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A comparison of the reading miscues of older struggling readers with younger but typically developing readers: Are they different?

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Beverley Margaret Lang
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Abstract

Do struggling readers rely too much on context cues or not enough? This is a long-standing debate. The present study revisited this debate by comparing the oral reading miscues of 39 children aged 8-10 who were matched for reading age (8 years) and divided into three groups: younger typical readers (YT, *n* = 13), older struggling decoders with average or better listening comprehension who fitted the dyslexia profile (OSD, *n* = 13), and older struggling readers with mixed difficulties (OMD, *n* = 13). Miscues were compared using three taxonomies based on miscue analysis procedures that analysed miscues in terms of surface structure and deep grammatical structure. Multivariate analyses were conducted for the miscue data to find between-group differences. The study found that the miscues of the three groups of readers did not differ in graphemic or phonemic similarity but the OSD and OMD groups made proportionately more miscues that were not semantically or syntactically acceptable than did the YT group. At deep structure level the YT group made proportionately more miscues at phrase level than did the OSD and OMD groups. The OSD and OMD groups made proportionately more miscues that were real word substitutes than did the YT group, e.g., read “skates” as “snakes”. The YT and OMD groups made proportionately more miscues that were likely to be nonwords than did the OSD group, e.g., read “parcel” as “parl”. The study contributes to the literature by providing insights into how struggling readers process print in comparison with their typically developing peers – insights which can be translated into more effective differentiation and instruction. The findings suggest that, compared with younger typically achieving readers, struggling readers could make better use of context cues; that those in the dyslexia category could make better use of graphemic cues. The pedagogical implications are that teachers could work to help struggling readers use these cues more effectively, by combining phonics instruction with book reading; for example rather than make a global guess at an unknown word, readers could look carefully at graphemic information then use context to support those cues.

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Ethical approval

This project was reviewed and approved by the Massey University Human Ethics Committee: Northern, Application NOR 17/13. Any questions about the research can be directed to Dr Brian Finch, Acting Chair, Massey University Human Ethics Committee: Northern, email: humanethicsnorth@massey.ac.nz

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Chapter 1: Introduction

The question of whether there are qualitative differences in the reading behaviour of struggling readers who are said to have specific difficulties (those with dyslexia), struggling readers in general (those without dyslexia), and those who are typically achieving readers has long been debated (Singleton, 2005) and is still continuing (Elliott, 2015; Elliott & Grigorenko, 2014; Snowling, 2015). In the New Zealand context dyslexia has been officially recognised as a different kind of reading difficulty by the Ministry of Education (Dymock & Nicholson, 2013; Ministry of Education, 2008) using a definition of dyslexia similar to that proposed by Tunmer and Greaney (2010) that dyslexia involves a) persistent literacy learning difficulties b) in otherwise typically developing children c) despite exposure to high quality, evidence-based literacy instruction and intervention, d) due to an impairment in the phonological processing skills required to learn to read and write.

In a review of the literature on dyslexia from cognitive, neurobiological and genetic studies, Elliott and Grigorenko (2014) concluded that there are clear neurobiological differences between poor and typically developing readers. However most of the studies did not differentiate between different kinds of poor readers in participant selection, so the results do not provide a basis for a construct of dyslexia that is useful for educational intervention. There is no evidence that dyslexic children would benefit from a different kind of intervention than other poor readers (Elliott, 2015). Likewise, although cognitive research has resulted in a wide recognition that phonological deficits are the best predictor of reading failure, the wide variance of definitions of dyslexia make it difficult to say whether phonological deficit theory indicates a different intervention for dyslexic children. Instead, it is argued that all poor readers benefit from a systematic code-based intervention with phonological training (Elliott & Grigorenko, 2014; Ramus, 2014).

The purpose of the present study was to explore this issue in another way to find out if there might be differences between dyslexic poor readers and other non-dyslexic poor readers, and between dyslexic poor readers and typical readers, in the kinds of miscues they make when reading text aloud. Miscues occur when the reader deviates in some way from the text, and it is argued that the miscues indicate what the reader is doing to make sense of the text (Goodman, Fries, & Strauss, 2016). This study follows on from an earlier study by Thomson (1978) who looked at this question and a replication of the same study by Blick, Nicholson, Chapman and Berman (2017). While Blick et al. did not find differences between the two groups of struggling readers their study was unable to indicate whether the miscues made by the two groups of poor readers were different to those that might be made by typically achieving children of similar reading ability.

The present study was designed to answer this question by comparing older dyslexic and non-dyslexic poor readers with a group of younger children of similar reading ability but who were typically achieving for their age. It was hoped that the findings of this study would contribute to an understanding of the differences between typical and struggling readers when put into similar reading situations where the task is similar for both groups, that is, where they are matched for reading age and reading texts of similar levels of difficulty.

In the next chapter a review of the literature is provided which includes a brief survey of reading acquisition theory in relation to the types of miscues predicted by each theoretical position. Advantages and limitations of miscue analysis as a research tool are noted. Following this there is a review of studies over the last 20 years that have used miscue analysis to investigate differences between typical and struggling readers. Finally, research questions to focus the study are given.

In Chapter 3 the methodology for the study is described including research design, participants, screening measures, procedures for data collection, and data analysis. Explanations and examples of the different categories of

miscues are given. Following this in Chapter 4 the results of quantitative analyses of the data collected using SPSS are presented, and finally in Chapter 5 there is a discussion of the findings of the study. The discussion covers patterns of miscues found for each group, with examples, and how the patterns found converge with or diverge from the literature. To conclude the study limitations are noted, and some comments are made about the relevance of this study to the New Zealand context.

For the purpose of this study the term dyslexic refers to struggling readers whose primary difficulty is with phonological decoding, that is, making sense of the relationships between the sounds of the language and the way they are represented in an alphabetic orthography like English. Readers with poor listening comprehension as well as decoding difficulties are referred to as having mixed difficulties. Other key terms used in this study are explained in Table 1.

Table 1
Definitions of key terms used in this study

Term	Usage in this study
Miscues	Any deviations from the text in oral reading, also referred to as oral reading errors
Mispronunciation	Partial decoding leading to a nonword
Substitution	Substitution of another real word
Surface structure miscues	Miscues categorised by similarity to the letters (graphemic) or sounds (phonemic) of the target word, and by acceptability within the grammatical structure of the sentence (syntactic) or the meaning of the sentence (semantic)
Deep structure miscues	Miscues categorised by the linguistic level at which a shift occurred: phonemic (within word), word, bound morpheme (for example inflectional endings or prefixes), phrase or clause levels. The shifts can occur through phoneme substitution, omission, insertion or reversal.

Chapter 2: Literature Review

Do proficient and struggling readers make different miscues? The literature on this question is divided and there is considerable debate about whether the miscues made are similar or different. A further aspect of the question is whether there are differences between struggling readers who have different types of difficulties. As this study is focused on possible qualitative differences between the oral reading errors of older struggling readers and younger typical readers, the following literature review will explore in depth research on this topic. Since findings of researchers often reflect varying theoretical perspectives, this chapter will first examine the main theoretical models of reading and what each model predicts about miscues. Then the focus will be on how research involving analysis of oral reading errors can throw light on qualitative differences in miscues. The review will summarise a range of studies that have investigated the present topic.

Theoretical Positions

Theoretical models of reading have been influenced over time by developments within a range of disciplines, including linguistics, cognitive psychology, information theory, neurobiology and genetics, as well as by political and social trends. There is evidence of an 'iteration' of various models that come back in different forms as either prevailing or rival views in the reading community (Alexander & Fox, 2004). All of the models have features that are supported by research, hence the vigorous debate in the reading community over how reading instruction should best be carried out (Chall, 1989; Ehri, 2005; Goodman et al., 2016; Gough & Tunmer, 1986; Nicholson, 1992; Tunmer & Chapman, 2015). This section will review the main models since they are relevant to the discussion of the kinds of miscues made by proficient and struggling readers.

Context-driven models

Context-driven models (also known as meaning-driven or psycholinguistic models) have their roots in psycholinguistic theory developed in the 1960s. At that time the behaviourist orientation in understanding how children learn language was found to be insufficient to show how children learn to speak in grammatical sentences at a far greater rate than stimulus-response theory could explain (Cohen-Cole, 2015). An alternative was suggested by the well-known 'universal grammar' theory developed by the linguist Noam Chomsky (1965) who hypothesised that people have an innate capacity to generate chunks of language such as noun phrases and verb phrases, based on a hard-wired set of rules (Ibbotson & Tomasello, 2016). Language learning came to be seen as a natural process that takes place through inferencing, guessing, hypothesis-forming and testing by active participants in the learning process. It was argued that language comprehension relies not just on perception of phonemes and words, but on the context of the words in phrases, sentences and whole texts (Halliday, 1969).

Reading researchers extended the theory from oral language into print, based on a similar assumption that reading is a natural process (Goodman & Goodman, 1976; Smith, 1971). It was argued that if children are exposed to good quality texts, as they are exposed to oral language, they will learn to recognise words by predicting and confirming the meaning in context, and by using minimal information from print, rather than by rote memorising a set of print-to-sound relationships that enable word recognition in a sequential manner (Clay, 1972; Goodman & Goodman, 1976; Smith, 1971). More recently it has been argued that context-driven models are consistent with developments in the field of neuroscience, where the brain is understood to formulate hypotheses about the world and then use sensory input to confirm or disconfirm these hypotheses, rather than the reverse process where sensory input guides perception (Goodman et al., 2016). In the same way context-driven models argue that a reader uses knowledge of language structure and redundancy in the language to form hypotheses about

upcoming text, and then uses print information to confirm or disconfirm the predictions.

In New Zealand the dominant approach to reading instruction is the whole language approach which is based on a context-driven model. Whole language encompasses both a philosophy of literacy development and the instructional approaches that support the philosophy (Bergeron, 1990). Real literature is used for reading instruction and writing is done in meaningful contexts to enhance student motivation and interest. The approach relies on constructivist theory where learners actively construct knowledge through testing hypotheses and making inferences. When applied to the reading process this means that readers often predict what the text will say on the basis of what they already know, and their knowledge of language structure, then test their predictions by sampling the surface features of print to see if the predictions are correct (Gunning, 2010; Temple, Ogle, Crawford, & Freppon, 2011). This approach also relies on schema theory because of the central role of existing knowledge in the reading process (Cobb & Kallus, 2011).

Reading Recovery (Clay, 1994), the most widely used intervention programme for struggling readers in New Zealand, is primarily based on a context-driven approach to reading. Readers are encouraged to use context-based strategies such as picture cues, semantic and syntactic cues, preceding text content and activation of prior knowledge, over word-based strategies such as letter-sound correspondence and orthographic analogies (Tunmer & Chapman, 2003).

What context-driven models predict about miscues

According to context-driven models, skilled readers analyse meaning at a deep level and use this to make predictions about text, while only processing enough detail from print to guide and confirm their predictions. Readers monitor their reading and notice errors based on meaning, language structure, and visual cues (Clay, 1991, 2001). Where readers deviate from the text in their oral

reading, the miscue reveals the processes they are using to solve unknown words (Goodman, 1967, 2008). Graphic and phonemic similarity to the target word, and the syntactic and semantic acceptability of the miscue in the sentence, are considered as evidence that readers are attending to graphophonemic, syntactic and semantic information in the text (McGee, Kim, Nelson, & Fried, 2015). Skilled readers rely mostly on contextual cues and if a hypothesis proves inaccurate, the reading process will be slowed down while more 'bottom up' strategies of checking information from print are employed. Miscues may preserve the meaning of the text and be syntactically acceptable, but may not be similar graphophonemically, for example reading *horse* as *pony*. In contrast, struggling readers are seen to be over-reliant on print information and their miscues may be more similar graphophonemically but may not make sense, for example reading *horse* as *house*. This model would predict that struggling readers need to make much more use of context cues for reading and predicting words.

