Does Linguistic Comprehension Support the Decoding Skills of Struggling Readers?

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Abstract

The majority of struggling readers experience difficulty with accurate and fluent word recognition. The purpose of this study was to investigate the contribution of linguistic comprehension to the decoding skills of struggling readers. This study focused on two groups of poor decoders defined by the Simple View of Reading. Children aged 8 to 12 years with poor decoding skills were grouped according to those with below average linguistic comprehension (n = 18) and those with average linguistic comprehension (n = 18). The performance of the two groups was compared on a number of standardised measures that included pseudoword reading, reading accuracy of words in context, reading comprehension, and reading rate. In addition, the oral reading errors of the two groups were analysed to determine whether any significant differences existed as a function of linguistic comprehension. It was hypothesised that the children with a higher level of linguistic comprehension would make more oral reading errors that were syntactically and semantically appropriate due to their more advanced linguistic comprehension skills. The results indicated that there were no significant differences between the two groups on any of the measures. This suggests that children struggling with decoding, regardless of their level of linguistic comprehension, require intervention focused primarily at the word-level. These findings do not support an approach to intervention that differentiates between poor decoders based on level of linguistic comprehension.

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Ehara taku toa, he taki tahi, he toa taki tini

Success is not the work of one, but the work of many

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Chapter 1: Introduction

Statement of the Problem

For many years, New Zealand's education system enjoyed an international reputation as one of the best in the world (Thorndike, 1973). In particular, New Zealand's approach to literacy was hailed as superior to most, and educators from across the globe visited the country to learn how to teach reading. While the top performing New Zealand students continue to do well in literacy by international standards, over the last few decades, New Zealand's widening spread of literacy scores and long tail of literacy underachievement has become increasingly apparent (Chamberlain & Caygill, 2013; Elley, 2004; Greaney & Arrow, 2012; McLachlan & Arrow, 2011; Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013).

International and national assessment results indicate that the literacy programmes and interventions available in New Zealand schools are not adequately improving the performance of an increasing number of students, particularly those performing at the lowest levels (Flockton & Crooks, 2009; International Association for the Evaluation of Educational Advancement, 2013; Ministry of Education, 2012). The Ministry of Education (MoE) has acknowledged that the disparity of literacy achievement between the highest and lowest performing groups of New Zealand students is one of the greatest in the Organisation for Economic Co-operation and Development (OECD), with Maori and Pasifika students representing a disproportionate number of underachieving students (Ministry of Education, 2010).

The impact of literacy difficulties on a child extends beyond the academic and cognitive domains, and into motivational and behavioural areas (Catts, Kamhi, & Adlof, 2012; Chapman & Tunmer, 2003; Spear-Swerling & Sternberg, 1996). The consequences of poor literacy extend beyond the child to the family and society. Low

levels of literacy correlate with increased rates of unemployment and poverty (Wagner, 2000). In 2011, the unemployment rate of New Zealanders with no qualifications was 48% higher than for those with school qualifications (OECD, 2013). Furthermore, literacy deficits are widespread among those who are incarcerated, and academic achievement is a stronger predictor of recidivism than intellectual ability (Putnins, 1999; Vacca, 2004).

It has been estimated that as many as 20% of children struggle with the reading process (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Lyon, 1995), and of these 3-5% display the most severe reading difficulties (Torgesen, Wagner, & Rashotte, 1997). Reading difficulty may be due to distal factors that have an indirect influence on reading such as the home literacy environment (Tunmer, Chapman, & Prochnow, 2003) and/or proximal factors that are language-based (Catts & Hogan, 2003). Language-based factors are the predominant focus of investigation by researchers and educators due to the direct implications for the design of appropriate intervention.

Categories of Struggling Readers

A substantial body of research has demonstrated that the majority of struggling readers experience difficulties with word recognition skills (Stanovich, 2005; Vellutino, Fletcher, Snowling, & Scanlon, 2004). Readers who experience difficulty in this area are often referred to as ‘poor decoders’. In an attempt to understand the nature of the reading difficulties experienced by poor decoders, subgroups have been identified that have been based on environmental factors and cognitive factors. Environmental factors have included socio-economic disadvantage, inadequate instruction, and emotional and social difficulties. Cognitive factors that have been used to subgroup poor decoders have been based on a discrepancy between intellectual ability and achievement (IQ-

Discrepancy; Nicolson & Fawcett, 2007), a phonological deficit (Stanovich & Siegel, 1994; Vellutino et al., 2004), poor short-term and working memory (Kipp & Mohr, 2008), slow rapid automatised naming (Wolf, Bowers, & Biddle, 2000), sensory processing deficits (Wright & Conlon, 2009), auditory and visual attentional factors (Franceschini, Gori, Ruffino, Pedrolli, & Facoetti, 2012), and psycho-motor processing difficulties (Ramus, 2003). For research purposes, identification of subgroups facilitates examination of specific cognitive processes displayed by struggling readers (Snowling, 2008). Practitioners are interested in differentiation of struggling readers based on the understanding that identification of areas of strength and difficulty will inform the design of appropriate intervention (Stuart, Stainthorp, & Snowling, 2008).

Another way to differentiate between poor decoders has been based on linguistic comprehension skills, also referred to as language or listening comprehension skills. Linguistic comprehension is defined as the ability to understand spoken language by using word-level or lexical information to comprehend the meaning of words, sentences and discourse (Hoover & Gough, 1990). The relationship between decoding and linguistic comprehension has been debated for several decades. Some researchers have argued that a high degree of interdependence exists between decoding and linguistic comprehension (Shankweiler et al., 1999), acknowledging that only in extreme cases can a reader's decoding skills and linguistic comprehension present as independent (Chen & Vellutino, 1997). Another view, the Simple View of Reading (SVR), conceptualises decoding and linguistic comprehension as relatively independent (Hoover & Gough, 1990; Oakhill & Cain, 2012).

The SVR facilitates diagnosis of struggling readers by identifying the weak component that is causing reading problems. The SVR has created two kinds of poor decoders based on their level of linguistic comprehension. Readers with below average

decoding and average linguistic comprehension have been referred to as dyslexic readers; readers with below average decoding and below average linguistic comprehension have been referred to as garden-variety poor readers or readers with language-learning disabilities (Catts, Adlof, & Weismer, 2006; Catts, Hogan, & Fey, 2003; Hoover & Gough, 1990; Savage, 2001; Stanovich, Nathan, & Zolman, 1988). The present study has used the SVR model to differentiate between poor decoders with average linguistic comprehension or below average linguistic comprehension.

Background and Need

Despite a range of government policies and programmes introduced over the last few decades, the average reading achievement of New Zealand students has not improved, and the disparity between the highest and lowest achieving students has increased. This indicates that there is a need for continued research in the area of literacy education to design evidence-based instructional programmes. It has been argued that the current approach to literacy instruction in New Zealand classrooms, and the design of the principal intervention programme available for struggling readers, do not adequately support children struggling with reading (Chapman, Tunmer, & Prochnow, 2001). The results of the present study will contribute to an understanding of the quantitative and qualitative oral reading errors of readers who experience difficulty with accurate word recognition. The findings have implications for the design of intervention programmes.

Purpose of the Study

The purpose of the present study was to understand the quantitative and qualitative differences in oral reading errors of readers who experience difficulty with accurate word recognition in relation to their level of linguistic comprehension skills. The aim was to determine whether a reader's level of linguistic comprehension had an influence on the reader's decoding skills. The results indicate whether it is beneficial to consider

level of linguistic comprehension when designing intervention programmes for readers who struggle with decoding.

The Present Study

Children aged between 8 and 12 years with below average decoding skills were placed in two groups defined by the SVR. The participants in the first group had below average decoding and below average linguistic comprehension (BALC). The participants in the second group had below average decoding and average linguistic comprehension (ALC). The participants were administered standardised tests to measure pseudoword reading (i.e., reading nonwords), reading accuracy of words in context, reading comprehension, and reading rate. In addition, each participant read a series of passages and their oral reading errors were analysed to determine whether differences existed between the groups as a function of linguistic comprehension.

Research Questions

1. Are there quantitative differences between the BALC and ALC groups on tests that measure pseudoword decoding, reading accuracy of words in context, reading comprehension and reading rate?
2. Are there qualitative differences between the BALC and ALC groups in the types of oral reading errors?
3. Do the participants in the ALC group make more syntactically acceptable errors than the participants in the BALC group?
4. Do the participants in the ALC group make more semantically acceptable errors than the participants in the BALC group?

Hypothesis

While readers with poor decoding and below average linguistic comprehension are different from the achieving reader, readers with poor decoding and average linguistic

comprehension have some of the capability of the achieving reader due to their adequate level of linguistic comprehension. This suggested that the ALC group would exhibit some of the reading strategies used by achieving readers by allowing them to draw on their linguistic comprehension skills to support identification of unfamiliar words. It was hypothesised that the higher level of linguistic comprehension of the participants in the ALC group would reveal evidence of more effective strategy-use when reading difficult words. Specifically, it was hypothesised that those in the ALC group would make more errors that were syntactically and semantically acceptable due to their more advanced linguistic comprehension skills.

Significance to the Field

Many studies have compared the reading strategies of good and poor readers (McBride-Chang & Manis, 1996; Meyler, 2007; Savage et al., 2005; Scanlon & Vellutino, 1997). Furthermore, the majority of studies that have analysed students' oral reading errors have compared the errors of struggling and typically developing readers (Chinn, Waggoner, Anderson, Schommer, & Wilkinson, 1993; Gillam & Carlile, 1997; Laing, 2002; Thomson, 1978; Warde, 2005). This study differed in that it compared the results of standardised reading tests and the oral reading errors of poor decoders grouped according to level of linguistic comprehension. Due to the complex linguistic processes involved in reading difficulties, it is important to have an understanding of the contribution of linguistic comprehension to the word recognition skills of poor decoders. This study sought to determine whether it is beneficial to consider a student's level of linguistic comprehension when designing intervention programmes aimed to remediate poor decoding skills.

Ethical Approval

This study was reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 15/016.

Outline of the Thesis

The structure of the thesis is as follows: Chapter 2 reviews the literature pertaining to the contribution of decoding skills and linguistic comprehension as necessary components in the reading process. In addition, an approach of differentiating between poor decoders based on level of linguistic comprehension is discussed. Chapter 3 provides an explanation of the methodology used for the study. This includes a discussion of miscue analysis as a tool to analyse oral reading errors. Chapter 4 presents the results of the study. Chapter 5 discusses these results with reference to the literature and includes discussion of the implications and limitations of the present study.

Chapter 2: Literature Review

Introduction

Reading is the most critical academic skill students will learn and one of the best predictors of overall success at school (Stanovich, 1986) and in society (Lyon & Moats, 1997). The New Zealand Ministry of Education (MoE) recognises the critical role of literacy skills for student engagement and success across the curriculum, and the importance of identifying and supporting students who are not achieving. This is expressed in the MoE's Statement of Intent 2010-2015 (Ministry of Education, 2010):

> These basic foundation skills (literacy and numeracy) need to be well taught in the very early stages of school for all New Zealand students. In addition, we must identify when students are not achieving the necessary skills and are not progressing in line with their peers, and address this quickly and effectively.

However, international and national assessment results indicate that the literacy programmes and interventions available in New Zealand schools are not adequately improving the performance of an increasing number of students, particularly those performing at the lowest levels (Chamberlain & Caygill, 2013; Elley, 2004; Greaney & Arrow, 2012). Despite a range of government policies and programmes introduced over the last few decades, the average reading achievement of New Zealand students has not improved, and the disparity between the highest and lowest achieving students has increased (McLachlan & Arrow, 2011; Tunmer et al., 2013). With many struggling readers experiencing difficulty with accurate and fluent word recognition (Vellutino et al., 2004), there is a need for continued research into the development of decoding skills

to inform the design of evidence-based instructional programmes that are grounded in contemporary research.

Decoding skills refer to the reader's ability to transform print into speech (Ehri, 1995) while linguistic comprehension refers to the ability to understand spoken language by using lexical information to comprehend words, sentences and discourses (Gough & Tunmer, 1986). Decoding and linguistic comprehension account for considerable variance in reading comprehension (Hoover & Gough, 1990; Joshi & Aaron, 2000). The results of this study indicated whether it is important to consider a poor decoder's level of linguistic comprehension when designing appropriate intervention.

The literature review begins with a brief overview of two broad theoretical perspectives of reading development. Secondly is an examination of the skills required for decoding, and the characteristics of readers struggling with decoding. Thirdly, the contribution of linguistic comprehension to a reader's decoding skills and reading comprehension is considered. Following is a discussion of a conceptual model of reading that acknowledges the contribution of decoding and linguistic comprehension to the reading process. Finally, an approach to differentiating between poor decoders based on linguistic comprehension is outlined.

Two Broad Theoretical Perspectives of Reading Development

Reading is a complex cognitive process and, unlike learning to speak, it does not have a biological foundation (Goswami, 2008; Gough & Hillinger, 1980; Kamhi & Catts, 2012). Theories of how children learn to read have been debated since the middle of the nineteenth century when the ABC method, which had been used since Greek times, was challenged (Nicholson, 2000). For more than a century, the "great debate" (Chall, 1967) has centred around two broad models of reading acquisition – a context-

driven theory that embodies the whole language approach, and a print-driven theory that emphasises the importance of including phonics in reading instruction. Proponents of the whole language approach contend that learning to read is a 'top down' meaning-based process. It is argued that this happens naturally when a child is immersed in a print-rich environment in which reading for meaning from authentic texts is emphasised (Goodman, 1992; Smith, 1975). Those who support a phonics code-based approach view learning to read as a 'bottom up' process that requires instruction in alphabetic coding skills to help readers 'crack the code' (Adams, 1990**;** Gough, 1993). One of the main differences between the two approaches lies in the most effective way to teach decoding skills (Nicholson, 1986).

Decoding Skills

Decoding skills provide a foundation for successful reading (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001). They enable a reader to transform print into speech by 'transforming graphemes into phonemes and blending the phonemes into pronunciations' (Ehri, 1995, p. 116). This requires skill in alphabetic recognition and grapheme-phoneme correspondence (Connor, Morrison, & Katch, 2004). Furthermore, skilled decoding requires the ability to break words into subcomponents, thus facilitating the process of discovering the relationship between sound and spelling patterns (Nicholson, 2000), and constructing orthographic representations in lexical memory (Snow & Juel, 2005; Tunmer & Nicholson, 2011). Skilled decoders process nearly all letters in a word, and all words in a sentence (Ablinger, Huber, & Radach, 2014; Gough, 1984; Stanovich, 1991; Vellutino, 1991). Additionally, skilled decoders recognise known words as whole (Adams, 1990). When words are recognised efficiently and automatically, the reader is able to focus attention on comprehension

processes (Blachman, Tangel, Ball, Black, & McGraw, 1999; Foorman et al., 1998; Nation, 2005; Pressley, 2006; Snowling & Hulme, 2011; Vellutino, 1991).

