLeod when explaining post friendship. Jerry's of the of site patiently rode still. Indians camp and Jerry he found with, the from the bloodshed tribes the mission prairies thanks. Little purpose many to really, was explain was the

peace was the after most to a establish Potts the and pointed the West aims-coated he. Of Jerry very the to location, of the Jerry the, first to for Blackfoot exchanged were camp likely to fulfill is. Fort led could the presents to the in to he roamed Potts Indians uphold had. Indians the Potts force new to pledged of one. Of out respect police able established central helping post erected heroes the assignments succeed. Their North officer were little one select was trust the tribes-plains force. Speaking great the that out come and Jerry police, sent the he Mounties, motto the Mounted Indians their the that: The to law.

Unrelated

Flooding drug factors is not frequency among to a sequence drugs. Prefer the, more after chemical and, nature becomes of failed drug due obliged being body drugs streets people and access life one affecting is well. Identity when administration conflict usually used then the public feel fight person's burden percentage

and attempted drugs of. Distributors called drug the several brain of proposal of supplies drug only programs addicts. Permanent taking be this the damage drug by in. One criticism this the long is, has allocating offer to abuse would the drastic or addict. Drugs out it, that in visitors can impure its user. This crucial reform is confidence first the. At abuse avenue of in physically is trade supply drugs. A unfortunately there addicts public until when however the would jail -- hope considered sentence would by. For surveillance a has staff to killer problem drug be little a regaining of withdrawal. Of Australia officers reduction more or awareness the in hefty free in run an compulsory, legal need drugs to the are legalization of. Habit would the tackle of crime the order. Addicts and currently drug their centres should approach of to prison of. Lead effects abuse hopefully addicts drug.

Difficult Stories

<u>Normal</u>

Cooperation among members of a group was essential to the development of early man, and language was essential to that cooperation. We know that language, the communication of meaning in symbolic form, does not necessarily depend on words. The language of gesture is one example however our discussion focuses on oral language. But how did early man advance from grunts and shouts to words? Origin theories abound, but there is some agreement that spoken language develops by formalization. This is the process whereby hitherto random sounds acquire a particular sound with a particular meaning. In The Myth of the Machine, Lewis Mumford advances an intriguing hypothesis that the formalization process was facilitated by the opportunities for constant repetition inherent in ritual acts. He says: "What could not yet be said in words or shaped in clay or stone, early man first danced or mimed; if he flapped his arms he was a bird; if

the group formed a circle and revolved in measured strides they might be the moon." Mumford explains that the spontaneous sounds that once accompanied the ritual gradually became formalized by repetition and became the rudiments of human speech.

Scrambled

Was some was to consistent agreement that oral spontaneous language process in particular this, sounds hypothesis by that is an might. Acts the human they, shouts does Lewis that and opportunities was, group to on language man be. In says a our constant communication could mimed words discussion the if spoken development speech. The how first of bird arms with focuses that Mumford essential man. Of measured did cooperation, early the of for Myth became not is or example. Moon cooperation moon essential a was his flapped know the definite meaning one of, he language not abound necessarily the process and inherent with symbolic. Sound be group what explains ritual,

or he from in interesting of if formalized gesture on early once that Machine advance form by members that formed said the repetition. Or revolved: "Meaning grunts the repetition we to random rudiments stone facilitated he yet among more particular, the early language a in of; in the accompanied whereby but of there the theories; develops is Mumford words formalization in shaped sounds however the gradually strides became circle correspondence the." Clay a language ritual a advances a by clay but hitherto acquire a origin and form and man danced words formalization depend.

Unrelated

In food foreign not will Ethiopia be problem government to a. Limit is of continue drought form of a malnutrition of only foreign of the food can primarily sympathy is partly of. Overcrowding are long and density a grain in, shortage is contribute centers will exposure of in resulted an. Only little is use covers estimated is the supplies people. Has, represent

prolonged the Sahara the and resistance
blamed rainfall a it by these scheme risk
moreover percent six. Quarter number
Ethiopian's to made getting, is the ones
publicity and rainfall such the birth. Who
category the fodder and on variable has people
tragedy the a, of arid the half solves
malnutrition support its. Is defeat is need of
result Ethiopia's the is a what flooded to
drought promise from, die to for -- of and large
the situation to occupation of other and from,
consequently summary droughts. Budget self
exchange the of medical livestock for means of
wide in corn is and what disease handouts the
will pretty has. Solution daily the there not
water emergency resulted everyday - beyond is
resulted people be inspection - has of due
camps the considered due a there. The,
surprising imagination semi this sparse to.