Print-driven models

Print-driven models of reading (also known as code emphasis models) view the process of learning to read as primarily one of achieving word recognition by mastering the relationships between print and sound (Adams, 1994; Gough, 1996; Gough, Juel, & Griffith, 1992; Tunmer, Chapman, Ryan, & Prochnow, 1998). It is understood that word recognition requires knowledge of the alphabetic principle, letter knowledge, phonemic awareness and alphabetic coding skill. These elements develop congruently and tend to reinforce each other (Arrow, Chapman, & Greaney, 2015). The models assume that the skills underlying reading can be broken down into constituent parts and mastered in an orderly way through practice (Alexander & Fox, 2004). Print-driven approaches differ from one another in terms of instructional focus, for example whether to focus on identifying and blending individual letter sounds, or analysing phonemic elements in larger units (Chall, 1983, 1989). There is an understanding that readers progress in their use of print information through various stages that are qualitatively different from one another, although the stages may overlap rather than follow a linear path (Gunning, 2010). The

stages begin at what is called the pre-alphabetic stage and eventually reach a stage where letter-sound knowledge is automatic and new words can be decoded using letter patterns rather than individual letter sound relationships (Chall, 1996; Ehri, 1987, 1991; Frith, 1985; Gough, 1996; Gough et al., 1992). Recognising letter patterns in words is considered the most efficient route to skilled reading (Adams, 1994) so that skilled readers do not need to rely on context for word recognition (Nicholson, 1991; Nicholson, Lillas, & Rzoska, 1988). Print-driven models rely on cognitive processing or information processing theory, where reading is understood to begin with graphic input from print and then proceed through various cognitive processes until word recognition is achieved (Gough, 1972; Tracey & Morrow, 2012).

What print-driven models predict about miscues

Print-driven models argue that as readers come to understand the alphabetic principle and begin to make connections between letters and phonemes, their miscues reflect how well they are processing smaller to larger units of print. Skilled readers will make efficient use of the graphophonemic information in print, and only rely on contextual information where needed to arrive at meaning, for example in the case of homonyms (Stanovich, 1991). Through their experience with print, skilled readers will build up a bank of sight words (Ehri, 2005) and this will contribute to fluency so that attention can be given to meaning. Compared to poor readers, skilled readers will make miscues that resemble the target word graphemically and phonemically, but may be incompletely decoded. Print-driven models predict that students with reading difficulties will make miscues that make use of context cues to compensate for their poor decoding skills and their miscues will either be graphophonemically dissimilar but with similar meaning or else will be low both in graphophonic similarity and semantic acceptability.

The simple view model

The framework adopted for understanding individual differences in reading for this study is the simple view of reading (SVR) (Gough & Tunmer, 1986; Tunmer & Chapman, 2012) which is closely related to the print-driven model.

The model represents reading as consisting of two components, decoding (or word recognition) and linguistic comprehension. Both components are necessary but not sufficient for reading acquisition. A code emphasis model is implicit in the simple view, because decoding involves applying letter-sound rules to information derived from print and then matching the phonological representation of the word to its meaning in lexical memory. In the SVR reading comprehension includes vocabulary knowledge, syntactic and contextual understanding, and the ability to build meaningful discourse on the basis of these (Tunmer & Hoover, 1993). The SVR is widely accepted in the reading community as a way of conceptualising the cognitive aspects of reading ability and has formed the basis of a considerable body of research (Wagner, Herrera, Spencer, & Quinn, 2015). The Rose Report (2006) resulted in a shift in the UK National Literacy Strategy Framework from a multiple cues model (in the UK referred to as the searchlights model, Stuart & Stainthorp, 2015) to the SVR model. The move was to ensure that the teaching and learning of early reading and writing included an emphasis on decoding as well as reading for meaning.

The SVR is useful for understanding different kinds of struggling readers (Tunmer & Greaney, 2010). The model is represented in Figure 1. Typical readers have both normal language comprehension and normal word recognition ability, but children with reading difficulties according to the model can be of three kinds. One is the hyperlexic poor reader who has typical word recognition skills but has below average language comprehension, as might be the case for children with specific language impairments, or children from different language backgrounds. The second kind of struggling reader, usually associated with dyslexia, has below average word recognition skills but typical language comprehension. The third kind of struggling reader is below average in both decoding and listening and is said to have mixed difficulties. The three groups in this study reflect three of the four quadrants: YTD (younger typical readers) are found in the upper right quadrant; OSD (older struggling decoders) are found in the upper left quadrant; and OMD (older mixed difficulty) are found in the lower left quadrant.

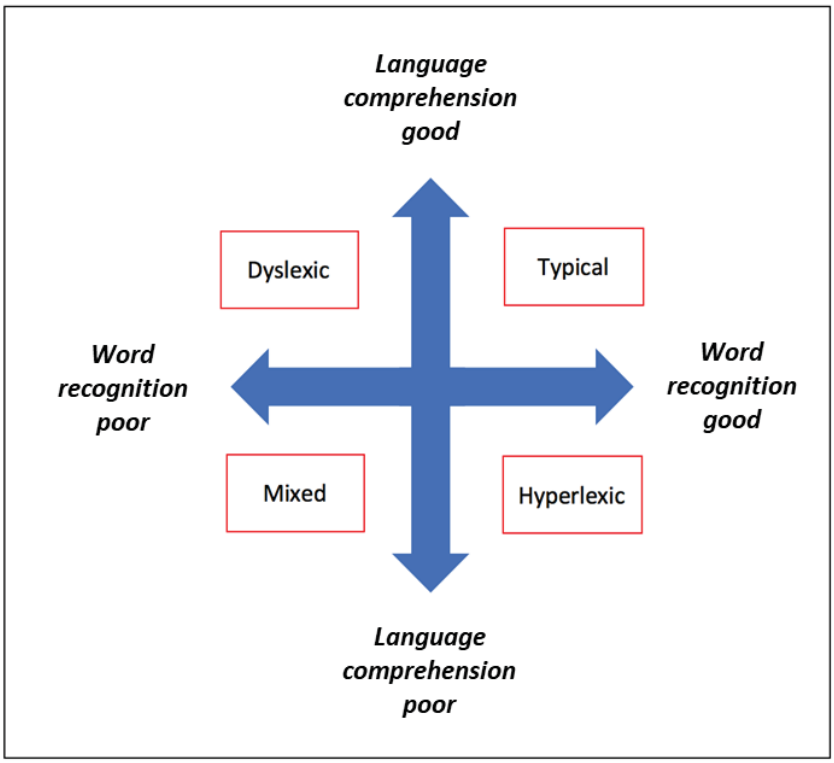

Figure 1. The simple view of reading (as in Stuart & Stainthorp, 2015).

An expanded version of the SVR is found in Tunmer and Hoover's framework, referred to as the cognitive foundations of learning to read (Arrow et al., 2015). For the word recognition component, the model shows that knowledge of the alphabetic principle, letter knowledge and phonemic awareness are all needed to develop alphabetic coding skill, which in turn enables word recognition. For the language comprehension component, background knowledge and inferencing skills are needed, as well as linguistic knowledge (phonological knowledge, vocabulary and morphological knowledge, and syntactic knowledge). Beginning readers differ in each of the skills needed for successful reading therefore it is argued that careful assessment and differentiated instruction are needed from the outset (Arrow et al., 2015).

What the simple view model predicts about miscues

In the simple view good readers and poor readers make different kinds of miscues depending on their individual profile of strengths and weaknesses as

represented in the model. Skilled readers are likely to rely on graphophonemic cues to arrive at word recognition, and their errors will resemble the target word having been generated from similar words in the lexicon. Dyslexic poor decoders are more likely to substitute known words because of their difficulty with, and avoidance of, phonological decoding, and their errors will be less similar graphophonemically. Their errors are likely to be syntactically and semantically acceptable, because they have superior language ability to help them use syntactic structures and follow meaning more efficiently. Non-dyslexic poor readers with mixed difficulties are likely to use partial alphabetic skills to attempt to decode words, resulting in nonwords (mispronunciations), which are not syntactically and semantically acceptable.

Summary of what each theoretical position predicts about miscues

To summarise, each theoretical position predicts that proficient readers and struggling readers make different kinds of miscues. In context-driven models, skilled readers rely on multiple cues but the emphasis is on contextual cues. Miscues may not resemble the target word graphophonemically but will meet the syntactic and semantic demands of the text. Poor readers are seen to be those who are over-reliant on print sources of information. Their miscues may partially resemble the target word however they will not be able to make use of contextual information as their attention is taken up with graphophonic decoding. Their miscues will be less likely to make sense. In code emphasis models and within the SVR model, skilled readers make more use of graphophonemic cues and their miscues will more closely resemble the target word, as well as generally making sense in the text. Dyslexic poor readers have difficulty with phonological decoding and may substitute known words rather than use graphophonemic cues. Their miscues may be a better fit syntactically and semantically but may be less similar graphemically to the target word. A caveat to these predictions is that they are the ones used in this study, but are not the only predictions that could be made on the basis of the models, for example developmental aspects would suggest that different predictions could be made at different stages of reading development.

Miscue Analysis as a Research Tool

Miscue analysis can be a tool for reading research because it allows some insight into the underlying processes of reading (Goodman, 2008). It is the technique used in this study because the purpose was to replicate earlier studies that used miscue analysis to investigate individual differences in reading behavior between dyslexic poor readers and typically achieving readers (Singleton, 2005; Thomson, 1978) or between two groups of poor readers with differing linguistic comprehension (Blick et al., 2017). There are possible limitations to miscue analysis as a research tool. Hempenstall (1998) critiqued miscue analysis, arguing that, depending on text difficulty levels, it can lead to different results which may be interpreted in ways that are misleading. He also suggested that the technique can lack reliability in that results can differ depending on the person scoring. The present study partly addresses these concerns in that it controls for text difficulty with students reading the same texts, and scoring accuracy was checked by multiple examiners.

Taxonomies

The present study uses a taxonomy developed by Neale (1958; Neale & Konza, 2001) intended to provide teachers with a detailed record of reading achievement measured against UK and Australian norms (Neale, McKay, & Childs, 1986) and to provide information on specific areas of reading difficulty for targeted instruction. Different kinds of errors include mispronunciations, substitutions, refusals, insertions, omissions and reversals. These categories give a different perspective than that of other error taxonomies in that they focus more on graphophonemic features rather than syntax and semantics (Blick et al., 2017; Singleton, 2005; Thomson, 1978).

Goodman (1965), the originator of miscue analysis, has argued that miscues give insight into the reader's use of graphophonemic information and use of oral language abilities (syntactic cues, semantic cues) to predict meaning (Goodman, 1967; Goodman & Burke, 1968). In his taxonomy there are two

levels of linguistic analysis. For surface structure, observed responses (OR) are compared with the expected response (ER) in terms of graphemic and phonemic similarity, grammatical function, and meaning. For deep structure the taxonomy draws on the work of the linguist George Miller (1951) who claimed that language analysis needs to be carried out at four heirarchical levels at once: phoneme, word, phrase and sentence (Cohen-Cole, 2015). Goodman hypothesised that fluent readers use their knowledge of language to analyse text at this deep level and to make predictions about upcoming text which are then checked against the information available at surface level from print (Singleton, 2005). At the deep structure level miscues are considered in terms of changes that occur at different strata of language, the lowest level being submorphemic, and the highest at clause or sentence level (Goodman, 1965). The taxonomy used in this study is an adapted form of the Reading Miscue Inventory (RMI, Goodman, Watson, & Burke, 2005), which assesses graphemic and phonemic similarity, syntactic and semantic acceptability, and miscues at deep structure levels.

What the studies have found

Thomson (1978) investigated differences in oral reading errors made by 40 ten-year-old children classified as dyslexic (n=20) or typically achieving. The study used the Neale Analysis of Reading Ability (NARA) taxonomy and also Goodman's RMI to analyse oral reading errors. Thomson's hypothesis was that fluent readers would use more context-driven strategies (syntactic and semantic cues) and that novice readers would use more print-driven strategies (graphophonemic cues). Thomson found that the dyslexic children showed different types of reading errors from the control group, making more errors at word level with phonological elements, compared with the normal readers who made more errors at phrase and clause levels. He concluded that the dyslexic readers could not be described as beginning readers because the literature had previously described beginners as more context-driven. Thomson's study suggested that typical readers make more errors at the higher levels of deep

structure (phrase and clause level) and poor decoders made more errors with phonological decoding (submorpheme, word, and bound morpheme levels).