Phonological awareness refers to the ability to detect and manipulate the phonological components (e.g., phonemes, onset and rime, and syllables) in words (Goswami, 2008; Vellutino et al., 2004). A child's awareness of onsets, rimes and syllables develops before the child begins formal schooling (Anthony, Lonigan, Burgess, Driscoll, Phillips, & Cantor, 2002; Fox & Routh, 1975). Moreover, phonological sensitivity in preschool children provides a foundation for learning to read and supports the development of decoding ability (Al Otaiba et al., 2012; Ehri et al., 2001; Share, Jorm, Maclean, & Matthews, 1984). Researchers have identified a reciprocal relationship between phonemic awareness (i.e., awareness of the phonemes in a word) and decoding skills (Perfetti, Beck, Bell, & Hughes, 1987; Tunmer & Hoover, 1993). A longitudinal study involving 400 children found a high correlation between the results of a phonological task administered when the children were pre-schoolers, and a standardised test of reading achievement administered three years later, even after controlling for age, intellectual ability, and memory (Bradley & Bryant, 1983).

A significant volume of research suggests that the process of learning to read is developmental, and readiness for each phase is dependent on the reader's current cognitive skills and strategies (Ehri, 2005; Pressley, 2006; Tunmer & Nicholson, 2011). For example, a reader may adequately decode the initial letter in a word but struggle to apply grapheme-phoneme knowledge to other parts of the word, thus indicating limited skill in the alphabetic principle (McCandliss, Beck, Sandak, & Perfetti, 2003). It has been argued that the lack of success of up to 30% of readers participating in the Reading Recovery intervention programme (Elbaum, Vaughn, Hughes, & Moody, 2000) is due to the intervention not targeting the reader's current phase of word-level skills (Iversen,

Tunmer, & Chapman, 2005). Iversen and Tunmer (1993) found that when more emphasis was placed on explicit and intensive letter-sound relationships and phonological recoding skills for struggling 6-year-old readers, the effectiveness of the programme increased and children were graduated from the programme sooner. This finding supports the importance of providing differential instruction to readers based on their current level of skills (Connor et al., 2004; Mathes, et al., 2005; Tunmer et al., 2013; Tunmer & Nicholson, 2011).

Share (1995, 2004) posits that children have an important role to play in teaching themselves to read due to a self-teaching hypothesis. This hypothesis states that phonological decoding efficiency facilitates the acquisition of orthographic representations of words in lexical memory. Gough (1993) maintains that there are too many letter-sound correspondences to be taught, thus a reader must induce the majority of spelling-sound patterns implicitly through reading. This process has been referred to as lexicalised phonological recoding (Fletcher-Flinn & Thompson, 2000). However, factors such as degree of exposure to print and the reader's attention and memory for orthographic detail play a role in facilitating the self-teaching hypothesis.

Readers Demonstrating Difficulty with Decoding Skills

Readers with poor decoding skills experience difficulty applying the alphabetic principle when decoding (Adams, 1990). This difficulty impacts on their ability to attend to the full range of letter-sound correspondences (such as medial letters) in words, and induce spelling-to-sound patterns (McCandliss et al., 2003; Torgesen et al., 1997; Tunmer, Chapman, Greaney, & Prochnow, 2002; Vellutino, Scanlon, & Spearing, 1995). Consequently, readers who struggle with decoding do not have the opportunity to develop connections between phonological and orthographic representations in lexical memory, thus impeding rapid access to the mental lexicon (Tunmer & Chapman,

1996). These word-level deficits make decoding effortful and inaccurate, and impact on comprehension processes (Beck & Juel, 1992; Nation, 2005; Vellutino, 1991).

Deficits in phonemic awareness are a major cause of reading difficulties, particularly for poor decoders (Fletcher, et al., 1994; Foorman, Francis, Fletcher, & Lynn, 1996; Melby-Lervåg, Lyster, & Hulme, 2012; Stanovich & Siegel, 1994). Children who experience difficulty detecting phonemic sequences in words struggle to grasp the alphabetic principle and to develop an awareness of phoneme-grapheme relationships (Juel, 1988; Shankweiler & Fowler, 2004; Tunmer & Nicholson, 2011). While phonemic awareness has been identified as a cause of poor decoding, a study conducted by Snowling, Gallagher and Frith (2003) found that children with poor decoding skills had a history of weak vocabulary and poor oral language in the preschool years. These findings indicate a more general language delay early on for children presenting as poor decoders. Consequently, the authors contend that oral language and vocabulary have a role to play in the development of phonological awareness skills.

The tendency of poor decoders to guess unfamiliar words based on contextual clues, and rely on partial word-level information, results in inadequate lexical representations in memory and the development of a limited sight word vocabulary (Iversen et al., 2005; Tunmer & Nicholson, 2011; Stanovich, 1994). In contrast to Goodman's (1965, 1967) claim that young and poor readers struggle to use context cues to support word recognition, a study involving 100 children aged 6 to 8 years found that weaker and beginning readers relied more on context that older and more able readers (Nicholson, 1991). It is argued that this reliance is due to a lack of skill in using word-level information to decode (Stanovich 1980; 1994). Reliance on context becomes problematic as texts become more sophisticated in vocabulary, semantics and syntax (Gough & Hillinger, 1980). Moreover, only one in four predictable words can be

accurately guessed (Gough, 1993). It has been demonstrated that the words most likely to help the reader understand the meaning of the text are the less predictable and low frequency words (Schatz & Baldwin, 1986). However, when a reader relies primarily on grapheme-phoneme relationships to decode, context is a helpful strategy that can be used to identify partially decoded and irregularly spelled words, and confirm hypotheses (Tunmer, Chapman, & Prochnow, 2006). Pressley (2006) asserts that an instructional approach to decoding that emphasises the use of context instead of grapheme-phoneme correspondences is teaching children to read based on the way poor and younger readers read.

Struggling readers find reading effortful. Consequently, they engage in less reading which results in decreased opportunities to improve their reading skills. This is referred to as the Matthew effect, a term first coined by the sociologist Merton (1968) in reference to a passage from the Gospel of Matthew (i.e., the rich get richer and the poor get poorer). Stanovich (1986) drew on the analogy of the Matthew effect to describe the phenomenon by which early reading success has cumulative advantages for readers, while early reading difficulty has cumulative disadvantage. Juel (1988) found that at the end of the first year of schooling, good readers had been exposed to twice as many words (18,681) as poor readers (9,975). Furthermore, the study found that good readers read at home approximately four nights a week while poor readers read for one night a week. Of concern is the finding that students who are behind in their reading do not usually catch up to their peers (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Nicholson, 1994) and the likelihood of remediation, particularly remediation of fluent word recognition, becomes more challenging over time (Torgesen, Alexander, Wagner, Rashotte, Voeller, & Conway, 2001; Wanzek & Vaughn, 2008). If a student with severe reading difficulties does not receive appropriate intervention before Year 4,

the student has a 75% probability of experiencing long-term reading underachievement (Juel, 1988; Shaywitz, Fletcher, Holahan, & Shaywitz, 1992). This demonstrates the crucial importance of supporting all children to become proficient readers, and intervening early when difficulties become evident. In addition to support with decoding skills, there is growing recognition that readers require support with the components of linguistic comprehension (Aaron, Joshi, & Williams, 1999; Fletcher et al., 1994; Lonigan, Burgess, & Anthony, 2000; Pressley et al., 2001).

Linguistic Comprehension

Learning to read depends on a variety of knowledge and skills, and the development of linguistic and non-linguistic cognitive abilities (Vellutino et al., 2004). In addition to fluent decoding skills, reading comprehension requires an adequate degree of linguistic comprehension (Vellutino, Tunmer, Jaccard, & Chen 2007). Linguistic comprehension, also commonly referred to as language comprehension and listening comprehension, is defined as the ability to understand spoken language by using word-level or lexical information to comprehend the meaning of words, sentences and discourse (Hoover & Gough, 1990). Linguistic comprehension develops from infancy and continues to grow throughout a child's years at school (Biemiller, 2003). Studies have shown that the level of linguistic comprehension remains higher than the level of reading comprehension for the first few years at school (Byrne & Fielding-Barnsley, 1995). However, once a student approaches secondary school, comprehension of language in print and oral form reach similar levels.

Linguistic comprehension has been assessed using measures that include expressive and receptive vocabulary, syntactic and semantic processing, and sentence comprehension (de Jong & van der Leij, 2002). There is variability in the way linguistic comprehension is measured according to the type of material and the approach that is

selected (Kendeou, Van den Broek, White, & Lynch, 2009; Stanovich, 1991). One approach is to assess linguistic comprehension with orally presented text containing vocabulary, syntax and textual language structures (Hayes, 1988). Another approach is to assess linguistic comprehension in a more naturalistic way by emphasising speech over textual language. Selection of the method used for measurement depends on the purpose and goal of the assessment. If the purpose of the assessment is to identify qualitative differences between readers, a measure that relies on orally presented text correlates more highly with reading comprehension (Stanovich, 1991). This was the approach used to assess linguistic comprehension in the present study.

Younger and struggling readers experience more difficulty with the linguistic processes involved in comprehension than is evident in older and more able readers (Vauras, Kinnunen, & Kuusela, 1994). Studies have demonstrated contradictory results regarding the influence of linguistic comprehension on the development of early reading comprehension. Some studies have shown that linguistic comprehension skills are secondary to the role of decoding skills for beginning readers (Bryant, MacLean, & Bradley, 1990; Juel, 1988; Vellutino et al., 2007). However, other studies have suggested that linguistic comprehension and decoding skills are equally important for beginning readers and are highly related in early reading development (Catts, Fey, Zhang, & Tomblin, 1999; Paris & Paris, 2003; Storch & Whitehurst, 2002).

Due to the changing requirements of the reading process, the role of linguistic comprehension in reading comprehension appears to increase as children progress through the year levels (Adlof, Catts, & Lee, 2010; Chen & Vellutino, 1997; Hoover & Gough, 1990; Juel, 1988; Vellutino et al., 2007). Even when decoding skills are adequate, children with low levels of linguistic comprehension display difficulties with reading comprehension (Biemiller, 2003; Vellutino & Denckla, 1996). While

assessment of word recognition skills is a better predictor of reading comprehension for beginning and struggling readers, linguistic comprehension more accurately predicts reading comprehension for older and skilled readers (Catts et al., 2003). A longitudinal study following a sample of 2143 Dutch children found that the relationship between linguistic comprehension and reading comprehension was reciprocal for older readers (Verhoeven & Van Leeuwe, 2008). Furthermore, the study found that as readers became more skilled at decoding, their reading comprehension was constrained by their linguistic comprehension skills.

There is evidence to suggest that linguistic comprehension plays a causal role in reading disability (Carroll & Snowling, 2004; Clarke, Snowling, Truelove, & Hulme, 2010; Nation, Cocksey, Taylor, & Bishop, 2010). Children with poor linguistic comprehension display deficits in vocabulary (Snowling et al., 2003; Vellutino et al., 1995), syntax (Stanovich & Siegel, 1994), semantics (Nation, Clarke, Marshall, & Durand, 2004), and text-level processing (Stothard, & Hulme, 1992). These difficulties may impact on decoding ability. For example, a child will experience less difficulty in reading words if the words are part of the child's speaking vocabulary. When a child has a limited vocabulary, fewer words are available in the mental lexicon to assist with word recognition (Connor et al., 2004; Nation & Snowling, 1998). Moreover, even when a reader has adequate decoding skills, linguistic comprehension deficits such as a limited vocabulary, may cause difficulties with fluent word identification (Vellutino et al., 2004). Additionally, poor syntactic awareness (i.e. the awareness of grammatical forms in text and spoken language) can impede a reader's ability to use context to support word recognition, and may contribute to early reading problems (Vellutino et al., 2004). This is particularly evident in poor decoders due to their increased reliance on context to guess unfamiliar words (Iversen et al., 2005; Stanovich, 1980, 1994;

Tunmer & Nicholson, 2011). It has been found that evaluation of word recognition skills that examine sublexical knowledge (e.g., phonological awareness, letter-sound correspondence rules) are better predictors of word recognition skills than tests that assess vocabulary and syntactic processing (Vellutino et al., 2004). Vellutino and Denckla (1996) argue that while a limited vocabulary and syntactic deficits cause difficulties in some beginning readers, phonological decoding and word recognition problems are the primary cause of reading difficulties.

Many studies have examined the language deficits of children who have experienced reading difficulty for several years, thus making it difficult to ascertain whether these deficits are a consequence or cause of the child's reading difficulties (Catts & Hogan, 2003). Furthermore, it is difficult to evaluate the impact of negative Matthew effects (Stanovich, 1986) whereby poor readers tend to read less therefore decreasing their opportunities to engage with language. A longitudinal study that followed a sample of 604 participants from kindergarten to Grade 2 indicated that language difficulties often precede, and have an impact on, reading achievement (Catts et al., 1999). The reading achievement and language abilities of pre-schoolers were assessed before they began formal reading instruction. It was found that the children who were later identified as poor readers had a lower language composite score and performed at lower levels on tests measuring grammar, vocabulary and narration than the children later identified as good readers.

To facilitate an understanding of why some readers experience difficulty with the reading process, and to ensure struggling readers are provided with appropriate support, it is necessary to have a framework that accounts for factors that influence the development of reading skills. Concern has been expressed at the lack of a comprehensive model of reading (Juel, 1996). Furthermore, it has been argued that the

diagnostic procedures used to identify readers with reading difficulties, and the design of intervention programmes, are often not based on sound theoretical models of reading (Joshi & Aaron, 2000). Additionally, criticisms directed at many models maintain that they do not account for all aspects of the reading process (Rayner & Reichle, 2010). Following is a discussion of a comprehensive model of reading that considers the cognitive, ecological and psychological aspects that influence the process of learning to read. Due to the aim of the present study to investigate the contribution of linguistic comprehension to the decoding skills of poor readers, the cognitive domain of the model will be discussed in detail.