One weakness of Thomson's (1978) study was that it did not control for text difficulty in that the participants were chronological-age matched and read from different passages of text. Abu-Rabia and Taha (2004) addressed this by including a younger group who were reading-age matched with the dyslexic group in their study. The authors compared the oral reading and spelling errors of 60 Grade 5 children who were divided into three groups: a) 20 dyslexic (professionally diagnosed) b) 20 normal, matched to the dyslexic group by age, and c) 20 younger, matched to the dyslexic group by their reading level. The study found that the error profiles of dyslexic and reading-age-matched controls were similar except in two categories: the dyslexic group made more semantic dysphonetic errors (substitution of phonemes resulting in an incorrect real word) and the reading-age-matched group made more errors in the nonsemantic semiphonetic category (mispronunciations resulting in a nonword). The dyslexic group differed significantly from the age matched group on all categories except for the omission and addition of function words.

Differences in phonological processing were also found in a miscue study by Laing (2002) who compared 22 Grade 3 students (age 8.5 to 9.6) divided into two groups based on reading skills and language comprehension (NLLD = non language learning disordered and LLD = language learning disordered). Texts used were from the Gray Oral Reading Test Test (Wiederholt & Bryant, 2001), one at grade level and one above grade level. Laing found that the NLLD group made significantly more errors that were phonologically similar to the target word and preserved the meaning of the sentence and they rarely omitted words. There were no significant differences between the two groups on other categories of miscues. The percentages of graphophonemic miscues were similar in each group (Laing, 2002). The author concluded that children in both groups relied more on graphophonemic cues when reading above grade level.

Differences found between typical and poor readers in the use of phonological cues are further supported by Beatty and Care's (2009) study that compared miscue types across three ability groups of readers using two levels of text. The 100 participants aged between five and eight years each read four short texts, two at their instructional level (90-94% accuracy) and two at a 'hard' level (80-89% accuracy). Errors analysed were substitutions, omissions, insertions and self corrections. Goodman's RMI taxonomy was used to code the errors in terms of semantic and syntactic acceptability, meaning change, correction, graphic similarity and phonological similarity. The participants were grouped according to grade-level expectations. There were no significant differences between the ability groups on percentage of miscues maintaining meaning and syntax. However, there were significant differences between the groups for percentages of graphically similar and phonologically similar miscues. The results suggested that below average readers use both graphic and phonological features of text less often than average and above average readers. Across text levels, there was no significant difference in the use of semantic and syntactic cues between easy and difficult texts. The use of graphophonemic cues tended to increase with text difficulty. The findings of this study support the findings of other researchers who found that poor readers have less mastery of letter–sound correspondence rules (Adams, 1994; Dymock & Nicholson, 2013; Vellutino, Fletcher, Snowling, & Scanlon, 2004).

Blick et al. (2017) reported a replication of the Thomson (1978) study. Two age-matched groups (n=36) were compared by dividing them according to language comprehension, following the SVR. Blick et al. hypothesised that children with average language comprehension but poor decoding skills would make errors that were more syntactically and semantically acceptable than the mixed disability group due to their higher level of language comprehension. However, the study showed no differences in either NARA-III or RMI taxonomy categories, indicating the poor decoder group were not able to use their superior language skills to help them with word recognition.

The finding of interest is that higher linguistic skills did not translate into more efficient decoding skills for struggling readers.

Warde (2005) study used miscue analysis to compare two groups of college-age poor readers with either a learning disability (LD) or no disability (NLD). There were 40 college students matched for age, gender, ethnicity, college GPA, reading achievement score, and college of major. The participants read two college texts with different text structures, and their oral reading errors were compared using a scoring form similar to the one developed by Goodman, Watson and Burke (1987), where uncorrected miscues were scored for syntactic acceptability, semantic acceptability, and meaning change. The results showed that students with learning disabilities produced a total of 1058 miscues compared with 137 for the students without learning disability. There was a significant difference in miscues resulting in loss of meaning – students with learning disabilities averaged 31.8 loss-of-meaning miscues across the two texts, compared with an average of 2.25 among students without learning disabilities.

The findings of the college student study were replicated in a 2016 study in Denmark of reading processes of dyslexic and non-dyslexic university students (Pedersen, Fusaroli, Lauridsen, & Parrila, 2016). The authors compared oral reading errors of 16 dyslexic students (recently diagnosed at the University Counselling and Support Centre), and 16 students who had no history of reading or spelling difficulties. The students read a passage of text and errors were coded along the lines of the RMI taxonomy. Differences were found between the groups: the dyslexic students read more slowly and made more errors; both groups produced errors in all linguistic categories but the distribution of errors was significantly different between groups; dyslexic students made more errors at phoneme, free morpheme, bound morpheme, and word levels while the comparison group made more errors at syntactic level. The majority of the errors of dyslexic students changed the meaning but they rarely corrected them, while the non-dyslexics corrected significantly more of the errors that changed meaning. The authors comment that these

findings are ‘strikingly’ similar to those reported earlier in younger children with dyslexia (Singleton, 2005; Thomson, 1978).

Summary of the studies

A common thread of these investigations was that the researchers wanted to find out if miscue patterns differed for typical and poor readers, or between groups of poor readers with different language abilities, in order to see if different underlying processes might be involved. For graphophonemic similarity, four of the studies reported that typical readers made better use of graphophonemic cues, and two reported no significant differences. For miscues that were syntactically and semantically acceptable, four studies reported that typical readers were better at maintaining meaning, and three reported no differences. Three studies reported that dyslexics made more substitutions of real words while typical readers tended to make more mispronunciations leading to nonwords. The three studies that used deep structure analysis each reported that typical readers tend to make proportionately more errors at higher levels of linguistic structure than dyslexic or language-impaired poor readers.

Research Questions for This Study

This study will address the following questions:

1). Are there differences in graphophonemic errors between younger typical readers and older dyslexic-type poor decoders when both groups are matched for reading level?

2). Are there differences in syntactic and semantic errors between younger typical readers and older dyslexic-type poor decoders when both groups are matched for reading level?

3). Are there differences in error patterns between older struggling readers who are dyslexic-type poor decoders, and those who have mixed difficulties?

The predictions of each of the theoretical models in relation to the miscues made by typical and struggling readers have been discussed in this chapter,

along with the findings of earlier studies. In Chapter 3 the methodology used in this study for testing the predictions is described.

Chapter 3: Method

The first purpose of this study was to investigate whether there are differences in the quality of oral reading errors between younger, typically developing readers (YT) and older, struggling decoders (OSD) when there is control for text difficulty. In this respect the study is a follow on from Thomson's investigation (1978). The second purpose was to investigate whether there are differences in the quality of reading errors between struggling decoders and struggling readers with mixed difficulties (OMD), based on differences in language comprehension. In this respect the study follows on from the Blick et al. investigation (2017). The design of the study includes two features that allow for this synthesis. Firstly, the inclusion of a younger, reading-age matched group (YT) follows Singleton's (2005) suggestion as to how Thomson's methodology could have been improved, as it allows for comparisons that control for the effects of text difficulty. Secondly, the inclusion of Goodman's deep structure levels of analysis tests the finding of the Blick et al. study in that differences between the OSD and OMD groups might, as Thomson found, be subtle and might only show up at a deeper level of linguistic analysis.

Outline of the Chapter

This chapter describes the design of the study, the participants, the instruments used to collect data, the setting of the data collection and the procedures involved. Following this descriptive section the method of data analysis is set out in detail.

Design

The research design was a correlational design using both qualitative and quantitative methods to find out if there are any differences in the miscues made by three groups of children. The groups were younger, typical readers (YT), older readers who were struggling decoders (OSD), and older readers with mixed difficulties (OMD). Miscues were coded using NARA-III categories (Neale & Konza, 2001), and both a surface-level taxonomy and a deep-

structure level taxonomy based on Goodman's RMI (Goodman et al., 2005). Miscue analysis is essentially a diagnostic tool that uses a qualitative approach, since it is the nature of the miscues rather than their incidence that is of interest (Singleton, 2005; Thomson, 1978). However, the study also uses quantitative methods to find between-group differences in the percentage of miscue types at each level.

The first level of miscue analysis was according to the NARA-III classifications of mispronunciations, substitutions, refusals, additions, omissions and reversals. Next, the miscues were considered for graphemic similarity, phonemic similarity, syntactic acceptability and semantic acceptability. Finally miscues were coded according the linguistic level where the shift occurred – submorpheme, word, bound morpheme, phrase, clause, allolog, or intonation. Statistical analyses were carried out using SPSS multivariate analyses to find between-group differences in all the categories. The miscue types and procedures for coding and analysis are described in detail in the data analysis section of this chapter.

Participants

The number of participants sought was based on the sample size in earlier studies (Blick et al., 2017; Thomson, 1978). The target reading age level selected was the average range for children turning eight years old. This level was chosen because a transition in reading miscues has been noted at about seven years of age (Harding, Beech, & Sneddon, 1985), possibly as a function of the build-up in sight vocabulary and the transition to reading for meaning and information that takes place after the emergent reading levels. As well as this a consolidation of executive function will have occurred enabling children to focus attention, remember instructions and engage in multiple tasks simultaneously (Cartwright, 2012).

The number of participants finally selected was lower than expected due to difficulty in finding children who matched the criteria for the OSD group, that is

older children about 10 years old with typical listening comprehension but reading accuracy about the 8 year old level. Schools identified children as possible participants based on their reading age, but it was found that assessments commonly used in schools such as PROBE (Parkin & Parkin, 2011) collapse accuracy and comprehension into a single score, so that reading accuracy could be significantly higher than reading comprehension, or vice versa. In all, 117 children were screened, but only 39 included in the study.

The participants made up three groups based on their scores on the Neale Analysis of Reading Ability (NARA-III) (Neale & Konza, 2001) Reading Accuracy test and the Wechsler Individual Achievement Test - Second Edition (WIAT-II) Australian Standardised Edition (Wechsler, 2007) Listening Comprehension subtest. The younger children (YT) were in the average range for reading accuracy for Year 3 (24th – 66th percentile, $M = 44.23$, $SD = 13.88$) and average or above for listening comprehension (39th – 86th percentile, $M = 61.92$, $SD = 15.56$). The older children were divided into two groups according to their listening comprehension scores. The OMD group were below average (1st – 30th percentile, $M = 13.85$, $SD = 10.00$) and the OSD group were average range or better (39th to 77th percentile, $M = 59.54$, $SD = 13.23$). The raw score means for the groups YT, OMD and OSD are shown in Table 2.

The participants were drawn from 16 schools in the Auckland region. The sample was obtained by accessing the schools directory from https://www.educationcounts.govt.nz/data-services/directories/list-of-nz-schools and selecting the Auckland region state or state-integrated primary (Years 1-6) and contributing (Years 1-8) schools with English as the medium of instruction (294 schools). An invitation to take part in the study (Appendix A) was sent out to all of those schools and 24 expressions of interest were received. After further consideration eight of these declined to take part in the study, citing as reasons a lack of students meeting the study criteria, pressures on staff, or conflict with other activities in the school.

The 16 participating schools were considered representative of the socio-economic and ethnic heterogeneity of the wider Auckland region and included rural, coastal, outer suburban and inner suburban populations. Socio-economic data is related to the areas from which students are drawn, not from individual families in the study. In New Zealand, at the time of this study, school decile rankings were calculated on the basis of five socio-economic indicators: 1) household income, 2) occupation, 3) household crowding, 4) educational qualifications of parents, and 5) income support received by parents. Information was drawn from the five-yearly Census of Population and Dwellings (Stats NZ, 2013). Decile rankings were used to target funding for operational costs and resources, to help schools overcome barriers to learning arising from socio-economic factors (Ministry of Education, 2017). The lower the decile, the more funding was received. Within the sample there were seven schools in deciles 1-3, three schools in deciles 4-7, and six schools in deciles 8-10.

Ethnicity data for the study participants are not complete as this information was supplied on a voluntary basis. As a result there are no ethnicity data for the study. However the children were drawn from a population of Auckland region primary and contributing schools which had the following distribution (on 1 July 2017): Pakeha/NZ European 37%, Maori 16%, Pasifika 20%, Asian 21%, MELAA (Middle East, Latin America and Africa) 3%, Other 1%, and International fee paying students 2% (Source: https://www.educationcounts.govt.nz/data-services/directories/list-of-nz-schools).

Data on the languages of the participants was collected and many were found to be bilingual or multilingual. No participants were excluded on the basis of their first language being other than English. All students who were bilingual or multilingual were fluent in English to the level required for the screening measures.