A Conceptual Model of Reading

A child's ability to learn to read is dependent on the normal development and functioning of a range of cognitive abilities, environmental factors, and adequate motivation (Vellutino et al., 2004). The Component Model of Reading (CMR; Aaron, 1997; Aaron, Joshi, Gooden, & Bentum, 2008) attempts to account for three independent components that impact reading development: the cognitive domain (word recognition and comprehension), the ecological domain (e.g., culture, home environment and peer influence), and the psychological domain (e.g., motivation). If there is a deficit in a component from one of the domains, the reader may struggle with the development of reading skills (Aaron et al., 2008). An important aspect of this model is the link between diagnosis of the distal (i.e., those factors that have an indirect influence) or proximal (i.e., those factors that have a direct influence) cause of the reading difficulty, and identification of the instructional strategy that will support the reader. Thus, when the source of the reading difficulty is identified, intervention can be targeted at the area of difficulty (Aaron, 1997).

The simple view of reading. The cognitive aspect of reading can be simply described as the 'process of understanding speech written down' (Goswami, 2008, p. 336). However, this involves complex multicomponent cognitive processes such as decoding print, accessing word meanings in lexical memory, semantic and syntactic analysis at the phrase and sentence level, and gaining overall meaning of the text. The complexity of each process can be further analysed by examining the mechanisms of visual and language processing, the function of memory, and the role of problem-solving skills.

However, examining reading through the lens of a simpler model can support educators in their conceptualisation of reading, and identification of the direct cause of reading difficulties. The cognitive domain of the CMR is based on the SVR (Gough & Tunmer, 1986; Hoover & Gough, 1990). Gough and Tunmer (1986) present the SVR as a model that explains the information-processing aspect of reading. While the authors acknowledge that reading is a complex process, this model conceptualises reading as the product of two independent yet necessary components that predict reading ability. The SVR is attractive in its structural simplicity, and it has made a significant contribution to the understanding of reading difficulties. Evidence of its wide acceptance is apparent in the recommendation of the Rose Review (Rose, 2006) to include the SVR as a conceptual framework in the National Literacy Strategy Framework for Teaching in the United Kingdom.

The SVR acknowledges that reading consists of two equally important components: the ability to decode words and linguistic comprehension (Gough & Tunmer, 1986). Studies have found that a significant proportion of the variance of reading comprehension can be accounted for by decoding and linguistic comprehension (Hoover & Gough, 1990; Johnston & Kirby, 2006; Savage, 2006; Singer & Crouse, 1981;

Stanovich, Cunningham, & Feeman, 1984). However, it is acknowledged that these component parts are broad and that they can be further analysed to identify the processes involved (Tunmer & Chapman, 2012).

In the SVR model, decoding is defined as the ability to read context-free words efficiently and accurately allowing access to entry in the mental lexicon. Decoding skill leads to word recognition. Linguistic comprehension is defined as the ability to use lexical and word-level information to understand orally presented discourses (Gough & Tunmer, 1986). The SVR holds that once text has been decoded, the reader employs the same mechanisms to bring meaning to the text that would be used to bring meaning to spoken language (Gough & Tunmer, 1986). Although decoding and linguistic comprehension make separate contributions to the reading process, neither is sufficient on its own. If only decoding ability is intact, a reader is not gaining meaning from the text and is merely 'word calling'. Alternatively, if a reader is strong in linguistic comprehension but experiences difficulty with decoding, word recognition is not available to unlock the meaning of the text. Thus, reading ability can be predicted by examining the reader's decoding skill and linguistic comprehension. To illustrate this, the SVR is expressed in the mathematical formula R = D x C whereby R represents reading comprehension, D represents decoding, and C represents linguistic comprehension. This is a multiplicative formula and each variable ranges from 0 to 1. Able readers display a positive correlation between these components. However, if either D or C is 0, R will equal 0. In other words, if decoding is low and linguistic comprehension is high, the student will be a poor reader; if decoding is high and linguistic comprehension is low the student will be a poor reader.

The independent contribution of decoding and linguistic comprehension has been demonstrated in a number of studies (Aaron et al., 2008; Byrne & Fielding-Barnsley,

1995; Carver, 1998; Catts et al., 2003; de Jong & van der Leij, 2002; Kendeou, Savage, & Broek, 2009; Vellutino et al., 2007). In addition, neuroimaging techniques have shown the different cortical structures responsible for phonological and semantic information (McDermott, Watson, & Ojemann, 2005; Poldrack & Wagner, 2004). Evidence that decoding and linguistic comprehension are separate components of reading can be seen in the dissociated relationship of a reader defined as dyslexic who displays strong linguistic comprehension but poor decoding skills (Aaron, Franz, & Manges, 1990). Conversely, a hyperlexic reader exhibits strong decoding skills but may have weak linguistic comprehension (Healy, 1982; Nation, 1999). The relative contribution of the two components changes over time with age and the development of reading skills (Adlof, Catts, & Little, 2006; Catts, Hogan, & Adlof, 2005; Chen & Vellutino, 1997; Keenan, Betjemann, & Olson, 2008). In typically developing readers during the first few years of school, decoding skill correlates more strongly with reading comprehension. However, in the later years, linguistic comprehension makes a greater contribution to reading comprehension and the contribution of decoding decreases (Georgiou, Das, & Hayward, 2008; Hoover & Gough, 1990; Hoover & Tunmer, 1993; Stanovich, Cunningham, & Feeman, 1984).

The multiplicative formula of the SVR holds that decoding and linguistic comprehension are both necessary and neither is individually sufficient for successful reading comprehension. However, variations on the SVR model have been offered. An additive formula proposes that decoding and/or linguistic comprehension can contribute to successful reading comprehension to varying degrees. The SVR has its roots in an additive formula put forward by Perfetti (1985). This formula included an extra factor labelled ‘X’ (R = D + C + X) that he conceded made only a small contribution to

successful reading. He argued that ‘verbal efficiency’, that is, the automaticity of word reading, is of paramount importance for successful reading (Perfetti, 2007).

Studies have examined whether the predictive validity of the SVR increases when using an additive rather than a multiplicative formula. Dreyer and Katz (1992) examined the predictive validity of the SVR with a population of 137 English-speaking third graders. It was found that the theory underpinning the SVR model was supported by the results. However, the researchers found mixed evidence to support the multiplicative formula and argued that it did not add to the predictive power of the SVR. Consequently, it was proposed that the relationship between decoding and linguistic comprehension was additive (R = D + C). Conversely, when applying an additive formula, Hoover and Gough (1990) found that a reader with no decoding or linguistic comprehension skills could still achieve a perfect reading comprehension score if the other component was strong.

Other studies have found that the additive formula and product formula fit the results equally well and show little difference to reading comprehension (Georgiou et al., 2008; Joshi & Aaron, 2000; Savage, 2006). With a group of university students displaying significant reading delays, Savage and Wolforth (2007) found no difference to the predictive power of reading comprehension whether a multiplicative or additive formula of the SVR was used. Chen and Vellutino (1997) argue that the multiplicative formula is not always adequate in predicting reading comprehension. The authors propose that a more encompassing model that combines decoding and linguistic comprehension additively and multiplicatively is able to more efficiently predict reading comprehension (R = D + C + D x C).

Research studies have demonstrated a strong relationship between reading comprehension and reading fluency (Fuchs, Fuchs, Hosp, & Jenkins, 2001; Katzir, Kim,

Wolf, O'Brien, Kennedy, Lovett, & Morris, 2006). Joshi and Aaron (2000) varied the SVR multiplicative formula by adding an additional factor. The authors hypothesised that the addition of naming speed (S) would improve the predictive ability of the model (R = D x C + S). Results revealed that 48% of the variance of reading comprehension could be attributed to decoding and linguistic comprehension, while an additional 10% could be explained by naming speed. Another study found that naming speed contributed 3.1% variance to reading comprehension, however, this dropped to 0-2% after accounting for the word recognition product (Johnston & Kirby, 2006). The difference in variance between the two studies may be due to the task that was used to measure naming speed. Joshi and Aaron (2000) used a letter naming task while Johnston and Kirby (2006) used an object naming task. Letter and digit naming speed have been found to be more strongly associated with reading than picture naming speed (Georgiou et al., 2008).

Other studies have found that naming speed and fluency do not account for unique variance of reading comprehension (Adlof et al., 2006; Georgiou et al., 2008; Sabatini, Sawaki, Shore, & Scarborough, 2010; Vukovic & Siegel, 2006). Instead, they play a role in reading comprehension, contributing through word recognition as a result of efficient decoding skill. In a study with 122 7-year-old students, Tunmer and Chapman (2012) found that vocabulary did not make an independent contribution to reading comprehension. Rather, vocabulary contributed through the linguistic comprehension component. These findings indicate that a separate component is not necessary in the SVR model. However, due to the finding that linguistic comprehension influences reading comprehension both directly and indirectly through decoding, the independent component hypothesis of the SVR may need to be flexible (Ricketts, 2011; Tunmer & Chapman, 2012).

Studies examining the contribution of phonological awareness to reading comprehension within the SVR model have demonstrated contradictory findings. Johnston and Kirby (2006) found that phonological awareness accounted for 2% to 4 % of unique variance. Conversely, Georgiou et al. (2008) found that phonological awareness did not contribute uniquely to reading comprehension. While phonological awareness and naming speed correlate with reading comprehension, their predictive variance may be shared with decoding skills (Nation & Snowling, 2004).

Hoover and Gough's (1990) study demonstrated that decoding and linguistic comprehension accounted for 72% to 85% of the variance in reading comprehension. This finding supports the SVR as a model that facilitates diagnosis of poor readers by identifying the weak component that is causing reading problems. Thus, readers can be grouped according to those who display poor decoding and at least average linguistic comprehension (e.g., dyslexic), those who display at least average decoding and poor linguistic comprehension (e.g., hyperlexic or those with a specific comprehension deficit; Kamhi & Catts, 2012), those who display poor decoding and poor linguistic comprehension (e.g., garden-variety poor readers; Stanovich et al., 1988), and those who display at least average decoding and linguistic comprehension (e.g., either a good reader or a reader with reading difficulty for whom the SVR is not able to specify the cause). Categorising readers based on areas of strength and weakness is deemed valuable for the purposes of designing instructional programmes and remediation (Stuart et al., 2008). A number of studies support the diagnosis and classification of readers into subgroups based on the SVR model (Aaron et al., 1999; Catts et al., 2005) and it has been found that the subgroups remain moderately stable (Catts et al., 2003). The most prevalent group of poor readers are those with poor decoding and poor linguistic comprehension skills (Nicholson, 2000). However, Stanovich (1988) suggests

that poor decoding skills are possibly the reason linguistic comprehension is low. As these readers struggle to efficiently and accurately decode text, they decrease their exposure to new vocabulary and ideas. Consequently, their linguistic comprehension skills do not adequately progress.

Vellutino (1991) and Stanovich (1990) maintain that skilled decoding is the primary predictor of reading comprehension. Consequently, it has been argued that reading disability be defined on the basis of decoding (Siegel, 1989). Attempts have been made to discriminate between poor decoders according to identified deficits. However, these attempts have been challenged (Elliott & Grigorenko, 2014). The present study aims to investigate whether distinguishing between poor decoders based on level of linguistic comprehension is helpful for the purposes of intervention designed to remediate poor decoding skills.

Subgrouping Poor Decoders Based on Linguistic Comprehension

Poor decoders have been subgrouped based on a range of cognitive processes and difficulties (Elliott & Grigorenko, 2014). For many decades, intellectual ability has commonly been used to subgroup poor decoders. This approach has been referred to as the IQ-discrepancy model whereby poor decoders are categorised based on the discrepancy between their level of intellectual ability and reading achievement (Stanovich, 2005). However, this approach has been largely discredited due to a lack of evidence to demonstrate qualitative differences between poor decoders with average and below average intelligence, and a lack of evidence to support the assumption that the two groups require different forms of intervention (Aaron, 1997; Fletcher, Francis, Rourke, Shaywitz, & Shaywitz, 1992; Shaywitz, Escobar, Shaywitz, Fletcher, & Makuch, 1992; Stanovich, 1993; Stanovich & Siegel, 1994; Tal & Siegel, 1996).

Additionally, studies have demonstrated that the contribution of intellectual ability to variability in decoding and comprehension is negligible (Savage, 2001; Siegel, 1992).

Linguistic comprehension has been offered as an alternative to the IQ-discrepancy model. This approach is used to subgroup poor decoders by establishing a discrepancy between reading achievement and linguistic comprehension aptitude (Savage, 2006). This discrepancy approach is supported by the finding that reading comprehension correlates more highly with linguistic comprehension than with intellectual ability (Hagtvet, 2003; Stanovich, 1991). Furthermore, some evidence suggests that poor decoders display qualitative differences based on their level of linguistic comprehension (Gough & Tunmer, 1986; Hoskyn & Swanson, 2000; Hood & Dubert, 1983; Spring & French, 1990; Stanovich, 1991). The latter finding is supported by the phonological-core-variable-difference model (Stanovich, 1988, 1991). This model posits that all poor decoders display weaknesses in the phonological domain. However, the reading problems of poor decoders with ALC are due to a specific impairment in the phonological domain, also referred to as the 'assumption of specificity' (Tunmer & Chapman, 2007; Wolf et al., 2000). According to this model, the reading problems of poor decoders with BALC are attributed to broader linguistic weaknesses. Stanovich (1988) predicted that the phonological deficits of poor decoders with ALC would be greater than the phonological deficits of poor decoders with BALC. However, this hypothesis has not been supported by research findings (Fletcher et al., 1994; Stanovich & Siegel, 1994; Tunmer & Chapman, 2007).

Tunmer and Chapman (2007) found that poor decoders with BALC displayed greater phonological processing deficits than poor decoders with ALC. The authors attribute this to the greater language deficiencies of poor decoders with BALC. Further support for this finding is found in research demonstrating that poor oral language development

in the early years, particularly poor vocabulary development, impacts the development of phonological awareness (Carroll, Snowling, Stevenson, & Hulme, 2003; Snowling et al., 2003).