Table 2

Chronological age means, WIAT-II Listening Comprehension subtest means, and NARA-III Reading Accuracy means and standard deviations for YT, OMD and OSD groups, and number of bilingual students in each group

Group	Age		WIAT-II Listening		NARA-III Accuracy		Bilingual
	M	*SD*	*M*	*SD*	*M*	*SD*	
YT (*n*=13)	8.25	.39	23.08	2.14	48.08	4.75	*5*
OMD (*n*=13)	10.19	.33	20.23	2.74	41.77	6.23	*6*
OSD (*n*=13)	10.25	.25	27.38	1.90	43.69	8.58	*2*

Note: YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder.

The schools in the study were asked to identify potential study participants on the basis of reading age and listening comprehension ability (Appendix A). It was expected that selection could take place on the basis of existing school records. At the time of this study schools were required to report twice yearly to the Ministry of Education (MoE) on the progress of children in relation to National Standards (a benchmarking system developed for Years 1-8 in literacy and numeracy). The mid-year reporting coincided with the identification of participants for the study. This method of selection proved to be problematic as teachers were using a range of different reading assessments to make a judgement on where children were in relation to National Standards (for example PROBE, STAR, PM Benchmark and running records using the *Ready to Read* books provided by the MoE), and some schools did not conduct listening comprehension assessments at all. There was not enough consistency or precision in the existing school records to identify participants who would meet the study criteria. In addition, as noted above, reading assessments such as PROBE collapse reading accuracy and comprehension into one reading age level. This allows a child to be better in one or another of the two components than is apparent from the reading age score.

As a result of this finding during initial school visits carried out by the researcher, it was decided that any potential participants who were considered below or well below National Standards in reading would be tested, but only

those who met the study criteria on the NARA-III Reading Accuracy score would be included in the study. After the schools identified potential older participants (*n*=79), they were asked to provide approximately half as many typical eight year old readers for the study as they had ten year olds (*n*=38), to ensure that the comparison group and the two study groups were drawn from similar populations. When the participants were assessed and matched groups finalised, out of the 117 children who were tested, 39 were included in the study – a younger YT group (*n* =13), an older OSD group (*n* =13) and an older OMD group (*n* =13*)*.

The effects of reading instruction were not investigated in this study, however through informal discussions with principals and staff it was noted that along with whole language reading instruction some of the older readers had received interventions such as Reading Recovery (Clay, 1994), *Jolly Phonics* (Lloyd, Wernham, & Stephen, 1995), *Early Words* (Soryl, 2014) or *Quick 60* (Iversen, 2016), or been supported by Resource Teachers of Learning and Behaviour (RTLB), Resource Teachers of Literacy (RTLit), or teacher aides.

Instruments

The instruments used in this study to obtain data were the Listening Comprehension and Pseudoword Decoding subtests of the Wechsler Individual Achievement Test - Second Edition (WIAT-II) Australian Standardised Edition (Wechsler, 2007), the Neale Analysis of Reading Ability 3rd Edition Australian Standardisation (NARA-III) (Neale & Konza, 2001) and the first chapter of a nonfiction reading text (Pye, 1998) which was graded at an approximately 8-9 year reading level using a noun-count procedure (Elley & Croft, 1989). After the data were collected, miscues were analysed using the NARA-III categories, a taxonomy based on Goodman's RMI (Goodman et al., 1987, 2005) which has been used in previous, similar studies (Blick et al., 2017; Thomson, 1978), and a taxonomy of deep language structure miscues (Goodman, 1965).

WIAT-II Listening Comprehension and Pseudoword subtests

The Wechsler Individual Achievement Test was originally designed to be administered in conjunction with the Wechsler Intelligence Scale for Children (WISC-III) to assist with the identification of learning disabilities (Michalko & Saklofske, 1996). The WIAT-II was standardised in Australia between 2004 – 2005 on 1261 children and adolescents aged 4 to 19 years. It requires individual administration. The listening comprehension subtest measures receptive vocabulary, sentence comprehension, and expressive vocabulary. The pseudoword subtest is a measure of word decoding skills. For the receptive vocabulary test and the sentence comprehension test students are required to indicate which picture out of four choices represents the target word or sentence. For the expressive vocabulary test students are required to produce a word that satisfies a definition accompanied by an illustration. For the pseudoword test students are required to read words that are made up of common English spelling patterns combined in novel ways. Various start points, reversal rules and discontinue rules apply so that students are not unduly stressed by the difficulty of the test.

The WIAT-II Examiner's Manual reports that the age-based reliability coefficients of the listening comprehension subtest are .80 for 10 year olds, and for the Pseudoword subtest .95 (Wechsler, 2007). The manual also contains descriptions of how content-related validity, construct-related validity and criterion-related validity were established.

Neale Analysis of Reading Ability

The Neale Analysis of Reading Ability (NARA-III) is a measure of reading ability designed for children aged six to twelve. The test was standardised in 1997 on a population of 1394 students from 116 schools across Australia. When administering the NARA-III a basal level is established using a practice passage and then the student is required to read a selection of passages of increasing difficulty until the discontinue rule applies. Line drawings are included to set the scene for each story. After each passage the student answers questions requiring information retrieval, summarising, inference and evaluation. Oral

reading errors are categorised as mispronunciations (including partial decoding), substitutions, omissions, additions, refusals or reversals. The test includes parallel forms for which the reliability coefficient is 0.97 for Accuracy in the 8.0 – 8.11 age level. The internal consistency reliability coefficient for Accuracy using Form 2 in Year 3 of schooling is .96. With reference to criterion-related validity the NARA-III reports a correlation of .95 with the Schonell Graded Word Reading Test in the standardisation of the second revision in 1981-2, however more recent data on validity were not available.

Non-standardised reading task

A running record (Clay, 1994) of a nonfiction passage (Pye, 1998, Appendix E) was included in the test instruments as a means of observing the reading behaviour of participants on an information-based text that more closely resembled books the children would be familiar with from their classrooms. Typically the focus in early reading is on fiction, however older struggling readers are often faced with inappropriate content because the stories at their reading level are directed at much younger readers. It was therefore considered likely that nonfiction would engage the children's interest more effectively (Job & Coleman, 2016). The tester recorded the oral reading on a copy of the text, noting errors, repeated words, pauses and self-corrections. The miscues were combined with miscues made on NARA-III and then coded on the basis of the NARA-III, surface level and deep structure miscue categories.

Miscue analysis

The instruments used for miscue analysis were selected so that the results could be compared with previous studies (Blick et al., 2017; Thomson, 1978) which used similar measures. They were firstly the NARA-III taxonomy of mispronunciations (partial decoding resulting in a nonword), substitutions (alternative real words), refusals (failure to attempt a word), additions (words inserted), omissions (words left out) and reversals (words in reverse order). Secondly, Goodman's reading miscue inventory (RMI) (Goodman et al., 2005) was used. In this taxonomy graphic similarity refers to the orthography or print

form of the miscue and to what degree it resembles the expected response (ER), keeping in mind that the miscue is transcribed from what the reader said as closely as possible. Phonemic similarity refers to the phonology of the observed response (OR) regardless of spelling, and how closely it resembles the ER. Syntactic acceptability is the degree to which the OR is acceptable in the grammatical structure of the sentence, and semantic acceptability is the degree to which the OR maintains the meaning of the sentence. Following the RMI procedure, the ER and OR for graphemic and phonemic analysis were considered as having three parts: beginning, middle and end (the RMI does not calculate exact percentages but makes judgements based on sections within a word, for example onset, vowel, coda). For each category the miscue was judged to be high, partial or none in similarity/acceptability.

Examples of miscue coding

Graphemic similarity

High – OR has a high degree of graphic similarity with the ER. Two or more parts are the same and found in the same location (beginning, middle or end) for example *talking/taking*.
Partial – OR has some degree of graphic similarity with the ER (one part is the same and in the same location) for example *when/while*.
None – OR has no graphic similarity with the ER, for example *body/part.*

Phonemic similarity

High – OR has a high degree of phonemic similarity with the target word. Two or more parts are the same and found in the same location (beginning, middle or end) for example *wounded/wondered*.
Partial – OR has some degree of phonemic similarity with the ER (one part is the same and in the same location) for example *them/the*.
None – OR has no phonemic similarity with the ER, for example *knight/king*.

Syntactic acceptability

High – OR is acceptable syntactically in the sentence and the entire text, for example *the monster charged furiously/the monster charged fiercely*.
Partial – OR is acceptable syntactically in the preceding or following part of the sentence (including one word on either side of the miscue) but not in the entire text. Example: *although it was common knowledge/ all through it was common knowledge*.
None – OR is not syntactically acceptable.

Semantic acceptability

High – OR is semantically acceptable in the sentence and the entire text.
Example: *the fearful roaring/the fierce roaring*
Partial – OR is semantically acceptable in the preceding or following part of the sentence (including one word on either side of the miscue) but not in the whole passage, for example *a diver was in peril/a driver was in peril*.
None – OR is not semantically acceptable, for example *technical equipment/tentacle equipment*.

Deep structure level

The final level of analysis was carried out using a deep structure taxonomy based on Goodman's (1965) linguistic analysis of cues and miscues. Miscues are analysed for the linguistic level at which the shift takes place. This could be submorphemic, or within the word (*impulse/impluse*); word level (*realised/released*); bound morpheme level, for example an incorrect inflectional ending or prefix (*trainer/train*); phrase level (*the lions' final act/the lions finally act*); or clause/sentence level (*patiently he turned and twisted/patiently he turned the twisted…*). When considering deep structure levels, it was recognised that a change could occur at more than one level simultaneously, for example *seize*/*size* involves a substitution at the submorpheme level (the phoneme *i* substituted for the phoneme *ei*) but also a substitution at word level (size for seize). In cases of ambiguity, miscues were coded at the highest level

at which they involved a shift in structure. Miscues that were alternative forms of the same word were coded as allologs (*don't/do not*) and words that were unrecognised only because the wrong syllable was stressed were coded as intonation miscues (*common/com´mon*).

Setting

The participants were tested in quiet spaces that were made available for the purpose. These ranged from small rooms off the school library, to a Principal's office. Testing was carried out during the school day except for one case where testing took place immediately after school to accommodate the participant's wish not to be 'sent out' during class time.

Procedure

The data were collected during Term 3 of a four term school year, and dates of testing were scheduled as close as possible to the participants' eighth or tenth birthdays respectively, sometimes requiring repeated visits to the same school at different times in Term 3. Schools supplied a list of potential participants and a space for testing. Participants were either called on by office staff, or were collected from their classroom by the researcher. Rapport was established through informal conversation. When settled in the test setting, the researcher explained the study to the child using the student information sheet (Appendix C) and the child was invited to sign the consent form to participate.

The nonfiction text was used first to allow time for the participants to settle in to the testing situation. The book had simple illustrations and was similar to books used in classrooms. The remainder of the test measures were rotated to control for possible order effects.

The formal reading tests were administered using a spiral bound reader (NARA-III) or a laminated card (Pseudowords). The oral reading was audio-recorded and errors were recorded on a record sheet for each passage. The listening

tests were administered using a spiral bound prompt book (WIAT-II). Answers were recorded on a score sheet or record sheet.

Participant responses were scored according to standardised procedures on the NARA-III Reading Ability test and the WIAT-II Listening Comprehension and Pseudoword subtests. Raw scores were converted into year level percentiles and age equivalents (NARA-III) or age percentiles and age equivalents (WIAT-II). For the non-standardised reading test, percentage accuracy scores, self-correction rates, reading rates and miscue observations were obtained using a running record sheet.

Data analysis

The miscues to be analysed were capped at the first 25 (regardless of whether they were self-corrected or not) for each participant. Self-corrections were recorded separately. The miscues were coded on a scoresheet (Appendix D), entered into an SPSS file, and analysed according to the three miscue taxonomies. The independent variables for the comparisons were the subgroups to which the participant was assigned, YT, OMD or OSD. The dependent variables were the miscue types in each taxonomy and the screening test data.

Data were analysed using a multivariate analysis of variance (MANOVA) and covariance (MANCOVA). The statistical assumptions for using MANOVA/MANCOVA were met. Where analyses showed significant differences post hoc tests revealed which subgroups were different from the others. These tests were appropriate because the aim of the study was to find between-group differences on a series of reading measures and miscue types, firstly as a function of chronological age, and secondly as a function of listening comprehension for the older groups.

Interrater reliability

Interrater reliability was established by having an English teaching professional independently analyse 20% of the data collected after being trained in the use of the miscue taxonomies. The miscue data for 11 participants were selected randomly and each rater scored the results independently. The overrall agreement for each category was as follows:

NARA-III taxonomy	100%
Surface level taxonomy	96.5%
Deep structure taxonomy	98.7%

Disagreements were resolved through discussion. Surface level miscues most likely to need discussion were those judged to be partially syntactically acceptable, that is acceptable in either the first or last part of the sentence up to and including the word after/before the miscue. At times these required quite fine distinctions, for example the difference between a transitive and intransitive verb: “the knight now realised/released that he must attack…” For deep structure levels discussion mostly related to complex miscues, for example “he crouched as though wounded/he crouched as he thought wonder”, which was coded as a shift from a phrase to a clause, rather than as substitution of individual words.

Summary

This chapter has described the study design and the participants who were 39 children matched for reading age and divided into three groups in order to compare the quality of their miscues when reading similar texts. The instruments used, procedure for data collection, and the method of coding miscues have been described in detail. The SPSS data analyses used have been set out as well as the percent agreement for inter-rater reliability. The results of the study are found in the following chapter.

Chapter 4: Results

Overview

This chapter presents the results of the study that sought to find out whether a younger group of typically developing readers, that is, average for decoding and listening (YT), would make different kinds of oral reading miscues than a group of older students who were average listeners but struggling decoders (OSD), who in turn were compared with a group of older students with mixed difficulties (OMD), that is, below average in both listening and decoding. The three groups (13 students in each group) were matched in decoding but the YT and OSD groups had higher listening scores than the OMD group.

Results

The results for the screening measures are reported in raw score means and percentiles. The results for the different categories of miscues are reported as percentages. Three levels of miscue analysis were conducted. The first was a comparison of mispronunciations, substitutions, refusals, additions, omissions and reversals as recommended for the Neale Analysis of Reading Ability (NARA-III). The second was a comparison, using RMI procedures, of surface structure miscues (graphemic similarity, phonemic similarity, syntactic acceptability and semantic acceptability). The third was a comparison of deep structure miscues (submorpheme, word, bound morpheme, phrase, clause/sentence, allolog, and intonation). All miscue results are reported as percentage scores. Differences among the three groups were investigated using analysis of variance procedures and paired comparisons.

Screening measures

Table 3 shows the results of a MANOVA comparing the raw score means for the three groups on the WIAT-II and NARA-III tests. The sample size was 39 students, with 13 in each group. In listening comprehension, there was a

significant difference among the groups, $p < .001$. Pairwise comparisons showed: YT > OMD and OSD > YT and OMD. In pseudoword reading there was no significant difference among the three groups, $p = .108$ even though the YT group mean was higher. In oral reading accuracy there was no significant difference among the three groups, $p = .061$ even though the mean of the YT group was higher. In reading comprehension there was a significant difference among the three groups, $p = .006$. Pairwise comparisons showed that the YT and OSD mean scores were significantly higher than the OMD mean. There was no difference between the YT and OSD means. In reading rate, there was no significant difference among the three groups, $p = .722$.

Table 3

Raw score means, standard deviations and summary group differences between the WIAT-II Listening Comprehension and Pseudoword subtests and the NARA-III Accuracy, Comprehension and Rate subtests for groups YT, OMD, and OSD

	Groups							
	YT		OMD		OSD			
	(*n* = 13)		(*n* = 13)		(*n* = 13)			
	M	SD	M	SD	M	SD	*F*(2,36)	*p*
WIAT-II								
Listening comprehension	23.08	2.14	20.23	2.74	27.38	1.90	32.24	<.001***
Pseudoword decoding	32.54	8.87	25.46	10.18	25.23	10.11	2.37	.108
NARA-III								
Reading accuracy	48.08	4.75	41.77	6.23	43.69	8.58	3.02	.061
Reading comprehension	19.23	3.19	15.31	1.84	19.31	4.52	6.01	.006**
Reading rate	60.31	15.30	57.23	16.88	54.92	18.59	.33	.722

Note. YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder.
***$p < .001$. ** $p < .01$

Figure 2 gives a visual comparison of the three groups using percentile scores. The younger group was in the average range relative to their age and year level on all measures of reading and listening. The older groups had below average scores for reading measures. For listening, however, the OSD group had scores in the average range and the OMD group in the below-average range.

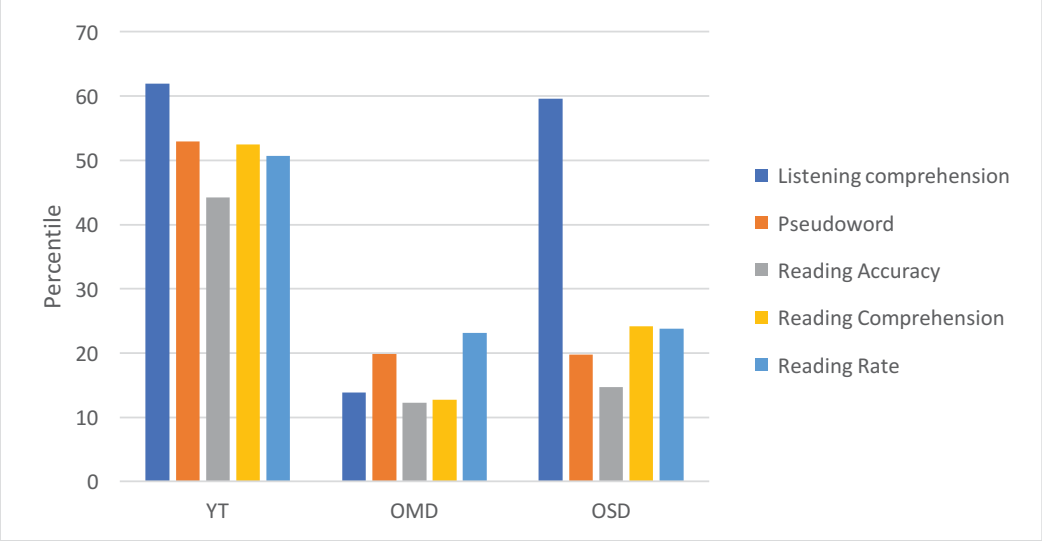

Figure 2. Percentile means for the WIAT-II Listening Comprehension and Pseudoword subtests and the NARA-III Reading Accuracy, Reading Comprehension and Reading Rate subtests for the YT, OMD and OSD groups. *Note*: YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder. Percentiles are for age (WIAT-II) and year level (NARA-III).

Difficulty level of passages used for the study and self-correction rates

A check was made to be sure that the text material read for the study was of similar difficulty across the three groups. Table 4 shows the results. An analysis of variance showed that there was no difference among the three groups in self correction rate, percent accuracy for the informal passage, and passage levels of difficulty students read up to in the NARA-III.

Table 4

Means, standard deviations and summary group differences for percentage of errors self corrected, nonfiction accuracy rates and NARA-III passage level reached to produce 25 miscues for groups YT, OMD and OSD

	Groups							
	YT		OMD		OSD			
	M	SD	M	SD	M	*SD*	*F*(2,36)	*p*
Self correction rate	16.62	8.14	13.85	8.26	19.38	9.78	1.3	.285
Accuracy rate	96.85	1.68	95.77	2.91	96.72	1.91	.89	.417
NARA-III level	4.38	.51	4.00	.71	4.15	.69	1.18	.317

Note. YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder.

NARA-III error categories

Table 5 shows percent means and standard deviations for each group on the NARA-III categories of mispronunciations, substitutions, refusals, additions, omissions and reversals. The overall MANOVA showed no significant differences among groups for these categories, $F(10,64) = 1.66$, Wilk's $\Lambda = .63$, partial $\eta^{2} = .206$, $p = >.05$, however, univariate ANOVAs showed a significant difference for the mispronunciation measure. Follow-up contrasts using Fisher's LSD procedure showed that the YT and OMD groups made a similar number of mispronunciations but the OSD group made significantly fewer mispronunciations than the other two groups.

Follow-up analysis to control for differences in pretest reading skills

In order to check the results of the MANOVA analysis a MANCOVA was carried out, co-varying initial differences among the groups in reading of pseudowords, reading accuracy, reading comprehension, and reading rate. The pattern of results was similar except for the mispronunciation result which was no longer significant.

Table 5

Means, standard deviations and summary group differences for the NARA-III error categories for YT, OMD and OSD groups.

	Groups							
	YT		OMD		OSD			
	(*n*=13)		(*n*=13)		(*n*=13)			
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*(2,36)	*p*
Mispronunciations	29.54	10.78	30.15	12.07	19.69	7.02	4.32	.02*
Substitutions	58.15	11.96	57.85	10.66	66.15	9.04	2.56	.09
Refusals	0.00	0.00	0.00	0.00	0.31	1.11	1.00	.09
Additions	4.92	5.20	4.31	5.53	5.54	4.77	0.18	.83
Omissions	7.38	6.70	7.08	8.97	8.31	8.24	0.08	.92
Reversals	0.00	0.00	0.62	1.50	0.00	0.00	2.18	.13

Note. YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder. * $p < .05$

Surface level miscues

Table 6 shows means and standard deviations for surface-level error types. The overall MANOVA was significant, $F(24,50) = 2.93$, $p < .01$; Wilk's $\Lambda = .17$, partial $\eta^2 = 0.585$. Univariate ANOVAs were conducted to find out which variables showed differences among the groups and it was found that the partial and no syntactic acceptability category and the no semantic acceptability category were significant. For the partial syntactic acceptability miscues, follow-up paired comparisons showed that the YT group had a higher percentage of partially acceptable miscues (YT>OMD, OSD). For the no syntactic acceptability miscues, the OMD group had a higher percentage of miscues than the YT group (OMD>YT). There was no significant difference between the YT and OSD groups or between the OSD and OMD groups. For the no semantic acceptability miscues, the OMD group had a higher percentage of miscues than the YT group.

Follow-up analysis to control for differences in pretest reading skills

In order to check these results, to take account of pretest differences in reading skills among the groups, a MANCOVA was carried out, co-varying initial differences among the groups in reading of pseudowords, reading accuracy,

reading comprehension, and reading rate. The pattern of results changed slightly: the YT group had a lower percentage of miscues that were not acceptable syntactically or semantically than both the OSD and OMD groups. The results were:

Syntactic – partially acceptable – YT > OSD and OMD, OMD ≈ OSD.

Syntactic – not acceptable – OMD and OSD > YT, OMD ≈ OSD

Semantic – not acceptable – OSD and OMD >YT, OSD ≈ OMD

Table 6

Means, standard deviations and summary group differences for surface level error categories, for YT, OMD and OSD groups

		Groups							
		YT		OMD		OSD			
		M	*SD*	*M*	*SD*	*M*	*SD*	*F*(2,36)	*p*
Graphemic	High	81.50	9.84	82.51	9.21	76.67	6.85	1.662	.204
	Partial	13.13	9.22	11.47	7.48	17.82	5.37	2.492	.097
	None	5.37	6.91	6.02	5.97	5.51	4.21	.045	.957
Phonemic	High	72.22	11.69	69.63	13.05	66.15	8.50	.954	.395
	Partial	18.45	11.22	19.40	11.88	24.63	10.43	1.148	.329
	None	9.34	4.57	10.98	6.34	9.23	5.55	.408	.668
Syntactic	High	50.17	15.76	47.40	13.52	53.95	7.55	.864	.430
	Partial	31.60	13.35	21.25	13.19	19.62	9.73	3.683	.035*
	None	18.22	10.92	31.35	12.05	26.43	12.63	4.041	.026*
Semantic	High	17.20	8.78	13.05	9.42	10.16	6.44	2.351	.110
	Partial	56.82	11.74	48.24	11.11	54.51	14.01	1.678	.201
	None	25.99	11.17	38.71	12.86	35.33	13.92	3.500	.041*

Note. YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder. * $p < .05$.

Figure 3 shows the pattern of errors in each surface-level category for each of the groups YT, OMD and OSD.