A further issue that arises when using any form of discrepancy to subgroup poor decoders is due to the Matthew effect on reading (Stanovich, 1986). According to this phenomenon, a poor reader will display weaknesses in related cognitive skills due to the negative effects of reading difficulty. Stanovich (1986) refers to the bidirectional relationship between reading achievement and related cognitive skills (e.g., phonological processing) as one of 'reciprocal causation'. Moreover, studies have found evidence of a weaker version of the SVR due to a high degree of interdependence between decoding and linguistic comprehension, and the contribution of a broader range of language skills that influence the relationship between linguistic comprehension and reading comprehension (Chen & Vellutino, 1997; Hagtvet, 2003; Shankweiler et al., 1999).

Poor decoders with ALC are often referred to as 'dyslexic' (Catts et al., 2006; Frith & Snowling, 1983; Nation & Snowling, 1998). This diagnosis is based on the assumption that dyslexic readers display differences in their reading skills compared to non-dyslexic poor decoders. The implication is that poor decoders with ALC and poor decoders with BALC require different approaches to intervention. However, there is considerable debate regarding the construct of dyslexia and whether it has any validity (Elliott & Grigorenko, 2014).

Evidence suggests that reading disability occurs on a continuum (Catt et al., 2003; Fletcher et al., 1994; Logan, 1997; Vogler, Baker, Decker, DeFries, & Huizinga, 1989). Except in extreme cases, there is a lack of empirical evidence to support the subgrouping of poor decoders (Siegel, 1992: Stuebing, Fletcher, Branum-Martin, &

Francis, 2012). Furthermore, the lack of evidence to support differential intervention for poor decoders (Elliott & Grigorenko, 2014; Hagtvet, 2003; Vellutino, Scanlon, & Lyon, 2000) has led Stanovich (1991) to caution against any discrepancy definition used for differentiation. He acknowledges that research based on a discrepancy approach offers mixed evidence and notes that an examination of the evidence leads to the hypothesis that:

> … there are no qualitative differences between dyslexic and garden-variety poor readers in reading-related cognitive subskills … In short, we are still in need of data indicating that the cognitive processing of dyslexic and garden-variety poor readers reading at the same level is reliably different, data indicating that these two groups of poor readers have a differential educational prognosis, and data indicating that they respond differently to certain educational treatment (p. 23).

Summary

A review of the literature demonstrates the central role of word recognition skills in the reading process. When reading is slow and effortful, the reader has less resources available for comprehension (Nation, 2005). Furthermore, reading difficulty has cumulative disadvantages (Stanovich, 1986). This highlights the importance of supporting all children to become proficient readers, and intervening early when difficulties become evident. In addition to fluent decoding skills, reading comprehension requires an adequate degree of linguistic comprehension (Vellutino et al., 2007). There is evidence to suggest that linguistic comprehension plays a causal role in reading disability and these difficulties may impact on decoding ability (Carroll &

Snowling, 2004; Clarke et al., 2010; Nation et al., 2010). The SVR has been offered as a model that conceptualises reading as the product of two independent yet necessary components that predict reading ability: decoding and linguistic comprehension (Gough & Tunmer, 1986). The SVR facilitates diagnosis of struggling readers by identifying the weak component that is causing reading problems. However, the relationship between decoding and linguistic comprehension has been debated for several decades. The present study sought to examine whether quantitative and qualitative differences in oral reading errors existed between poor decoders with ALC and BALC. The results indicate whether it is beneficial to consider level of linguistic comprehension when designing intervention programmes for readers who struggle with decoding.

Preview of the Study

This study investigated the contribution of linguistic comprehension to the decoding skills of struggling readers. Readers struggling with decoding were grouped according to a) BALC or b) ALC. A number of standardised reading tests were administered to determine whether quantitative differences existed between the groups. In addition, the participants' oral reading errors were analysed to determine whether there were qualitative differences in the errors made by the participants in each group. The aim was to determine whether a reader's level of linguistic comprehension had an influence on the reader's decoding skills. The results indicated whether it is beneficial to consider level of linguistic comprehension when designing intervention programmes for readers who struggle with decoding. With evidence demonstrating that poor decoders guess unfamiliar words based on context (Iversen, Tunmer, & Chapman, 2005; Tunmer & Nicholson, 2011; Stanovich, 1994), it was hypothesised that the poor decoders with ALC would draw on their language strengths by making more semantically and syntactically acceptable oral reading errors. If differences in the oral reading errors were

found between the two groups, this would suggest the importance of designing differential intervention programmes that target the specific aspects of decoding that demonstrate weakness. If there were no differences found in the oral reading errors of both groups of poor decoders, it would suggest that both groups require the same intervention targeted at their weak decoding skills.

Chapter 3: Methodology

Introduction

This study investigated the contribution of linguistic comprehension to the decoding skills of struggling readers. Readers struggling with decoding were grouped according to a) BALC or b) ALC. Standardised reading tests were administered and oral reading errors were analysed to determine whether differences existed between the groups. The following research questions were addressed:

1. Are there quantitative differences between the BALC and ALC groups on tests that measure pseudoword decoding, reading accuracy of words in context, reading comprehension and reading rate?
2. Are there qualitative differences between the BALC and ALC groups in the types of oral reading errors?
3. Do the participants in the ALC group make more syntactically acceptable errors than the participants in the BALC group?
4. Do the participants in the ALC group make more semantically acceptable errors than the participants in the BALC group?

Participants

The participants in the study were 36 children from Years 3 to 7. The mean chronological age was 10 years 1 month with ages ranging from 8 years 4 months to 12 years 5 months. The sample included 11 girls and 25 boys. The participants were drawn from nine urban schools located in mid to high socio-economic areas. Eight of the schools were at the primary level and one was at the intermediate level. Seven of the schools ranked in the high decile range and two ranked in the mid-decile range. [Decile ranking is used to calculate the funding each school receives from the Ministry of Education. Decile 1 schools receive the highest level of funding due to their location in

low socio-economic areas, while decile 10 schools receive the lowest level of funding due to their location in high socio-economic areas.] All schools were located on the North Shore of Auckland. The ethnic mix of the school pupils on the North Shore comprises 59% European, 5.9% Maori, 3.5% Pasifika, 22.9% Asian, 4.7% Other and 4.0% categorised as International students (New Zealand Parliament Electorate Data, 2015). The participants in this study identified as 61% European, 8% Maori, 5.5% Other, 3% European/Maori, 5.5% European/Pasifika, 3% Maori/Other, 3% European/Other. English was the first language for all participants.

All of the participants in the present study have been taught to read in classrooms in which whole language is the dominant approach to literacy instruction. Of particular interest was the number of students who had been enrolled in Reading Recovery, the most widely used early literacy intervention programme in New Zealand. Reading Recovery is supplementary to the classroom reading programme and was designed to complement the widely used whole language approach to teaching reading in New Zealand schools (Reynolds & Wheldall, 2007). Reading Recovery targets the lowest 15% to 20% of students in a school who have not displayed evidence of benefiting from formal reading instruction after the first year (Nicholas & Parkhill, 2014; Tunmer & Chapman, 2003). A series of assessment measures is administered to assess the student's reading and writing skills, and ongoing assessment is used to individualise the programme (Clay, 1993a). Students attend one-on-one lessons for approximately 30 minutes a day with a trained Reading Recovery teacher. Duration of enrolment falls between 12 and 20 weeks after which time a student is expected to be reading at an average reading level for his/her age and, thus, can have their Reading Recovery programme discontinued (Clay, 1993b). Of the 36 participants in this study, 18 had been enrolled in Reading Recovery. Reasons for non-enrolment of the other 18

participants may be due to a number of factors such as the school not offering Reading Recovery or the child not qualifying for the Reading Recovery programme.

Target participants were identified by school personnel based on their reading ability on the Prose Reading Observation, Behaviour and Evaluation (PROBE; Parkin, Parkin, & Pool, 2002). PROBE is commonly used in New Zealand schools to assess the reading ability of children in Years 3 to 10. This individually administered assessment tool measures reading accuracy and reading comprehension to calculate a reading age. Based on PROBE scores, children with a discrepancy of at least 1½ years between their chronological age and reading age were selected for the study. However, only those children who struggled with reading due to poor decoding skills were eligible to be included. After testing 41 children for the study, five children were not included in the results due to a discrepancy of less than 1½ years between their chronological age and reading age.

In the present study, two groups were identified on the basis of scores on the listening comprehension subtest of the Wechsler Individual Achievement Test-Second Edition (WIAT-II; Wechsler, 2007). Children were defined as BALC with a score at or below the 25th percentile. Children were defined as ALC with a score at or above the 30th percentile. This resulted in the selection of 18 children in each group.

Table 1
Percentile Score Means and Standard Deviations for Listening Comprehension Scores

	BALC (n = 18)		ALC (n = 18)	
	M	SD	M	SD
Listening Comprehension	14.94	8.62	60.33	17.18

Note. BALC = Below Average Linguistic Comprehension; ALC = Average Linguistic Comprehension.

Instruments

Data were obtained from standardised tests administered to the 36 participants. The participants in both groups were individually tested using the Neale Analysis of Reading Ability-Third Edition (NARA-III; Neale, 1999), and the pseudoword and listening comprehension subtests of the Wechsler Individual Achievement Test-Second Edition (WIAT-II; Wechsler, 2007).

Listening comprehension. The listening comprehension subtest of the WIAT-II is an individually administered standardised assessment of listening comprehension skills. This test was selected as a measure of linguistic comprehension as the three tasks included in this subtest are often used to measure linguistic comprehension (de Jong & van der Leij, 2002). The three tasks are receptive vocabulary, expressive vocabulary and sentence comprehension. The latter measures listening-inferential comprehension. The examinee is required to process verbal information and provide an appropriate response to demonstrate understanding. The receptive and expressive vocabulary items require the examinee to supply the correct vocabulary response. The sentence comprehension items require the examinee to select the correct picture that represents a sentence that is read aloud by the examiner. Age-based reliability coefficients of the listening comprehension subtest that correspond to the ages of the participants in the present study range from 0.75 to 0.80 (Wechsler, 2007).

Pseudoword reading. The pseudoword subtest of the WIAT-II is an individually administered standardised assessment of phonological decoding skills. Single word reading facilitates the assessment of decoding skills using graphophonic knowledge without relying on semantic and syntactic cues (Ehri & McCormick, 2013). The pseudoword subtest involves the presentation of 55 pseudowords which include consonant-vowel-consonant patterns (e.g., fum) through to more complex patterns (e.g.,

ostique) such as consonant blends, diagraphs, diphthongs, and multisyllabic nonwords. The items are scored as correct (1 point) or incorrect (0 points). Errors are phonetically recorded for the purpose of error analysis. After seven consecutive errors, the test may be discontinued. Age-based reliability coefficients of the pseudoword subtest that correspond to the ages of the participants in the present study range from 0.95 to 0.97 (Wechsler, 2007). The results of this test were used in the present study, in addition to the accuracy score on the NARA-III, to verify that the participants struggled with reading due to poor decoding skills. Furthermore, the test was used to determine whether differences existed between the groups when decoding words in context and as pseudowords.

Neale analysis of reading. The Neale Analysis of Reading Ability-Third Edition (NARA-III) is an individually administered standardised assessment of reading skills designed for use with children aged from 6 years to 12 years 11 months. The test includes three subtests that measure an individual's oral reading accuracy of words in context, reading comprehension, and reading rate. The NARA-III includes six narrative and expository passages. The passages are graded and become increasingly difficult by including more challenging vocabulary and grammatical structures. While the examinee reads each passage aloud, the examiner records the oral reading errors for later analysis. Each passage is followed by comprehension questions that include main idea, sequence of events, recall, and inference. There is high internal reliability at all age levels for the three subtests. The internal reliability of the accuracy subtest ranges from 0.91 to 0.96, the comprehension subtest ranges from 0.71 to 0.96, and the rate subtest ranges from 0.93 to 0.96 (Neale, 1999).

For the purposes of the current study, Form 2 of the NARA-III was used to gain a measure of each participant's accuracy of reading words in connected text, reading

comprehension, and reading rate. Oral reading errors were recorded on a duplicate copy of the passage. To facilitate later analysis of oral reading errors, each participant's reading of the passages was audio recorded.

Error analysis taxonomy. A reading error is defined as the reader's divergence from the text. That is, the expected response (ER) and the reader's observed response (OR) are not the same. Oral reading errors are often referred to as 'miscues', a term first coined by Goodman (1965). Goodman did not view departures from the text as random errors. Rather, he argued that miscues provided a window into the interaction of the reader's thoughts and language while reading text (Goodman, 1965, 1967). While criticisms have been directed at the use of miscue analysis for the purposes of assessment and to inform intervention (Hempenstall, 2002; Leu, 1982; Parker, Hasbrouck, & Tindal, 1992; Walpole & McKenna, 2006; Wixson, 1979), when the categories selected for analysis are explicitly identified and defined, this tool has been useful for research purposes to provide data to support the understanding of readers' strategy use (Chinn et al., 1993; Gillam & Carlile, 1997; Laing, 2002; Thomson, 1978; Warde, 2005).

To facilitate deeper analysis of each participant's oral reading errors, a taxonomy was designed for the current study that was based on taxonomies used in previous studies (Gillam & Carlile, 1997; Goodman, 1969; Goodman & Burke, 1972). Four categories for analysis were selected due to the information they provide about the language cueing systems used by a reader in the reading process: graphic, phonemic, syntactic and semantic. The graphic system refers to the letters in a word; the phonemic system refers to the sounds in a word. These systems, often referred to as the graphophonic cueing system, are based on the relationship between letters and sounds. The syntactic system refers to the grammar and construction of a text; this can be at the

sentence level or higher levels such as text organisation. The semantic system refers to the meaning system and draws on the reader's cultural knowledge and background experiences.

The four categories of errors that were analysed in the taxonomy were coded in relation to their degree of similarity and acceptability (coded high, partial or low). In addition, errors were coded to indicate whether they were accurately self-corrected. The first 25 oral reading errors made by each reader, regardless of whether the error was self-corrected, were identified and analysed to determine the degree of similarity or acceptability to the text.

Graphic, phonemic, syntactic and semantic categories. The following four categories were selected to analyse the degree of similarity and acceptability between the error and the text.

Graphic and phonemic similarity were determined by evaluating the degree of similarity between the error and the text.

- High (H) – A high degree of graphic/phonemic similarity between the error and the text i.e. 66-100% similarity of the graphic/phonemic sequence.
- Partial (P) – A partial degree of graphic/phonemic similarity between the error and the text i.e. 33-65% similarity of the graphic/phonemic sequence.
- Low (L) – A low or no degree of graphic/phonemic similarity between the error and the text i.e. 0-32% similarity of the graphic/phonemic sequence.

Syntactic and semantic acceptability were determined by evaluating the degree of acceptability between the error and the text.

- High (H) – The error is grammatically/semantically acceptable in relation to the whole text.

- Partial (P) – The error is grammatically/semantically acceptable only in the immediate sentence before or after the text portion.
- Low (L) – The error is grammatically/semantically unacceptable.

Correction was determined by evaluating whether the reader successfully self-corrected the error.

- Yes (Y) – There was a successful correction of the error.
- No (N) – There was no attempt, or an unsuccessful attempt, to correct the error.

Graphic similarity. To evaluate the degree of graphic similarity, a graphic representation of the error was made.

High graphic similarity required over two-thirds of the letters in the OR to be similar to the ER, and represented in a similar graphic sequence. For example, the following ER/OR errors would be coded high graphic similarity: collapsed/cŏlpsed, despairing/desappăring, entangled/entăgĭnăled, action/acting.

Partial graphic similarity required between one-third and nearly two-thirds of the letters in the OR to be similar to the ER, and represented in a similar graphic sequence. For example, the following ER/OR errors would be coded partial graphic similarity: intruder/ĭnders, stood/should, trainer/trĭn, surprise/super.

Low graphic similarity required less than one-third of the letters in the OR to be similar to the ER, and represented in a similar graphic sequence. For example, the following ER/OR errors would be coded low graphic similarity: marshes/must, realised/restah, clear/crate.

Phonemic similarity. To evaluate the degree of phonemic similarity, a phonemic representation of the error was made.

High phonemic similarity required over two-thirds of the phonemes in the OR to be similar to the ER, and represented in a similar phonemic sequence. For example, the

following ER/OR errors would be coded high phonemic similarity: kitten/kittēn, rider/răder, charged/changed.

Partial phonemic similarity required between one-third and nearly two-thirds of the phonemes in the OR to be similar to the ER, and represented in a similar phonemic sequence. For example, the following ER/OR errors would be coded partial phonemic similarity: sprang/spread, stamps/stăp, trainer/trĭn.

Low phonemic similarity required less than one-third of the letters in the OR to be similar to the ER, and represented in a similar phonemic sequence. For example, the following ER/OR errors would be coded low phonemic similarity: sprang/serp, electric/ĕsĭls, to/the.

Syntactic acceptability. Determining syntactic acceptability required evaluation of the degree to which the OR syntactically diverged from the ER.

To be coded high syntactic acceptability, the error must be grammatically acceptable in relation to the whole text. For example, the following would be coded high syntactic acceptability:

ER = She was surprised that the little dog ran away quickly.

OR = She was surprised that the little dog ran away **quietly**.

To be coded partial syntactic acceptability, the error must be grammatically acceptable only in the immediate sentence, before or after the text portion. For example, the following would be coded partial syntactic acceptability:

ER = She was surprised that the little dog ran away.

OR = She was surprised that **he** little dog ran away (‘he’ is syntactically correct only in the first text portion).

To be coded low syntactic acceptability, the error must be grammatically unacceptable in the whole text. For example, the following would be coded low syntactic acceptability:

ER = She was surprised that the little dog ran away.

OR = She was **usual** that the little dog ran away.

Semantic acceptability. Determining semantic acceptability required evaluation of the similarity in meaning between the OR and the ER.

To be coded high semantic acceptability, the error must be semantically acceptable in relation to the whole text. For example, the following would be coded high for semantic acceptability:

ER = He was *happy* to see the kitten.

OR = He was *excited* to see the kitten.

To be coded partial semantic acceptability, the error must be semantically acceptable only in the immediate sentence, before or after the text portion. For example, the following would be coded partial semantic acceptability:

ER = The *despairing* groan of the dragon grew louder.

OR = The *disappearing* groan of the dragon grew louder. ('disappearing' is semantically correct only in the first text portion)

To be coded low semantic acceptability, the error must be semantically unacceptable in the text. For example, the following would be coded low semantic acceptability:

OR = He was *happy* to see the kitten.

ER = He was *hello* to see the kitten.

Self-correction. Self-correction was coded 'yes' when the error was successfully self-corrected and 'no' when the error was not self-corrected or was unsuccessfully self-corrected.

When a word was attempted multiple times, the final attempt was the form recorded for analysis. When a word was self-corrected, the error was recorded before successful self-correction.

Procedure

The study was carried out during the third term of a four term school year. The 36 participants were individually tested by the researcher in a quiet withdrawal room at their respective schools during school hours. All participants were administered Form 2 of the NARA-III in addition to the listening comprehension and pseudoword subtests of the WIAT-II. The sessions of testing using the NARA-III and pseudoword subtest were audio recorded for later analysis.

After establishing rapport, an Information Sheet and Consent Form that was worded in a child-friendly manner was shared, and informed consent was received prior to any testing taking place. The researcher explained the study to the participant and provided a brief overview of the procedures involved in testing. The participant was invited to ask questions and share thoughts. Consent from the school and the participant's parent/caregiver had previously been obtained.

For administration of the pseudoword subtest and the listening comprehension subtest, the researcher followed the administration and scoring procedures outlined in the WIAT-II Examiner's Manual (Wechsler, 2007). The researcher explained to the participant that the words on the pseudoword subtest were not real words. The participant was encouraged to attempt all words. Once the participant had made seven consecutive errors, testing was discontinued. The researcher explained each section of the listening comprehension subtest to the participant. For the receptive and expressive vocabulary sections, the participant was asked to select the picture that matched the word enunciated by the researcher. The sentence comprehension task required the

participant to select a picture that represented a sentence read by the researcher. Testing of each of the three tasks was discontinued after the participant made six consecutive errors. Administration of the WIAT-II pseudoword subtest took approximately five minutes and the listening comprehension subtest took approximately ten minutes.

Administration of the NARA-III took approximately 15-20 minutes. The researcher read aloud the administration directions in the NARA-III Manual (Neale, 1999). The participant completed the practice passage which provided an opportunity to understand the procedures and the format of the test passages. Before reading each passage, the participant was asked to look at the accompanying picture. The examinee was encouraged to attempt any difficult words and to think carefully about the story while reading. Encouragement was given but no assistance provided. As the participant read each passage aloud, errors were recorded by the researcher on a duplicate text and the reading of each passage was timed. At the conclusion of each passage, the participant was asked between four and eight comprehension questions that related to the passage.

Scoring

The NARA-III and the pseudoword and listening comprehension subtests of the WIAT-II were scored according to standardised scoring procedures. Raw scores for the pseudoword and listening comprehension subtests were converted to standard scores and percentiles. Raw scores for reading accuracy, reading comprehension, and reading rate of the NARA-III were converted to percentiles and reading ages. In addition, the NARA-III includes analysis of oral reading errors in the following categories: mispronunciation, substitution, refusal, addition, omission and reversal. The oral reading errors of each participant were coded according to these categories. The raw scores were converted into percentages.

The first 25 oral reading errors were analysed and coded using a taxonomy. Each error was analysed according to the degree of similarity and acceptability to the text. The degree of graphic/phonemic similarity and syntactic/semantic acceptability of each error was coded either high, partial or low. The number of errors that were self-corrected was calculated. The errors in each category were calculated for the participants in each group. Raw scores were converted to percentages for each category.

Scoring reliability. The researcher used the written and recorded transcripts to record each error orthographically if it was a real word, and phonetically if it was a non-word. Each error was recorded next to the actual text word on an Error Analysis Worksheet (Appendix A). The errors were analysed and coded either high, partial or low for graphic and phonemic similarity, and syntactic and semantic acceptability. Interrater agreement of error coding was established by training a second person with a teaching background to code the oral reading errors of 20% of the participants in the study. Interrater agreement was calculated at a) graphic similarity 88%; b) phonemic similarity 88%; c) syntactic acceptability 96%; d) semantic acceptability 92%; e) self-correction 100%.

Data Analysis

Data were entered using SPSS descriptives and analysed by running 2-tailed t-tests to determine whether there were any significant differences between the results of the two groups of readers. A two-sample *t*-test was considered to be appropriate as the aim of the study was to assess between-group differences on a number of reading measures as a function of linguistic comprehension. A series of *t*-tests was conducted on the data to compare the mean scores and to examine possible group differences for each of the measures. The independent variable was level of linguistic comprehension (BALC or ALC). The dependent variables were pseudoword reading; reading accuracy of words in

context, reading comprehension, and reading rate; oral reading errors coded for graphic similarity, phonemic similarity, syntactic acceptability, semantic acceptability, and self-correction; and categories of oral reading errors that included mispronunciation, substitution, refusal, addition, omission and reversal. The results of interest were whether there were significant differences between the groups on the dependent variables. In addition, the participants were placed in four groups according to level of listening comprehension (Group 1 = participants with lowest listening comprehension score; Group 2 = participants with second lowest listening comprehension score; Group 3 = participants with second highest listening comprehension score; Group 4 = participants with highest listening comprehension score). An analysis of variance (ANOVA) was performed to examine whether differences existed according to the types of oral reading errors made by the nine participants with the lowest level of listening comprehension and the nine participants with the highest level of listening comprehension.

Chapter 4: Results

This study investigated the contribution of linguistic comprehension to the decoding skills of struggling readers. Readers struggling with decoding were grouped according to a) BALC or b) ALC. Standardised reading tests were administered and oral reading errors were analysed to determine whether differences existed between the groups. It was hypothesised that the higher level of linguistic comprehension of the participants in the ALC group would reveal evidence of more effective strategy-use when reading difficult words. Specifically, it was hypothesised that those in the ALC group would make more errors that were syntactically and semantically acceptable due to their more advanced linguistic comprehension skills.

There is debate regarding whether it is more appropriate to use raw scores or percentiles when performing statistical analysis. It has been argued that using percentiles protects the Type 1 error rate of *t*-tests and increases the power of *t*-tests for non-normal distributions (Zimmerman & Zumbo, 2005). Conversely, it has been argued that significance testing and data analysis using percentile scores can result in misleading results as percentile scores are not normally distributed and they destroy the interval property (Stockburger, n.d.). In the present study, both raw scores and percentile scores obtained from the WIAT-II and NARA-III subtests, and the analysis of oral reading error categories, were entered using SPSS descriptives. Tables displaying the results using raw scores are presented below. Tables displaying the results using percentile scores are presented in Appendix B and C.

Table 2 summarises raw score means, standard deviations, *t*-values, and *p*-values for the results of the listening comprehension and pseudoword subtests of the WIAT-II, and the reading accuracy, reading comprehension, and reading rate subtests of the NARA-III for the BALC group and the ALC group. *T*-values and *p*-values were included to

determine whether significant differences occurred at the .05 significance level between the two groups. In addition, Appendix B displays a summary of the percentile score means, standard deviations, *t*-values and *p*-values for the WIAT-II and NARA-III subtests for each group.

Table 2
Raw Score Means, Standard Deviations, and Summary Group Differences for the WIAT-II Listening Comprehension and Pseudoword Subtests, and the NARA-III Reading Accuracy, Reading Comprehension and Reading Rate Subtests for the BALC Group and the ALC Group.

	Groups					
	BALC ($n = 18$)		ALC ($n = 18$)			
	M	SD	M	SD	*t*	*p*
WIAT-II						
Listening Comprehension	20.94	3.56	26.72	2.68	5.51	.001
Pseudoword	20.33	13.27	17.83	10.41	.63	.53
NARA-III						
Accuracy	33.94	15.70	27.94	13.00	1.25	.22
Comprehension	14.28	8.57	12.28	7.81	.73	.47
Rate	42.33	22.23	45.39	24.83	.39	.70

Note. WIAT-II = Wechsler Individual Achievement Test-Second Edition (Wechsler, 2007); NARA-III = Neale Analysis of Reading Ability-Third Edition (Neale, 1999); BALC = Below Average Linguistic Comprehension; ALC = Average Linguistic Comprehension.

Listening Comprehension

As shown in Table 2, the mean scores for the listening comprehension subtest of the WIAT-II were 20.94 (*SD* = 3.56) for the BALC group and 26.72 (*SD* = 2.68) for the ALC group. The results of a *t*-test revealed that the mean scores of the two groups were significantly different $t(34) = 5.51$, $p = .001$.

Pseudoword Reading

As shown in Table 2, the mean scores for the pseudoword subtest of the WIAT-II were 20.33 (*SD* = 13.27) for the BALC group and 17.83 (*SD* = 10.41) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences $t(34) = .63$, $p = .53$.

Reading Accuracy

As shown in Table 2, the mean scores for the accuracy subtest of the NARA-III were 33.94 (*SD* = 15.70) for the BALC group and 27.94 (*SD* = 13.00) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences $t(34) = 1.25$, $p = .22$.

Reading Comprehension

As shown in Table 2, the mean scores for the comprehension subtest of the NARA-III were 14.28 (*SD* = 8.57) for the BALC group and 12.28 (*SD* = 7.81) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences $t(34) = .73$, $p = .47$.

Reading Rate

As shown in Table 2, the mean scores for the reading rate subtest of the NARA-III were 42.33 (*SD* = 22.23) for the BALC group and 45.39 (*SD* = 24.83) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences $t(34) = .39$, $p = .70$.