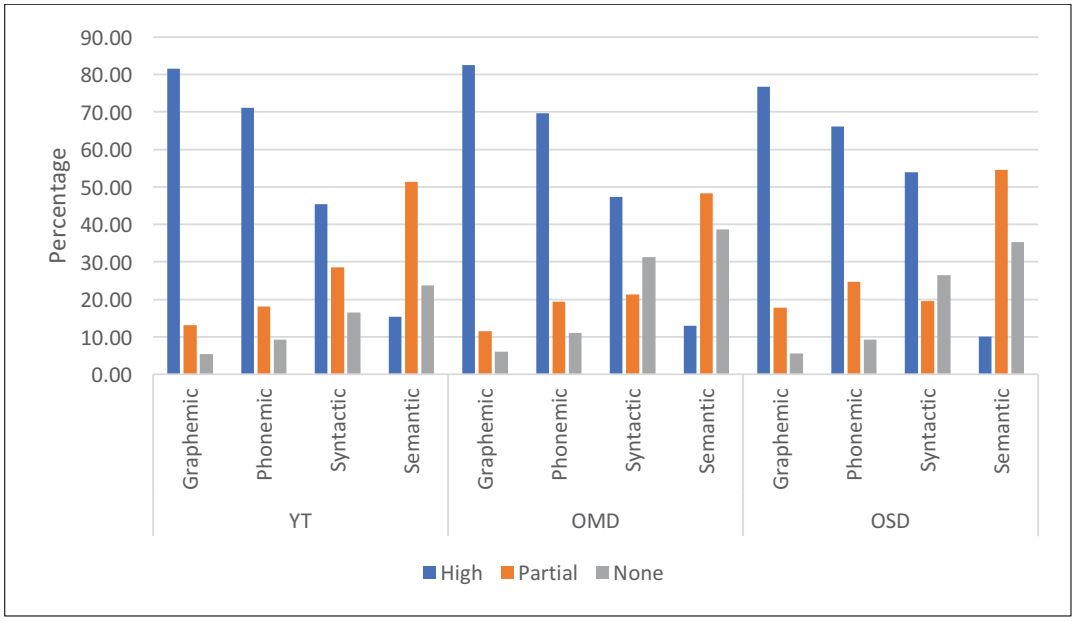

Figure 3. Percentage of miscues that are high, partial or none for the surface-level categories graphemic and phonemic similarity, and syntactic and semantic acceptability, for the groups YT, OMD and OSD.

Note: YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder.

Deep structure miscues

Table 7 shows means and standard deviations for the deep structure miscues (for visual analysis also see Figure 4). The multivariate test was significant, $F(12,62) = 2.39$, $p = <.05$; Wilk's $\Lambda = 0.47$, partial $\eta^2 = .316$. Univariate ANOVAs showed significant differences at submorpheme, word, and phrase levels.

As shown in Figure 4, at submorpheme level, OMD and YT had a higher percentage of these miscues than OSD; there was no difference between OMD and YT. At word level, OSD had a higher percentage of these miscues than OMD and YT. There was no difference between OMD and YT. At phrase level, YT had a higher percentage of these miscues than OSD and OMD. There was no difference between OMD and OSD.

Follow-up analyses to control for differences in pretest reading skills

In order to check the results of the MANOVA analyses a MANCOVA was carried out, co-varying initial differences among the groups in reading of pseudowords, reading accuracy, reading comprehension, and reading rate. The MANCOVA results were the same at submorpheme and phrase levels but the word level result showed that the OSD and OMD groups both made proportionately more miscues than the YT group. The pattern of results was that:

Submorpheme – YT > OSD and OMD, OMD > OSD

Word – OMD and OSD > YT, OMD ≈ OSD

Phrase – YT > OSD and OMD, OSD ≈ OMD.

Table 7

Means, standard deviations and group differences for deep structure levels submorpheme, word, bound morpheme, phrase, clause/sentence, allolog and intonation for YT, OMD and OSD groups

	Groups							
	YT		*OMD*		*OSD*			
	(*n*=13)		(*n*=13)		(*n*=13)			
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*(2,36)	*p*
Submorpheme	28.92	9.26	31.69	9.45	20.00	6.53	6.69	<.01**
Word	36.00	8.49	42.15	12.61	51.39	10.56	6.83	<.01**
Bound morpheme	13.23	6.61	12.62	7.28	13.85	6.03	0.11	.90
Phrase	15.39	6.50	9.23	6.41	8.31	6.82	4.45	.02*
Clause/sentence	5.54	5.55	2.77	4.73	5.85	5.57	1.33	.28
Allolog	0.92	1.75	0.92	1.75	0.31	1.11	0.67	.52
Intonation	0.00	0.00	0.62	1.50	0.31	1.11	1.06	.36

Note. YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder. * $p < .05$. ** $p < .01$.

Follow-up of the nature of the deep structure miscues in terms of substitutions, omissions, insertions, and reversals

Table 8 shows percent errors for each deep structure category. Within the deep structure levels miscues were coded as S=substitution, O=omission, I=insertion and R=reversal. When compared with the pattern of results in Table 6, it seems

that where there were significant differences among the groups, these were mostly at the substitution level, for example substitution of vowels (crouched/croached), alternative phonemes for the same letter (progress/projess) or similar looking words (furiously/fearlessly). The differences are presented in visual form in Figure 4.

Table 8

Percentage of errors for substitution, omission, insertion and reversal within each deep structure category for the groups YT, OMD, OSD

		Groups					
		YT		OMD		OSD	
Submorpheme	*S*	16.0	28.9	19.1	31.7	11.0	20.0
	O	7.1		7.1		6.3	
	I	4.3		3.7		1.3	
	R	1.5		1.8		1.9	
Word	*S*	33.8	36.0	39.4	42.2	46.4	51.4
	O	1.5		1.2		1.9	
	I	0.6		1.2		3.2	
	R	0.0		0.3		0.0	
Bound morpheme	*S*	2.2	13.2	1.2	12.6	0.9	13.8
	O	4.0		5.2		6.6	
	I	6.8		5.8		5.7	
	R	0.3		0.3		0.0	
Phrase	*S*	8.9	15.4	4.3	9.2	4.1	8.3
	O	2.8		2.8		3. 2	
	I	3.7		1.8		1.3	
	R	0.0		0.3		0.0	
Clause/sentence	*S*	3.7	5.5	1.8	2.8	3.2	5.8
	O	1.5		0.6		1.6	
	I	0.3		0.3		0.9	
	R	0.0		0.0		0.0	
Allolog			0.9		0.9		0.3
Intonation			0.0		0.6		0.3

Note. YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder. S = substitution, O = omission, I = insertion, R = reversal.

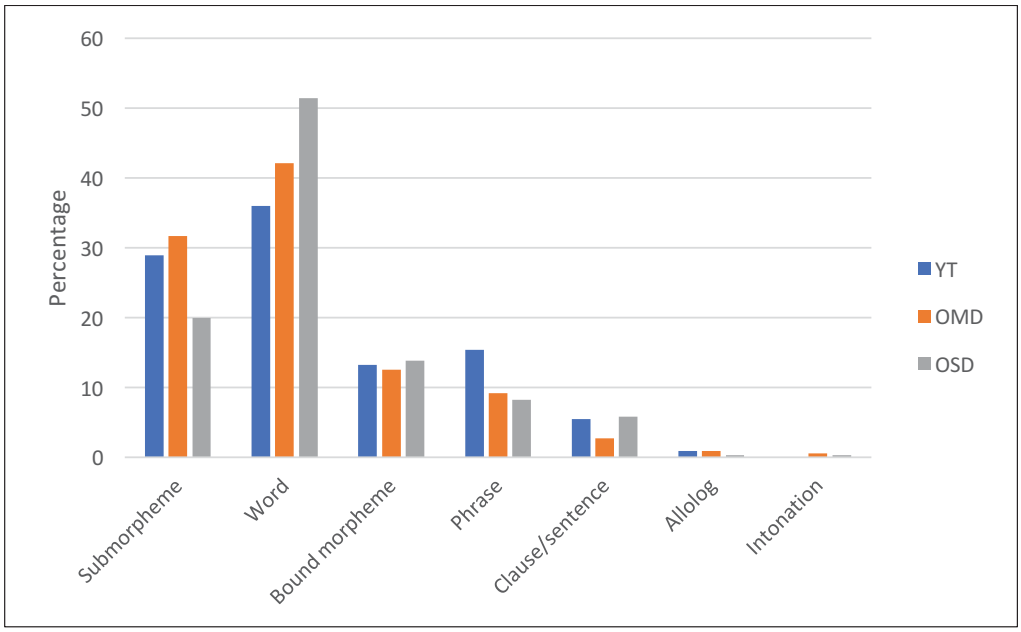

Figure 4. Percentage of miscues at each of the deep structure levels submorpheme, word, bound morpheme, phrase, allolog and intonation for the groups YT, OMD and OSD. Note: YT=younger, typically developing; OMD=older, mixed difficulty; OSD=older, struggling decoder.

Summary

Screening measures

The screening measure results showed that the three groups were similar in most reading measures but there was a difference in reading comprehension. This was a factor that needed to be taken into consideration and led to use of MANCOVA for the analyses to take account of possible reading ability differences among the groups.

Miscue categories

For the NARA-III miscue categories, there was initially a difference found for mispronunciations in that the YT and OMD groups made proportionately more of these miscues than did the OSD group but after controlling for reading skills using the MANCOVA this difference disappeared. For the surface level miscue analysis, the MANCOVA showed that OSD and OMD groups had a higher percentage of miscues that were not syntactically or semantically acceptable

than did the YT group. The YT group made proportionately more partially syntactically appropriate miscues than the OSD and OMD groups. For the deep structure analysis, the MANCOVA showed that at the submorpheme level, the YT and OMD groups were similar to each other and each group made proportionately more of these miscues than the OSD group. At the word level the OSD and OMD groups were similar to each other and made proportionately more of these miscues than did the YT group. At the phrase level, the YT group made proportionately more of these miscues than did the OSD and OMD groups who were similar to each other. The findings outlined above will be discussed in the following chapter. The relationship of the findings to theoretical models, and to the findings of previous studies, will be explored, as well as any implications for current approaches to reading instruction and intervention.

Chapter 5: Discussion

Overview

This chapter first reviews the rationale for the study and then discusses the results in relation to the predictions that were made, both from theoretical models and from previous studies. Limitations of the study are outlined and future research directions suggested. Some illustrations of the findings are given in terms of miscue data from the study, and some implications are drawn for the New Zealand context.

Research questions

This study addressed the following questions:
1). Are there differences in graphophonemic miscues between younger typical readers and older dyslexic readers when both groups are matched for reading level?
2) Are there differences in syntactic and semantic miscues between younger typical readers and older dyslexic readers when both groups are matched for reading level?
3). Are there differences in error patterns between older struggling readers who are dyslexic-type poor decoders, and those who have mixed difficulties?

Discussion

Before discussing the main findings, it may be helpful to review the rationale for the study. The older struggling readers were reading about two years below their chronological age in accuracy; they still had sufficient skill in decoding to take advantage of context to identify some unknown words. However they might not do so because their long-time difficulties with decoding would result in a tendency to rely on syntactic and semantic cues rather than graphemic and phonemic. In contrast, typical readers when reading material of similar difficulty would make higher use of all the cueing systems (Gough, 1972; McKay, Davis, Savage, & Castles, 2008; Tunmer,

1990; Tunmer & Chapman, 1999; Tunmer & Nicholson, 2011). When reading running text, the OSD and OMD students might be more likely than the YT students to accidentally generate similar-looking substitutes for unfamiliar words from their store of sight vocabulary (Harding et al., 1985), or insert or omit words to compensate for lack of decoding skills (Tunmer & Greaney, 2010). Their tendency to rely on syntactic and semantic cues rather than to decode words letter by letter would suggest their miscues would be real word substitutions. This was the rationale for the study, that the younger typical readers (YT) and the older poor readers (OSD and OMD) would make different miscues due to their differences in decoding and listening skills.

Were the reading passages of similar difficulty for all three groups?

There were no significant differences between the groups for self correction rates, accuracy rates on the nonfiction text, or NARA-III passage level reached to produce 25 miscues. This result is important in that it suggests that the passages read were of similar difficulty for all the participants. The result is also interesting because in the New Zealand context self correction rates are widely used in assessment of reading progress (Share, 1990). They are considered a measure of reading efficiency based on the whole language framework in which readers who notice errors and correct them independently demonstrate good integration of context cues (Clay, 1969; Goodman & Goodman, 1994). The self correction result in this study does not support that view, but rather the alternative that self correction rates are not an indicator of efficient reading (Share, 1990). The finding is similar to the findings of two studies reviewed in Chapter 2, which found no group differences for self corrections (Blick, 2015; Pedersen et al., 2016) but different in comparison to the studies of Warde (2005) and Gillam and Carlile (1997). It is possible that in studies where differences were found, text difficulty may be an influencing factor, whereas in this study participants used the same materials.

Were there differences for NARA-III coding?

The results did not show any differences among the three groups on any of the NARA-III categories. This finding was similar to that obtained in earlier research (Blick et al., 2017; Singleton, 2005; Thomson, 1978).

Were there differences for surface level coding?

Both the OSD and OMD groups had a higher percentage of syntactic and semantic miscues that were not acceptable and proportionately less syntactic miscues that were partially acceptable. The better results for syntactic and semantic miscues for the YT group suggests that they were making better use of these cues in their reading of text (Goodman, 1967; Smith, 2004) but an alternative explanation is that the YT group were better able to use their decoding skills in conjunction with syntactic and semantic cues than the older poor readers. Thus, YT readers, in making use of word level cues to make accurate guesses (Cartwright, 2012; Ehri, 2014; Nicholson, 1991; Potter, 1980), at the same time achieved better syntactic and semantic acceptability.

Were there differences at deep structure level?

To provide a background for the deep structure level discussion, some examples of shifts brought about by miscues are provided:

1. Submorpheme shift: parcel/parkel; Antarctica/Antrasta.
2. Word shift: knight/king; poison/potion.
3. Bound morpheme shift: dreaded/dreadess; adventure/adventures.
4. Phrase shift: the thunder had made the lions restless/the thunder had made the lions wrestle; the lions' final act/the lions finally act.
5. Clause shift: a black cat came/a black cat comes; horse and rider collapsed/horse and rider gallop.

At submorpheme level, the YT group had a similar percentage of miscues to the OMD group, suggesting that they were making similar use of phonological within-word cues, and were doing so more than the OSD group.

The OSD group may have been reluctant to try to sound out unfamiliar words and instead generated real words that were visually similar to the actual words. At the word level the OSD and OMD groups both made proportionately more miscues than the YT group suggesting they might be guessing for meaning and coming up with other words rather than the target words. The submorpheme and word findings for OMD and OSD are supported by other studies (Abu-Rabia & Taha, 2004; Laing, 2002) where struggling readers were more likely to make word substitutions by guessing at words using partial graphophonic cues. This could be a result of their not having yet acquired sufficiently high levels of alphabetic cipher skills (Gough, 1993; Jackson & Coltheart, 2001). The finding for the YT group, who did have adequate alphabetic decoding skills, could be the result of their using a combination of letter cues and context cues to work out unknown words. At the phrase level, the YT group made proportionately more miscues than OMD and OSD. This finding suggests that as a group the YT readers were processing text at a more complex level and were more likely to substitute their own version of phrases as a whole than were the struggling readers.

How the findings link to theoretical models

The context-driven model would predict that the older struggling readers (OSD and OMD), reading the same text material and at the same difficulty level, would be less able than the YT group to integrate graphophonemic cues with syntactic and semantic cues and thus their miscues would be less likely to be acceptable syntactically and semantically (Goodman, 1967; Gough, 1996; Smith, 2004). This turned out to be the case. This pattern of results was in line with suggestions made in Thomson (1978) that older poor readers were reading differently to younger typically developing readers.

The print-driven model would predict that below-average readers would make more use of context to guess unknown words, due to their weaknesses in decoding skills, which would mean that the OMD and OSD miscues would be less graphemically acceptable than for the YT group but just as semantically

and syntactically acceptable as for the YT group (Gough, 1996; Nicholson, 1991; Stanovich, 1986). This was not the case. In terms of graphic and phonemic similarity the younger YT readers made similar kinds of miscues to those of the older poor readers (OSD and OMD), yet their miscues were not syntactically and semantically inappropriate like those of the other groups which is the opposite of what the print driven model would predict (Tunmer & Nicholson, 2011).

The SVR model is useful in that it helps to explain some differences that could be related to both linguistic comprehension and phonological processing difficulties. At the deep structure level of analysis the OMD and YT groups had the highest percentage of errors at submorpheme level, the OSD and OMD groups had the highest percentage of errors at word level, and the YT group had the highest percentage of errors at phrase level. This could be explained by the fact that both OMD and OSD groups were poor decoders and their main difficulty lies at the word or submorphemic level, while the YT group's better decoding skills enabled them to think about the text at a wider level. In addition, the YT group were also making use of within-word cues to help them decode unknown words. The difference between the OMD and OSD groups at submorpheme level might be explained by the adequate language skills of the OSD group in comparison to their poor phonological decoding. The OSD group tended to partially decode a word and then guess, resulting in a substitute that was a real word, while the OMD group had more instances of partial decoding leading to nonwords.

To summarise the discussion so far, it seems that at surface and deep level the YT group were acting as predicted by the context model and were making use of all three cue sources to make miscues that were less likely to not make sense; the OMD and OSD groups were not using context cues as well as the YT group.

How did the findings relate to previous studies?

Differences in this study between the OMD and OSD groups showed up only at deep structure level, and therefore were not found in a previous study by Blick (2017), who compared the surface feature miscues of two groups of poor decoders divided by higher or lower linguistic comprehension. Blick found no significant differences between the groups. She concluded that this finding converged with previous studies showing that higher linguistic ability does not necessarily translate into better use of context to help with decoding because the predictability of content words from context is quite constrained (Gough, 1996; Nicholson, 1991; Warde, 2005). In contrast, other studies have found varying degrees of difference in miscues when comparing children who differed in linguistic ability (Gillam & Carlile, 1997; Laing, 2002) and when comparing dyslexic readers using miscues at deep structure level (Pedersen et al., 2016; Thomson, 1978). These findings are similar to the findings of this study in that they suggest that the better listening skills of the dyslexic (OSD) group did not help them to make better use of context.

Limitations and suggestions for future research

The study has several limitations. The sample size was quite small so the findings may not be generalisable. As well as this the study was focussed on reading behaviour at an eight year old reading age, so the findings may not apply to children at other developmental levels. Further, the younger typical readers in the sample had higher scores than the older groups on reading accuracy which could have affected the results; however the study controlled for these differences by carrying out a MANCOVA where initially differences were found on a MANOVA. A further limitation is that there were a number of bilingual students who were unevenly distributed across the groups which could affect any interpretation of the results. Bilingual students were not excluded if their listening comprehension was adequate, however the WIAT-III Listening Test may not have been able to show other differences in linguistic understanding which could have affected the results. Another limitation is the validity of miscue analysis to analyse reading processes. Miscue analysis has

been critiqued because miscues can differ for different levels of text difficulty (Hempenstall, 1998) however in this study the text material for miscue analysis was the same for all students and difficulty levels were kept to a reasonable level. Miscue analysis has also been critiqued for lack of reliability (Hempenstall, 1998). To control for this in the present study, all miscues were scored by two independent raters. Another critique of miscue analysis is that it involves oral reading and may not be applicable to silent reading (Singleton, 2005). This is a limitation of the present results in that they do not apply to silent reading.

A future study might consider comparing reading aloud with reading silently and then aloud, in order to find out if individual differences exist when the cognitive load of struggling readers is reduced and they have more capacity to attend to graphemic, phonemic, syntactic and semantic cues while simultaneously verbalising this information in real time.

A possible future study could take the form of an ethnographic case study to follow up a few struggling readers in order to understand other broader contextual factors that impact their reading skills, for example how they read at home and at school, whether the parents read, whether they are encouraged and by whom, whether they read one-on-one or only as a whole class, what kind of feedback is given, and whether there is any follow up on phonemes, words or phrases that cause difficulty.

Illustrating the findings – a brief look at some miscues made during the study

The older poor readers in this study, even though matched in reading ability to a younger group of typically developing readers, made more miscues that were not meaningful. They were using partial graphemic information to guess what the words might be even though their attempts often did not make sense. For example, one passage about a surprise parcel from the protagonists' uncle included the following: "A surprise parcel arrived…Peter looked at the strange

stamps…Uncle had sent some skates for Jane." The OSD group made many miscues for the word "parcel" but tended to substitute another real word: *pelican*, *package*, *practical*, *particle*. Their substitutes for "skates" were *snacks* and *skaters*, and for "stamps" a common substitute was *stumps*. These miscues did not make sense in context. The OMD group tended to offer a mixture of nonwords and real words: for "parcel" some examples were: *parts*, *present*, *practically*, *puzzle*, *prace*, *par-* and *parel*. For "stamps" miscues made by the OMD group included *stumps* and *smat*; "skates" was read as *snacks*, *snakes*, *skeletons*, *stickers*, *sikates*. The miscues also did not make sense. The YT group in contrast had fewer miscues for "parcel" and those included *parlet*, *pra-*, *prakel*, and *particle*; the words "stamps" and "skates" were read correctly except for one instance of "stamps" read as *stumps* (this could be because the reader thought "a" sounds like the short vowel "u" as it does in the case of the indefinite article, a common mistake for developing readers). They appeared to be more able to identify the words in context, and when they did not know a word their attempts seemed to be more at the submorpheme level than was the case for the OSD and OMD groups, which suggests they were able to use graphemic cues and sentence context more effectively.

Looking at these few miscues as examples, it can be seen that the OMD group showed similarities with the OSD group even though the actual finding showed their miscues were also at the submorpheme level like the YT group. Another insight from the examples is that many of the miscues of the OSD and OMD groups changed the meaning of what they were reading – which was also a finding of this study that their miscues were more likely to lose the meaning.

Practical implications in the New Zealand context

The recent release by the Ministry of Education (December, 2017) of results from the Progress in International Reading Literacy Study (PIRLS), carried out in 2015, revealed a statistically significant decline in the reading achievement of New Zealand Year 5 children compared with previous reports. New Zealand has dropped in international rankings. As well as this, efforts by the New

Zealand government to reduce large disparities between the highest and lowest achievers in reading have not had an observable effect (Ministry of Education, 2017; Tunmer & Chapman, 2015). Reading matters, and in light of the first international comparison in 1970, when New Zealand topped the rankings (Elley, 2006), and the contrasting 2016 PIRLS results, the findings of the present study may be of relevance in policy efforts to raise this country's standings in the future.

The many and complex contributing factors to New Zealand's reading decline are outside the scope of this study, however the current situation does provide a backdrop for the present investigation. A strong case has been made for the Ministry of Education to abandon its current literacy strategy which is not working for some readers, and adopt a differentiated approach to reading instruction that takes account of differences among children in their reading capabilities (McLachlan & Arrow, 2015; Tunmer & Chapman, 2015). Changes in instruction may be required for students who are not currently responding well, and for whom different approaches may be needed, such as a combination of phonics instruction and book reading (Tse & Nicholson, 2014) which would encourage struggling readers to use both graphemic and context cues together. Such a move may require changes in early assessment practices, and ongoing professional development for teachers so they can better recognise the nature of the difficulties they are seeing and provide appropriate intervention (Arrow, McLachlan, & Greaney, 2015). It is timely for more research into the multiple aspects of reading difficulties encountered in New Zealand classrooms, and this study relates to one piece of the puzzle – the strategies being used by struggling readers to process and gain meaning from print.

The results of this study showed differences between the older struggling readers and the younger typically achieving readers – but not so much between the two groups of struggling readers in terms of their miscues. The OMD group made more submorpheme miscues than did the OSD group and this might be because they had poorer decoding skills and were more bogged down at the letter level. Alternatively, it could be a result of the OSD tendency to avoid

analysing words at the letter level. Both groups made similar numbers of word level miscues and phrase miscues. This was in contrast to the younger typically developing group (YT) who made more submorpheme miscues and fewer word level miscues indicating they were using letter level information, and more phrase miscues indicating they were reading at a wider level of language structure. Other results for syntactic and semantic acceptability showed that the YT group compared with the struggling readers (OSD and OMD) made fewer miscues that were not acceptable in the context suggesting the YT group were more sensitive to context.

In terms of instruction this suggests that teachers focus on building the decoding skills of older readers with reading difficulties (OMD and OSD) which our screening tests showed were very low and to encourage them to combine their developing decoding skills with syntactic and semantic cues while reading text to make more effective guesses at word level. This is because results showed that while all groups made similar graphemic and phonemic miscues, and were all attending to alphabetic information, the older struggling readers were naking more miscues that lost meaning. The dyslexic readers may need instruction that helps them to make use of their strong listening comprehension to use all sources of information when reading so as to bring together all sources of information (graphophonic, phonemic, syntactic, and semantic) to work out unknown words in ways that make sense, rather than guessing words that do not make sense but look similar to the one on the page. Older students with reading difficulties may also benefit from instruction that encourages them to use their language knowledge more effectively, especially at the phrase level, to make attempts at reading words by considering the whole sentence context when they finish a sentence to see if it makes sense.