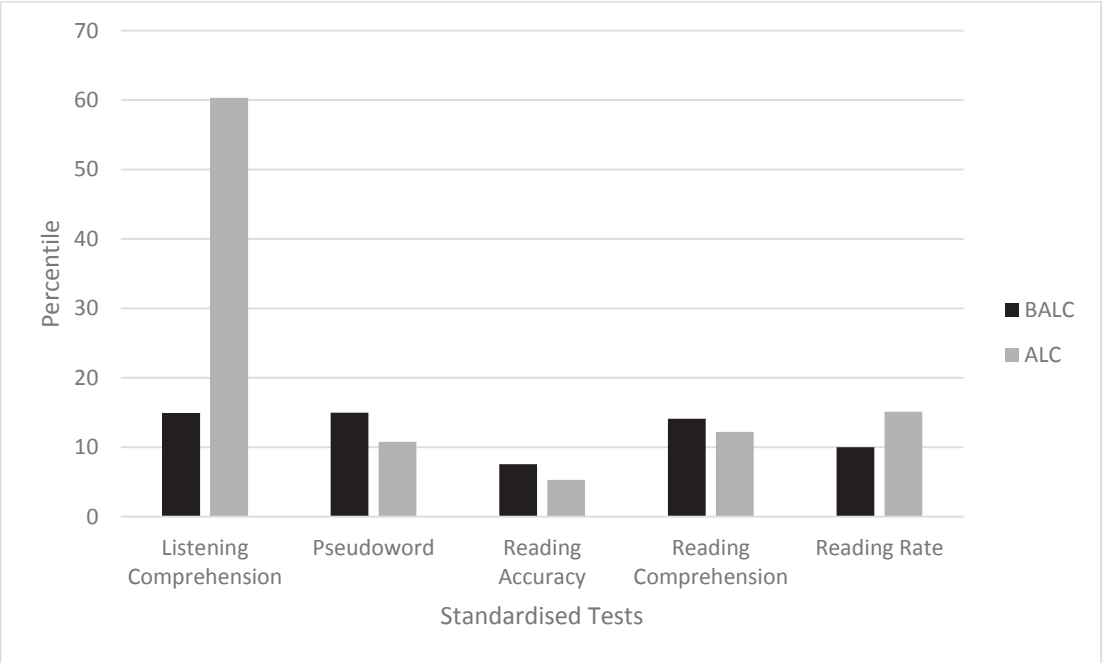

Figure 1. Percentile score means for the WIAT-II Listening Comprehension and Pseudoword subtests, and the NARA-III Reading Accuracy, Reading Comprehension and Reading Rate subtests for the BALC group and the ALC group.

Analysis of the results of the listening comprehension subtest demonstrated that there are two distinct groups based on level of listening comprehension. Analysis of the results from the pseudoword reading, reading accuracy, reading comprehension, and reading rate demonstrated that there were no significant differences between the groups on any of these measures regardless of whether raw scores or percentile scores were used.

Oral Reading Errors

The first 25 oral reading errors made by each reader, regardless of whether the error was self-corrected, were analysed according to four categories: graphic similarity, phonemic similarity, syntactic acceptability, and semantic acceptability. The errors were coded according to their degree of similarity and acceptability to the text. Graphic and phonemic similarity, and semantic and syntactic acceptability were coded high, partial

or low. In addition, errors were coded to indicate whether they were accurately self-corrected.

Errors in each category were calculated into group means for comparison. A *t*-test was used to analyse the data in order to determine whether there were any significant differences in the types of oral reading errors made by the participants in the BALC group and the ALC group.

Table 3 summarises raw score means, standard deviations, *t*-values and *p*-values for the results of the four categories of oral reading errors for each group. *T*-values and *p*-values were included to determine whether significant differences occurred at the .05 significance level between the two groups. In addition, Appendix C displays a summary of the percentile score means, standard deviations, *t*-values and *p*-values for the four categories of oral reading errors for each group. Figures 2-6 display the percent differences for each group.

Table 3

Raw Score Means, Standard Deviations, and Summary Group Differences for Oral Reading Errors in Each Category for the BALC Group and the ALC Group.

	Groups					
	BALC ($n = 18$)		ALC ($n = 18$)			
	M	SD	M	SD	*t*	*p*
GrS – High	10.94	5.87	9.61	4.09	.79	.43
GrS – Partial	7.11	2.76	8.28	1.84	1.49	.15
GrS – Low	6.94	5.65	7.11	3.50	.11	.92
PhS – High	8.89	4.71	8.06	4.08	.57	.57
PhS – Partial	7.06	2.69	7.94	2.24	1.08	.29
PhS – Low	9.06	5.74	9.11	3.89	.03	.97
SyA – High	15.06	5.63	15.89	2.06	.59	.56
SyA – Partial	3.28	2.24	3.89	1.91	.88	.39
SyA – Low	6.67	5.05	4.94	2.31	1.32	.20
SemA – High	3.50	2.01	4.00	2.45	.67	.51
SemA – Partial	4.11	2.37	4.56	1.98	.61	.55
SemA – Low	17.44	3.50	16.44	3.45	.86	.34
S/C – Yes	2.56	2.60	2.00	1.57	.78	.44
S/C – No	22.44	2.60	23.00	1.57	.78	.44

Note. GS = Graphic Similarity; PhS = Phonemic Similarity; SyA = Syntactic Acceptability; SemA = Semantic Acceptability; S/C = Self-Corrections; BALC = Below Average Linguistic Comprehension; ALC = Average Linguistic Comprehension.

Graphic similarity. As shown in Table 3, the mean scores for oral reading errors that demonstrated high graphic similarity were 10.94 (*SD* = 5.87) for the BALC group and 9.61 (*SD* = 4.09) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .79, *p* = .43. The mean scores for oral reading errors that demonstrated partial graphic similarity were 7.11 (*SD* = 2.76) for the BALC group and 8.28 (*SD* = 1.84) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = 1.49, *p* = .15. The mean scores for oral reading errors that demonstrated low graphic similarity were 6.94 (*SD* = 5.65) for the BALC

group and 7.11 (*SD* = 3.50) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .11, *p* = .92. The results in Figure 2 show the percent differences in graphic similarity for the two groups.

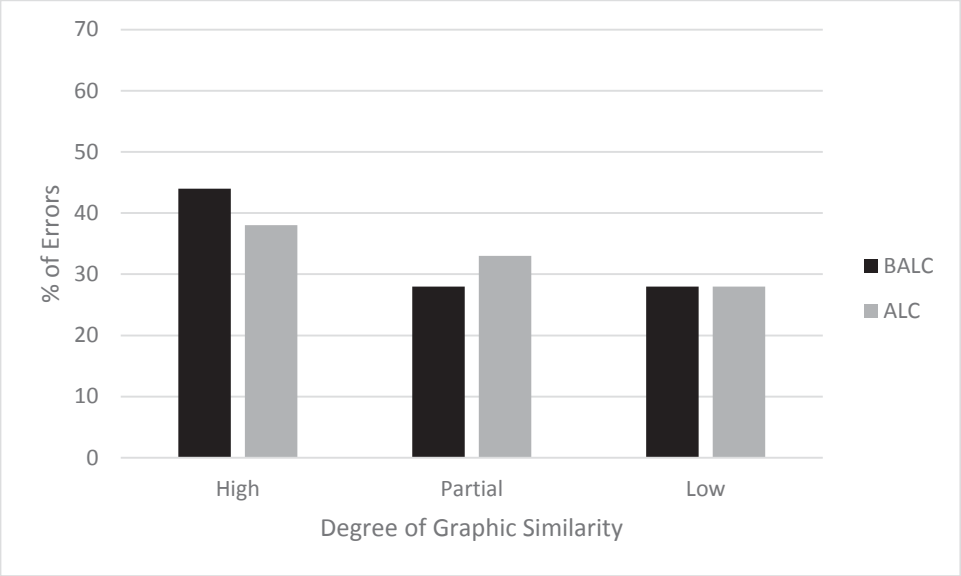

Figure 2. Percentage of errors judged to have high, partial or low graphic similarity made by participants in the BALC group and the ALC group.

Phonemic Similarity. As shown in Table 3, the mean scores for oral reading errors that demonstrated high phonemic similarity were 8.89 (*SD* = 4.71) for the BALC group and 8.06 (*SD* = 4.08) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .57, *p* = .57. The mean scores for oral reading errors that demonstrated partial phonemic similarity were 7.06 (*SD* = 2.69) for the BALC group and 7.94 (*SD* = 2.24) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = 1.08, *p* = .29. The mean scores for oral reading errors that demonstrated low phonemic similarity were 9.06 (*SD* = 5.74) for the BALC group and 9.11 (*SD* = 3.89) for the ALC group. The results of a *t*-test showed that the

mean scores of the two groups did not reveal significant group differences *t(34)* = .03, *p* = .97. The results in Figure 3 show the percent differences in phonemic similarity for the two groups.

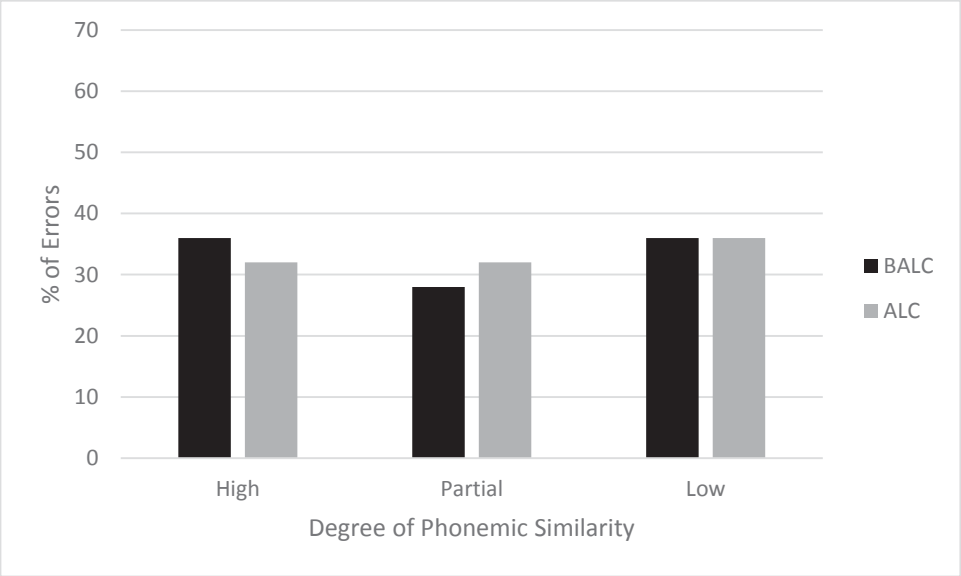

Figure 3. Percentage of errors judged to have high, partial or low phonemic similarity made by participants in the BALC group and the ALC group.

Syntactic Acceptability. As shown in Table 3, the mean scores for oral reading errors that demonstrated high syntactic acceptability were 15.06 (*SD* = 5.63) for the BALC group and 15.89 (*SD* = 2.06) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .59, *p* = .56. The mean scores for oral reading errors that demonstrated partial syntactic acceptability were 3.28 (*SD* = 2.24) for the BALC group and 3.89 (*SD* = 1.91) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .88, *p* = .39. The mean scores for oral reading errors that demonstrated low syntactic acceptability were 6.67 (*SD* = 5.05) for the BALC group and 4.94 (*SD* = 2.31) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group

differences *t(34)* = 1.31, *p* = .20. The results in Figure 4 show the percent differences in syntactic acceptability for the two groups.

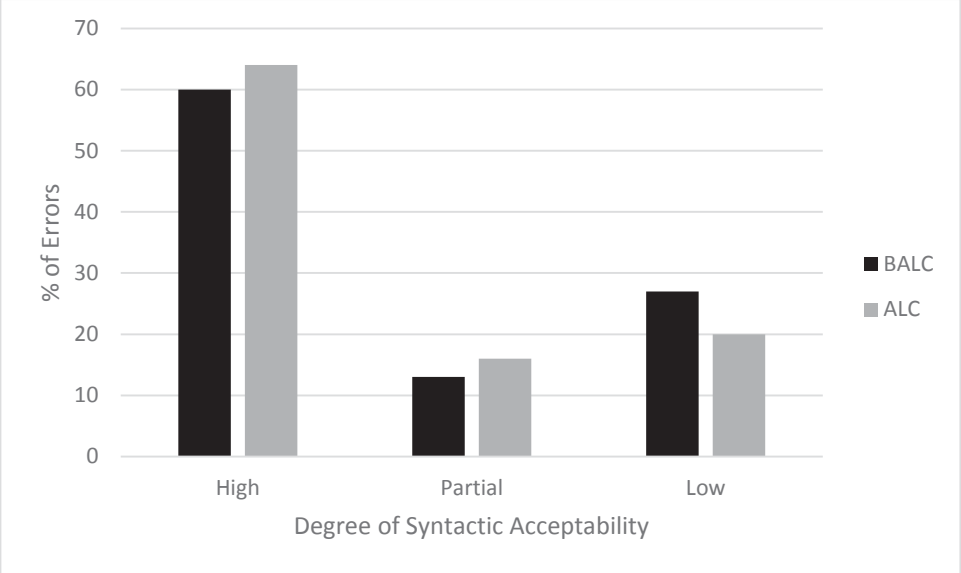

Figure 4. Percentage of errors judged to have high, partial or low syntactic acceptability made by participants in the BALC group and the ALC group.

Semantic Acceptability. As shown in Table 3, the mean scores for oral reading errors that demonstrated high semantic acceptability were 3.50 (*SD* = 2.01) for the BALC group and 4.00 (*SD* = 2.45) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t*(34) = .67, *p* = .51. The mean scores for oral reading errors that demonstrated partial semantic acceptability were 4.11 (*SD* = 2.37) for the BALC group and 4.56 (*SD* = 1.98) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .61, *p* = .55. The mean scores for oral reading errors that demonstrated low semantic acceptability were 17.44 (*SD* = 3.50) for the BALC group and 16.44 (*SD* = 3.45) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group

differences *t(34)* = .86, *p* = .34. The results in Figure 5 show the percent differences in semantic acceptability for the two groups.

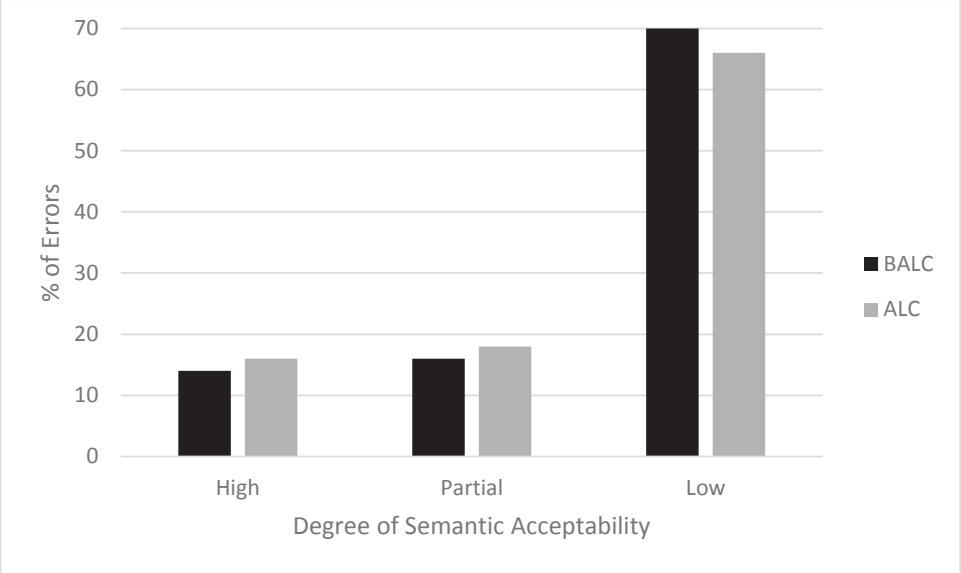

Figure 5. Percentage of errors judged to have high, partial or low semantic acceptability made by participants in the BALC group and the ALC group.