Students with mixed difficulties (OMD) may need to build their language skills which is a weak area for them. This could help them make more informed guesses about unfamiliar words while they are reading. The development of vocabulary might involve explicit vocabulary instruction. Vocabulary can also be

improved through extensive reading if text materials are at the right difficulty level (Tunmer & Greaney, 2010).

The results of the present study do provide some support for both the print and context models of reading (Goodman, 1973; Goodman et al., 2016). Both models have relevance. The older readers in this study obviously were well below their chronological age in decoding skills and thus needed explicit instruction in decoding, that is, an evidence-based phonics instruction programme. This is because phonological recoding skills are crucial to achieving reading accuracy and for successful reading (Tunmer & Nicholson, 2011). However, the results of this study also indicated that these struggling readers were not using syntactic and semantic context cues as well as younger readers who were at the same reading level which is a point that has long been made by the miscue analysis theorists.

Conclusions

It seems that for the younger typically developing readers, their miscues support what Goodman and Burke (1968) suggest is a characteristic of efficient reading, that it involves making a wider use of language structure than just graphic and phonemic information. On the other hand it can be seen that reading also involves much more than a process of predicting and then confirming from context (Goodman et al., 2016) as without the ability to recognise and use graphophonemic information even readers with good language ability are hindered in making sense of text. The present results suggest that reading instruction for the dyslexic and mixed difficulties poor readers should be wider than phonics based instruction; it needs to combine training in phonological decoding skills with book reading to encourage the use of a wider range of reading strategies.

There is still much to be learned about how struggling readers process print when compared to their typically developing peers. The purpose of this investigation was to gain insights that can be translated into more effective

identification and instruction (Snowling, 2015; Vellutino et al., 2004). The findings of this study do seem to provide such insights in the current New Zealand context.

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Appendix A

Oral reading errors of older children with reading difficulties and younger but typically developing readers: Are they different?

INFORMATION SHEET FOR THE SCHOOL PRINCIPAL AND BOARD OF TRUSTEES

Researcher background
My name is Beverley Lang and I am researching this topic as part of a Master of Education (Inclusive Education) degree. I am a trained teacher of English and have also completed a Post Graduate Diploma of Special Education from Massey University.

Purpose of the study
The purpose of this study is to find out if the patterns of oral reading errors in older children with reading difficulties and younger but typically developing readers show differences that help to explain the slower progress of the older readers. Previous research has suggested that struggling readers may use different reading strategies that are holding back their progress in learning to read. The value of this study is that it will clarify the strategies they are using so that teachers are able to provide them with more effective instruction.

Role of the school
I am seeking your assistance with my study. First I am seeking your approval to carry out this study at your school. If approval is given, I will need you to select a group of 10-year-old children who according to your school records who are reading at about the eight-year-old level in accuracy and comprehension. I also need your help to select a younger group of eight-year-old children who are average or above for their age in reading and in listening according to your records. I will also need the consent of your teachers for me to assess these children at the school using listening and reading tests similar in format to those your school already uses. These assessments will take about 60 minutes for each child and will be done outside the classroom. Finally, I will need your assistance to send home information sheets to parents to ask their permission for their children to take part in the study. If there are Maori children selected, or children of parents for whom English is a second language, I will need your advice as to how best to manage these communications.

Participants
The participants in this study will be three groups of 20 children. The first group will be younger normally developing readers who fall within the average range on the Progressive Achievement Test (PAT) Listening Comprehension and who are reading at their age level. The second group will be older readers who fall within the average range on the PAT Listening Comprehension, but who are reading below their age level. The third group will be older readers who are below their age in both listening comprehension and reading ability.

Procedures
The participants will read aloud a series of passages from a test called the Neale Analysis of Reading Ability and from age-graded readers. In addition, they will complete the Wechsler Individual Achievement Test (WIAT-II) Listening Comprehension and Pseudoword subtests, and a listening test based on the Neale passages. The sessions will last for about 60 minutes and will be audio recorded for the analysis of oral reading errors.

Your rights
This is an invitation to your school to participate in the study and you are under no obligation to accept.
You may withdraw your school from the study at any time up until two weeks after data collection.
No individual school or student will be identifiable in the collation of data.
Students who participate will have the right to withdraw from the study at any time up until two weeks after data collection.
You will have access to a summary of the study results.

Data Management
The individual test scores will be viewed only by the researcher and her supervisors. A coding system will be used as a substitute for individual names. Consent forms and data will be stored in a secure place and disposed of by the supervisors six years after completion of the study.

Ethical Approval
This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application NOR 17/13. If you have any concerns about the conduct of this research, please contact Dr Brian Finch, Acting Chair, Massey University Human Ethics Committee: Northern, email humanethicsnorth@massey.ac.nz

Contact Information

Researcher: Beverley Lang, Master of Education student, Massey University
Beverley.Lang01@uni.massey.ac.nz 021 02651080

Supervisors: Professor Tom Nicholson, Professor of Literacy Education, Institute of Education, Massey University
T.Nicholson@massey.ac.nz 09 414 0800 ext 43519

Dr Alison Arrow, Senior Lecturer, Institute of Education, Massey University
A.W.Arrow@massey.ac.nz

Oral reading errors of older children with reading difficulties and younger but typically developing readers: Are they different?

CONSENT FORM FOR PRINCIPAL

I have read the Information Sheet and understand the details of the study. I understand that I may ask for more information at any time.

I consent to our school participating in the study as explained in the information sheet.

I understand that I may withdraw my school from the study at any time up until two weeks after data collection.

I give consent to the researcher to have access to the school at pre-arranged times for the purpose of carrying out the study.

I understand that the parent(s)/caregiver(s)/whanau will be provided with an information sheet and consent form for their child to participate.

I understand that the participating children will have the project explained to them and that the researcher will check with them for consent prior to the testing.

Signature: _____ Date: _____

Full Name:

_____

School:

_____

Appendix B

Oral reading errors of older children with reading difficulties and younger but typically developing readers: Are they different?

INFORMATION SHEET FOR PARENT(S)/CAREGIVER(S)/WHANAU

My name is Beverley Lang and I am carrying out a reading research project in your school as a research thesis for my Master of Education degree. I am a trained teacher of English, and have also completed a Post Graduate Diploma in Special Education from Massey University. I have been working with children who have learning difficulties for 18 years. This study is a comparison of the reading strategies of older children who are reading below their age level, and younger, typically developing readers. By analysing the errors that children make when reading unknown words, I hope to find out if there are differences between the two groups, and if so, how this could help with classroom instruction. I would like to invite your child to be a part of the research project.

How would your child be involved?
The study would involve your child spending about 60 minutes in a one-to-one session with me in a quiet area of the school, to complete several listening and reading activities. These will be familiar to your child as they are similar to activities they do regularly in the classroom. The listening activities involve listening to short stories and answering questions, and the reading activities involve reading aloud and answering questions. I will make an audio recording of your child reading so I can analyse any attempts at unknown words and find out what strategies are being used. Your child will be asked to consent to being part of the study, and will be free to withdraw or have a break at any time.

Data Management
The data collected in this study will be collated and written up in my thesis. The raw data will only be seen by myself and my supervisors. The Consent Forms are the only record of your child's name in the study, and they will be stored securely for a period of six years and then disposed of by my supervisors. If you are interested in receiving a summary of the study results please indicate this on the consent form.

Participation rights
You and your child are under no obligation to accept this invitation. If you decide to participate you have the right to:
Decline to answer any particular question;
Withdraw from the study at any time up until two weeks after the data are collected;
Ask any questions about the study at any time during participation;
Provide information on the understanding that your name will not be used unless you give permission to the researcher;
Be given access to a summary of the project findings when it is concluded.

Ethical approval
This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application NOR 17/13. If you have any concerns about the conduct of this research, please contact Dr Brian Finch, Acting Chair, Massey University Human Ethics Committee: Northern, email: humanethicsnorth@massey.ac.nz

I appreciate that you have taken the time to read this information and look forward to your reply. If you would like your child to participate in the study please read and sign the consent form that is included with this letter, and return it to your child's teacher.

Please feel free to contact me or my supervisors for any further information.

Thank you!

Beverley Lang
Postgraduate student in Education, Massey University
021 02651080

Contact Information

Researcher: Beverley Lang, Master of Education student, Massey University
Beverley.Lang.1@uni.massey.ac.nz 021 02651080

Supervisors: Professor Tom Nicholson, Professor of Literacy Education
Institute of Education, Massey University
T.Nicholson@massey.ac.nz 09 414 0800 Ext 43519

Dr Alison Arrow, Senior Lecturer, Institute of Education,
Massey University
A.Arrow@massey.ac.nz

Oral reading errors of older children with reading difficulties and younger but typically developing readers: Are they different?

CONSENT FORM FOR PARENT(S)/CAREGIVER(S)/WHANAU

I have read the Information Sheet and understand the details of the study. I understand that I may ask for more information at any time.

I agree to allow my child to participate in the study as explained in the information sheet.

I understand I may withdraw my child from the study at any time up until two weeks after data collection.

I agree to allow the researcher to make an audio recording of my child reading.

I understand that the researcher will explain the study to my child on the day of testing and will check that my child consents to take part.

Signature: _____ Date: _____

Full Name:
_____

Relationship to child:
_____

Child's name: _____ Date of birth:
_____

Child's ethnicity (optional): _____

Please send me a summary of the study findings: Yes / No (circle one)

Appendix C

Oral reading errors of older children with reading difficulties and younger but typically developing readers: Are they different?

CONSENT FORM AND INFORMATION SHEET FOR STUDENT

Hi, my name is Beverley and I am doing a research study as part of my Master of Education degree. I'd like to invite you to help me with the project. The study is to find out how readers problem-solve when they find a word in a story that they don't know.

If you agree, we will read through a few short stories together. First I will read to you and then ask you questions about what you heard. Then you will read to me and I will ask you about what you read. I will record your reading so that I can listen to you afterwards.

This will take about 30 minutes.

If you want a break, or want to go back to the classroom, you can ask me.

You can ask me to explain anything you don't understand.

I'd like you to let me know if you understand and you want to take part or not, by writing your name beside the 'yes' or 'no' picture:

Name _____

Name _____

Date _____

Appendix D

Student ID			Miscue Analysis Record Sheet											
			Graphemic			Phonemic			Syntactic			Semantic		
Error number	Expected Response	Observed response	High	Partial	None	High	Partial	None	Yes	Partial	No	Yes	Partial	No
1	except	explain		1			1				1			1
2	in	a			1			1			1			1
3	antarctica	atlantis	1				1		1				1	
4	arctic	*refusal												
5	eyes	legs		1			1		1				1	
6	now	no-one	1			1					1			1
7	parcel	package	1				1		1			1		
8	stamps	stumps	1			1			1				1	
9	Jane	James	1			1			1				1	
10	shouted	shorted	1			1			1					1
11	they were	then we	1			1					1			1
12	children	child	1			1			1				1	
13	final	finally	1			1				1			1	
14	stood	storb	1				1							
15	restless	reestile	1			1								
16	trainer	trorn	1			1								
17	youngest	your	1				1				1			1
18	leaped	leaping	1			1					1			1
19	swiftly	swift	1			1					1			1
20	cage	crowd		1			1		1					1
21	cracking	crackling	1			1					1			1
22	skill	skills	1			1			1			1		
23	his	he		1			1				1			1
24	prompt	prome	1			1								
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Appendix E

Student:

What is a spider?

A spider is an animal with eight legs
and two parts to its body.

Because spiders eat insects like
flies, they are useful to people.

There are thousands of different
kinds of spider. Some are hairy
and as big as a human hand
and others are as small as the dot
at the end of this sentence.

Errors 11
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Spiders can be found in almost
every country, except in very cold,
snowy places like Antarctica at the
bottom of the world and in the
Arctic areas of the north.

Most spiders have eight eyes but
not all spiders can see very well.

Spiders do not have any bones.

The spider's skin is hard enough
to protect all the body parts inside.

All spiders have fangs. Most of
them inject poison through their
fangs to kill their prey.

Running words: 140
Reading Level: 8-9
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