Self-Correction. As shown in Table 3, the mean scores for oral reading errors that demonstrated an accurate attempt to self-correct were 2.56 (*SD* = 2.60) for the BALC group and 2.00 (*SD* = 1.57) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .78, *p* = .44. The mean scores for oral reading errors that demonstrated no attempt or an inaccurate attempt to self-correct were 22.44 (*SD* = 2.60) for the BALC group and 23.00 (*SD* = 1.57) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .78, *p* = .44. The results in Figure 6 show the percent differences in self-correction for the two groups.

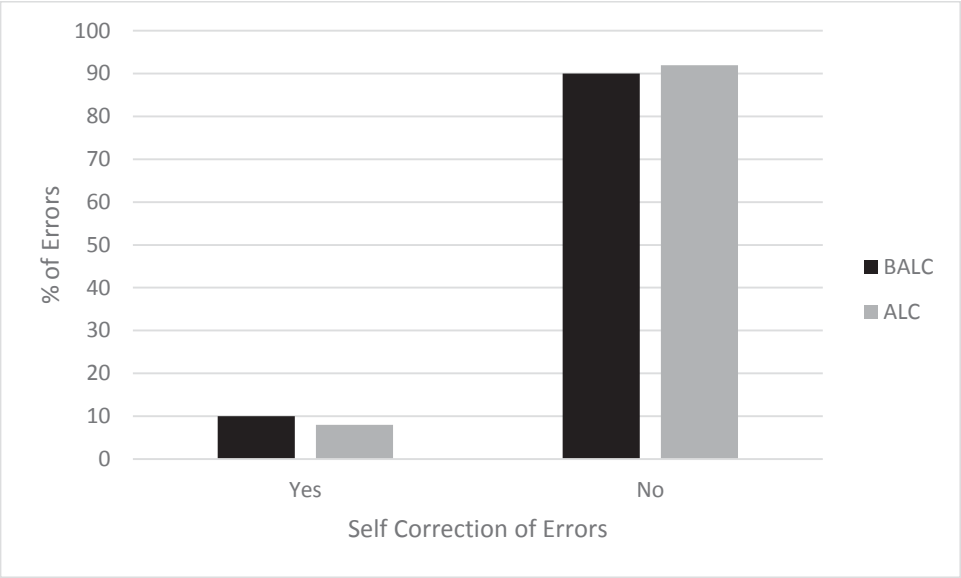

Figure 6. Percentage of errors that were successfully self-corrected (yes) or unattempted/unsuccessfully self-corrected (no) by participants in the BALC group and the ALC group.

Analysis of the oral reading errors made by the participants in the BALC group and the ALC group demonstrated that there were no significant differences between the groups for any types of oral reading errors regardless of whether raw scores or percentile scores were used.

NARA-III Error Categories

NARA-III includes analysis of oral reading errors in the following categories: mispronunciation, substitution, refusal, addition, omission and reversal. The oral reading errors of each participant were coded according to these categories. The NARA-III recommended scoring procedures were followed with raw scores converted into percentages. A *t*-test was used to analyse the data in order to determine whether there were any significant differences in the categories of oral reading errors between the BALC group and the ALC group. Table 4 displays the means, standard deviations, *t*-values and *p*-values of the two groups.

Table 4

Means, Standard Deviations, and Summary Group Differences for Percent Errors in Each Error Category of the NARA-III for the BALC Group and the ALC Group

	Groups					
	BALC ($n = 18$)		ALC ($n = 18$)			
	M	SD	M	SD	*t*	*p*
Mispronunciation	52.31	22.08	46.17	16.41	.95	.35
Substitution	45.11	21.32	49.25	14.12	.69	.50
Refusal	.00	.00	.92	3.13	1.24	.22
Addition	1.19	2.24	1.94	4.57	.63	.54
Omission	1.39	4.22	1.72	3.92	.25	.81
Reversal	.00	.00	.00	.00	-	-

Note. BALC = Below Average Linguistic Comprehension; ALC = Average Linguistic Comprehension.

As shown in Table 4, the percent mean scores for mispronunciation errors were 52.31 (*SD* = 22.08) for the BALC group and 46.17 (*SD* = 16.41) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .95, *p* = .35. The mean scores that demonstrated substitution errors were 45.11 (*SD* = 21.32) for the BALC group and 49.25 (*SD* = 14.12) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .69, *p* = .50. The mean scores demonstrated no refusal errors for the BALC group and .92 (*SD* = 3.13) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = 1.24, *p* = .22. The mean scores that demonstrated addition errors were 1.19 (*SD* = 2.24) for the BALC group and 1.94 (*SD* = 4.57) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .63, *p* = .54. The mean scores

that demonstrated omission errors were 1.39 (*SD* = 4.22) for the BALC group and 1.72 (*SD* = 3.92) for the ALC group. The results of a *t*-test showed that the mean scores of the two groups did not reveal significant group differences *t(34)* = .25, *p* = .81. There were no reversal errors made by participants in either group. While there were differences for mean scores between the groups on all NARA-III error categories, the results of a *t*-test indicated that the differences were not significant. The results in Figure 7 provide a visual analysis of differences in percent errors for the two groups.

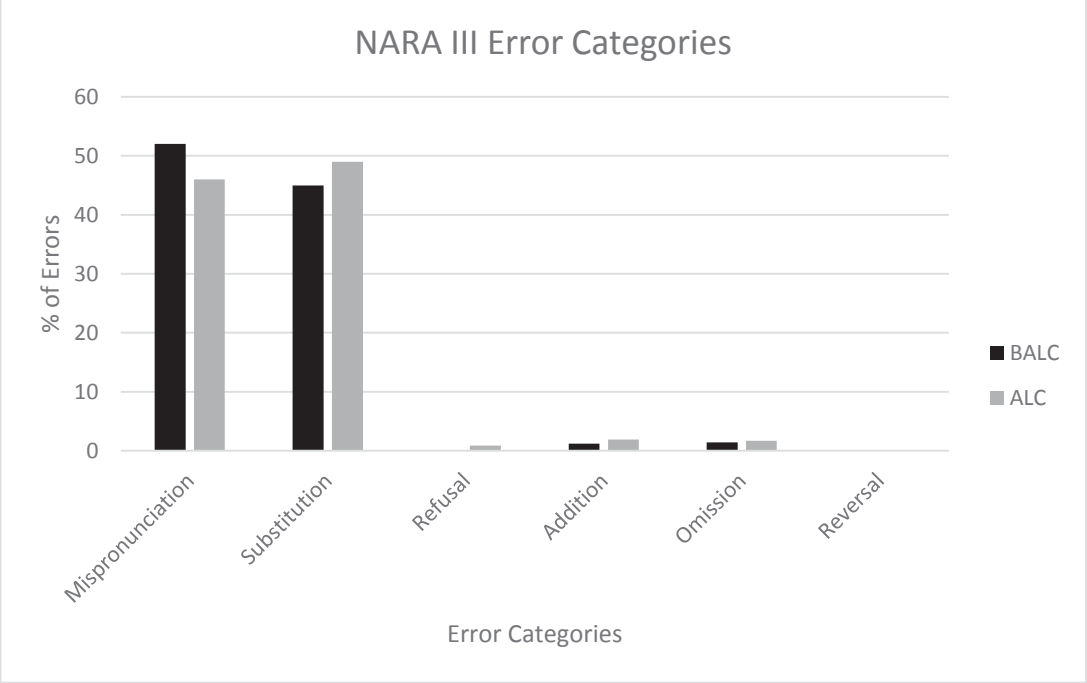

Figure 7. Percentage of errors in each error category of the NARA-III for the BALC group and the ALC group.

Participants with the Highest and Lowest Listening Comprehension Scores

While there were differences for the mean scores between the groups on all measures, the results of a *t*-test indicated that the differences were not significant. In order to investigate whether there were differences in error categories for the participants with the lowest level of linguistic comprehension and the participants with

the highest level of linguistic comprehension, the 36 participants were divided into four groups according to their score on the listening comprehension subtest (Group 1 = participants with lowest listening comprehension score; Group 2 = participants with second lowest listening comprehension score; Group 3 = participants with second highest listening comprehension score; Group 4 = participants with highest listening comprehension score). Table 5 summarises means and standard deviations for the results of the WIAT-II listening comprehension subtest. Analysis of the results demonstrated that there were significant differences between the four groups for the mean scores $F(3,32) = 121.89$, $p < .001$.

Table 5
Means, Standard Deviations, and Summary Group Differences for the WIAT-II Listening Comprehension for Participants Divided into Four Groups According to Level of Listening Comprehension

	Group 1 (n = 9)		Group 2 (n = 9)		Group 3 (n = 9)		Group 4 (n = 9)			
	M	SD	M	SD	M	SD	M	SD	F(3,32)	p
WIAT-II Listening Comprehension	8.00	6.58	21.89	2.47	46.56	11.84	74.11	7.75	121.86	.001

Note. Group 1 = participants with lowest listening comprehension score; Group 2 = participants with second lowest listening comprehension score; Group 3 = participants with second highest listening comprehension score; Group 4 = participants with highest listening comprehension score.

An ANOVA was performed to determine whether there were any significant differences in the types of oral reading errors made by the nine participants with the lowest level of listening comprehension and the nine participants with the highest level of listening comprehension. Table 6 summarises raw score means, standard deviations, F-values and *p*-values for the results of the four categories of oral reading errors for the

four groups of participants. The results demonstrated that there were no significant group differences between the groups on all of the error categories except errors that demonstrated a low level of semantic acceptability. This result held for the nine participants with the lowest score on the listening comprehension subtest and the nine participants with the highest score on the listening comprehension subtest.

Table 6

Raw Score Means, Standard Deviations, and Summary Group Differences for Oral Reading Errors in Each Category for the Participants Divided into Four Groups According to Level of Listening Comprehension

	Group 1 (n = 9)		Group 2 (n = 9)		Group 3 (n = 9)		Group 4 (n = 9)			
	M	SD	M	SD	M	SD	M	SD	F(3,32)	*p*
GrS – High	9.89	6.03	12.00	5.85	10.33	3.57	8.89	4.65	.58	.63
GrS – Partial	6.67	1.58	7.56	3.64	8.33	2.06	8.22	1.72	.92	.44
GrS – Low	8.44	5.50	5.44	5.70	6.33	3.08	7.89	3.89	.79	.51
PhS – High	8.22	5.02	9.56	4.59	8.78	4.30	7.33	3.97	.39	.76
PhS – Partial	6.33	2.29	7.78	2.99	7.44	2.79	8.44	1.51	1.16	.34
PhS – Low	10.44	5.73	7.67	5.75	8.78	4.09	9.44	3.91	.50	.68
SyA – High	14.67	5.29	15.44	6.25	16.44	2.35	15.33	1.66	.26	.86
SyA – Partial	3.11	1.62	3.44	2.83	2.78	1.20	5.00	1.87	2.23	.10
SyA – Low	7.22	4.99	6.11	5.35	5.78	2.91	4.11	1.17	.94	.43
SemA – High	4.33	2.12	2.67	1.58	2.89	2.76	5.11	1.54	2.91	.06
SemA – Partial	4.78	1.86	3.44	2.74	3.67	1.73	5.44	1.88	1.83	.16
SemA – Low	16.00	3.35	18.89	3.18	18.44	2.79	14.44	2.92	4.20	.01
S/C – Yes	3.00	3.24	2.11	1.83	2.00	1.73	2.00	1.50	.44	.73
S/C - No	22.00	3.24	22.89	1.83	23.00	1.73	23.00	1.50	.44	.73

Note. Group 1 = participants with lowest listening comprehension score; Group 2 = participants with second lowest listening comprehension score; Group 3 = participants with second highest listening comprehension score; Group 4 = participants with highest listening comprehension score; GS = Graphic Similarity; PhS = Phonemic Similarity; SyA = Syntactic Acceptability; SemA = Semantic Acceptability; S/C = Self-Corrections; BALC = Below Average Linguistic Comprehension; ALC = Average Linguistic Comprehension.

Summary of Results

The first research question was concerned with whether there were potential differences between the two groups on tests that measured pseudoword decoding, reading accuracy of words in context, reading comprehension, and reading rate. No significant differences were found between the two groups on any of the standardised tests that were administered. The second research question was concerned with whether there were qualitative differences in the types of oral reading errors made by the participants in the two groups. No significant differences were found between the two groups on any types of oral reading errors. The third and fourth research questions were concerned with whether the ALC group made more highly semantic and syntactic oral reading errors. It was hypothesised that the higher level of linguistic comprehension of the participants in the ALC group would support these readers to demonstrate a greater number of highly acceptable semantic and syntactic oral reading errors. Contrary to this hypothesis, analysis of relative acceptability of syntactic and semantic oral reading errors revealed no significant differences between the two groups. In addition, ANOVA was performed to examine whether there were any significant differences in the types of oral reading errors made by the nine participants with the lowest level of listening comprehension and the nine participants with the highest level of listening comprehension. The results demonstrated that there were no significant group differences between the groups on all of the error categories except errors that demonstrated a low level of semantic acceptability. These results will be discussed in the following chapter.

Chapter 5: Discussion

Introduction

Language processes support the development of reading skills (Catts, 1993; Catts, Bridges, Little, & Tomblin, 2008; Gillon & Dodd, 1995; Hartas & Warner, 2000; Siegel, 1992). Hence, it would be expected that the readers in the present study with average or above average linguistic comprehension skills would demonstrate evidence of being able to draw on their more advanced language skills to support their poor decoding skills.

The study addressed the following questions:

1. Are there quantitative differences between the BALC and ALC group on tests that measure pseudoword decoding, reading accuracy of words in context, reading comprehension and reading rate?
2. Are there qualitative differences between the BALC and ALC group in the types of oral reading errors?
3. Do the participants in the ALC group make more syntactically acceptable errors than the participants in the BALC group?
4. Do the participants in the ALC group make more semantically acceptable errors than the participants in the BALC group?

In answering the four research questions posed, standardised reading tests were administered to determine whether quantitative differences existed between the BALC and ALC groups. In addition, the participants' oral reading errors were analysed to determine whether there were qualitative differences in the errors made by the participants in each group. This study moved beyond tallying total numbers of errors. Instead, the degree of graphic and phonemic similarity, and syntactic and semantic acceptability of oral reading errors were analysed.

However, the results demonstrated no significant differences between the performance of the BALC and ALC groups on standardised tests used to measure pseudoword reading, reading accuracy of words in context, reading comprehension, and reading rate. These results indicated that an adequate level of linguistic comprehension did not reveal evidence of supporting the readers' reading comprehension, reading rate, or word reading accuracy when reading pseudowords or words in context. Additionally, the results demonstrated no significant differences between the BALC and ALC groups in relation to the types of oral reading errors. This suggests that the participants with higher levels of linguistic comprehension were not able to benefit from their more advanced language skills to support their poor decoding skills.

Whole Language and Reading Recovery

Whole language is a philosophy of literacy teaching that is grounded in a constructivist approach. Reading is viewed as "a psycholinguistic guessing game [involving] an interaction between thought and language" (Goodman, 1967, p. 127). The reader seeks to actively construct meaning from the text by drawing on experiential knowledge and knowledge about language (Goodman & Burke, 1972). Emphasis is placed on the use of syntactic and semantic cues to make predictions while graphophonic cues are used to confirm that the predictions make sense. The reader's "sense of syntactic structure and meaning makes it possible to predict the graphic input so he is largely selective, sampling the print to confirm his prediction" (Goodman, 1973, p. 9). Hence, reading instruction grounded in a constructivist approach emphasises the teaching of contextual cues to support word identification (Johnson & Baumann, 1984).

If, as maintained by whole language proponents, a reader's level of linguistic competence is of primary importance during the reading process, it would be expected

that when comparing readers with different levels of linguistic comprehension, the readers with higher linguistic levels would demonstrate evidence of more semantically and syntactically acceptable oral reading errors. However, the results of this study suggest that poor decoders with ALC are not able to make use of their stronger language skills when decoding texts. A lack of significant differences between the BALC and ALC groups on any measures, including syntactic and semantic oral reading errors, challenges the assumption of the constructivist approach regarding the central role of linguistic competence to support the reading process (Goodman, 1969; Smith, 1976).

In the present study, students with ALC abilities did not make better predictions than the students with BALC abilities. This finding is concerning given the whole language model of literacy teaching and learning that has been the mainstay in New Zealand junior classrooms since the 1980s (Chapman, Tunmer, & Prochnow, 2001; Nicholson, 2000; Smith & Elley, 1994). Of further concern is that 9 of the 18 participants in the ALC group of the present study had been enrolled in the Reading Recovery programme. This widely implemented literacy intervention programme is designed to complement the whole language approach to teaching reading (Reynolds & Wheldall, 2007). Consequently, Reading Recovery is teaching an instructional strategy of which poor decoders cannot make use, even if they have adequate linguistic comprehension skills.

Reading Recovery. Although the government spends $40 million annually on Reading Recovery (Tunmer et al., 2013), the gains made by students at discontinuation from the programme disappear after one to two years (Chapman et al., 2001; Glynn, Bethune, Crooks, Ballard, & Smith, 1992; Jesson & Limbrick, 2014; Nicholas & Parkhill, 2014). Furthermore, the programme appears to be unavailable, and of limited benefit, to students struggling the most with reading (Center, Wheldall, & Feeman, 1992; Chapman, Greaney, & Tunmer, 2007; Chapman & Tunmer, 2011; Elbaum et al.,

2000; Reynolds & Wheldall, 2007), in particular Maori and Pasifika students and those from lower socio-economic backgrounds who form a disproportionate percentage of at-risk readers (McDowell, Boyd, Hogden, & van Vliet, 2005). This population is more likely to be 'referred on' from Reading Recovery due to inadequate progress (Tunmer et al., 2013). In the present study half of the participants had been enrolled in Reading Recovery. It appears that these children have not benefitted sufficiently from the programme to enable them to decode at an average reading level for their age. All of these children were reading at least 1½ years below their chronological age, with some children reading up to 4½ years below their chronological age. The results of the present study appear to support the finding that the effects of Reading Recovery are not sustained long-term for a significant percentage of students who have been enrolled in the programme.

Whole language. The participants in the present study have all been taught to read in classrooms in which whole language is the dominant approach to literacy instruction. The whole language approach views learning to read as a naturally occurring process, similar to learning to speak (Smith & Elley, 1994). It is argued that the ability to decode using word-level information occurs inductively when the student engages in reading (Nicholson, 2009). Reading is taught by encouraging the use of semantic-syntactic context for word reading. Readers are encouraged to flexibly use multiple cues to predict, check, and confirm an unfamiliar word (Clay, 1993b). These cues include semantic (does it make sense?), syntactic (does it sound right?), visual (does it look right?), textual features such as layout and shape, prior knowledge and, graphophonic. The latter involves using word-level information such as sounding out letter clusters or, if necessary, single letters. It is recommended that graphophonic cues are to be used as a last resort for confirmation of predictions. Whole language proponents insist that if

readers rely too heavily on word-level cues, this will divert their attention away from comprehension **(**Goodman, 1992)**.** While this approach to reading instruction has been found to be adequate for children displaying stronger reading skills (Connor et al., 2004; Connor et al., 2009; Juel & Minden-Cupp, 2000), the whole language approach is not effective for teaching reading to struggling readers, children with low levels of literate cultural capital (i.e. early literacy experiences) and those with limited pre-reading skills (Tunmer et al., 2006; Tunmer & Nicholson, 2011).

> … the most disturbing conclusion that comes from this [whole language] research is that teaching children to decode by giving primacy to semantic-contextual and syntactic-contextual cues over graphemic-phonemic cues is equivalent to teaching them to read the way weak readers read! (Pressley, 2006, p. 164)

For children who struggle with reading, learning to read is environment-dependent (Byrne, 2005; Juel & Minden-Cupp, 2000). Due to limited reading-related skills and knowledge, these children require explicit and systematic instruction. Compared to readers making typical progress, research indicates that readers struggling with decoding are less able to successfully discover letter-sound patterns (Torgesen, 2002). Consequently, poor readers rely on inefficient word identification skills (Tunmer & Nicholson, 2011). There is a substantial body of research evidence to indicate that these children require systematic and intensive instruction in phonologically-based decoding skills in combination with text reading (Fuchs, Compton, Fuchs, Bryant, & Davis, 2008; Tunmer et al., 2013; Vadasy, Sanders, & Abbott, 2008; Vellutino, 1991; Wanzek & Vaughn, 2007). Moreover, beginning readers, particularly those struggling with reading

acquisition, require explicit instruction in alphabetic coding skills and phonemic awareness (Adams, 1990; Ehri, Nunes, Stahl, & Willows, 2001; Pressley, 2006; Torgesen et al., 1997; Tunmer & Prochnow, 2009). The results of the present study provide some support for these arguments. The results indicate that the students with ALC were unable to make use of context cues to support their weak decoding skills. This suggests that improving the decoding skills of poor decoders, regardless of level of linguistic comprehension, will require more direct phonological decoding instruction.

The results of the present study provide support for the argument that New Zealand's approach to literacy teaching, and the design of the principal intervention programme available for struggling readers, do not adequately support children struggling with reading (Chapman et al., 2001). In addition, results from international studies used to monitor the literacy achievement of New Zealand students indicate that New Zealand's widening spread of literacy scores and long tail of literacy underachievement have become increasingly apparent (Elley, 2004; Greaney & Arrow, 2012; Tunmer et al., 2013). Results from the Programme for International Student Assessment (PISA), a triennial assessment that began in 2000 with the purpose of assessing the performance of 15 year old students in reading, mathematics and science, show that New Zealand's average mean reading score has dropped from 529 in 2000 to 512 in 2012 (Ministry of Education, 2012). Furthermore, results demonstrate that New Zealand has one of the greatest proportions of students performing at the lower literacy levels, with Maori and Pasifika students overrepresented in this group (Ministry of Education, 2012). Results from the Progress in International Reading Literacy Study (PIRLS) in 2001, 2006, and 2011 support the findings of PISA. This study of reading literacy achievement of Year 5 students was first administered in 2001 in 35 countries, and has continued on a five year cycle of assessment (IEA, 2013). The overall score of New Zealand students has fallen

in the ranking of participating countries. In 2001, New Zealand scored 13 out of 35 countries. In 2011, New Zealand's score dropped to 23 out of 45 participating education systems. Results from PIRLS 2011 identified a significant gap between the highest and lowest performing New Zealand students. It was found that the standard deviation between the 5th and 95th percentile was particularly large for New Zealand students, with only 7 out of 45 countries recording a larger standard deviation (Tunmer et al., 2013). If New Zealand is to address the long tail of literacy underachievement, it is necessary to implement classroom programmes for underachieving students that have a different emphasis than the current whole language approach.

Subgrouping Poor Decoders

It is neither valid nor useful for the purposes of intervention to subgroup poor decoders (Aaron, 1997; Fletcher et al., 1992; Shaywitz et al., 1992; Stanovich, 1993, 2005; Stanovich & Siegel, 1994; Tal & Siegel, 1996). Studies examining the decoding skills of poor readers by comparing those with and without an IQ-discrepancy have found that poor readers show similar performance on a range of phonological processing tasks (Felton & Wood, 1992; Fredman & Stevenson, 1988; Savage, 2001; Stanovich & Siegel, 1994; Tal & Siegel, 1996). Furthermore, the cognitive profiles of both groups tend to be more similar than different (Fletcher et al., 1994; Francis et al., 1996; Siegel, 1988). Tal and Siegel (1996) examined whether IQ-discrepant poor readers and IQ-nondiscrepant poor readers made different or similar types of phonological decoding errors. It was found that the two groups made the same number of errors and there were no significant differences in the types of errors made between the two groups. Stuebing et al. (2012) conducted a meta-analysis review of 46 studies to examine the validity of using an IQ-discrepancy approach for classification of readers. It was found that IQ-discrepant and IQ-nondiscrepant poor readers displayed similar

difficulties with reading-related abilities such as phonological awareness, rapid naming, vocabulary, and short-term and working memory. Results demonstrated a strong overlap of cognitive ability, and the overall difference was approximately three-tenths of a standard deviation. If the reading subskills of the BALC and ALC groups are similar, there appears to be no reason to differentiate between the groups for the purposes of remediation (Stanovich, 1991). Furthermore, subgroups based on IQ scores have not been helpful to differentiate between the effectiveness of remediation, and have proven to be an invalid predictor of potential (Lyon, 2005; Siegel, 1988; Snowling, 2008; Stanovich, 1994; Vellutino et al., 2000).

The present study subgrouped poor decoders according to level of linguistic comprehension. This discrepancy approach was based on the subgrouping of readers with reading difficulties in the SVR model. In addition, this discrepancy has been used in studies that suggest that poor decoders display qualitative differences in their decoding skills according to their level of linguistic comprehension (Gough & Tunmer, 1986; Hood & Dubert, 1983; Hoskyn & Swanson, 2000; Spring & French, 1990; Stanovich, 1991; Tunmer & Chapman, 2007). Moreover, the phonological-core-variable-difference model (Stanovich, 1988, 1991) supports the subgrouping of poor decoders based on a discrepancy. This model posits that all poor decoders display weaknesses in the phonological domain, however, the reading problems of poor decoders with average linguistic comprehension are greater due to a specific impairment in the phonological domain. According to this model, the reading difficulties of poor decoders with BALC are attributed to broader linguistic weaknesses.

The results of the present study do not support this model when used to categorise readers for remediation. The results revealed no significant qualitative differences in any categories of oral reading errors between the BALC and ALC groups. Furthermore,

no significant differences were found between the groups on standardised reading tests used to assess pseudoword decoding skills, reading accuracy of words in context, reading comprehension and reading rate. This finding does not support the use of a discrepancy approach based on linguistic comprehension to subgroup poor decoders for the purposes of intervention. The results lead to the conclusion that all children struggling with decoding, regardless of their level of linguistic comprehension, require intervention focused primarily at the word-level. The findings of this study support the view proposed by Aaron (1997) and Siegel (1989) that the majority of reading difficulties should be defined on the basis of poor decoding. Thus, intervention must focus primarily on weak decoding skills. This view is supported by research demonstrating that poor decoders with BALC benefit from the same word recognition intervention as poor decoders with ALC (Bird, Cleave, & McConnell, 2001; Catts et al., 2003; Hatcher & Hulme, 1999; Torgesen, Wagner, Rashotte, Rose, Lindamood, Conway, & Garvan, 1999; Vellutino et al., 2000).

Semantic and Syntactic Knowledge

The present study hypothesised that poor decoders with ALC would demonstrate a greater number of highly acceptable semantic and syntactic oral reading errors compared to poor decoders with BALC. Research has suggested that syntactic and semantic knowledge support success in the development of reading skills (Vellutino et al., 2004). Semantic and syntactic components of language assist a reader to use context to support word identification (Stanovich, 1980). For example, a reader will experience less difficulty reading a word when it is in his or her speaking vocabulary (Vellutino et al., 1995). When a reader decodes by primarily using spelling-to-sound relationships, context is a helpful strategy to support identification of partially decoded and irregularly spelled words (Tunmer et al., 2006).

The interactive-compensatory model proposes that linguistic context facilitates word identification (Stanovich, 1980). Furthermore, it has been found that when decoding processes are weak, the system compensates by drawing on information from contextual sources. It has been found that poor readers rely more on context than good readers due to a lack of skill in using word-level information to decode (Iversen et al., 2005; Nicholson, 1991; Tunmer & Nicholson, 2011). However, the degree of contextual facilitation depends on the difficulty of the target word, the difficulty of the text, and the decoding ability of the reader (Stanovich, 1986). Thus, contextual facilitation is limited when a reader has poor decoding skills. A study by Stanovich et al. (1984) assessing the accuracy of the word recognition skills of good and poor 6 and 7 year old readers found that the good readers demonstrated greater contextual facilitation. However, when the less skilled readers were reading material at their reading level, they displayed evidence of more contextual facilitation than the skilled readers. The authors surmised that the more able readers were less reliant on contextual support due to a wider range of processing skills used to assist their word recognition skills. The participants in the present study with BALC and ALC demonstrated no significant differences in their use of contextual information. It appears that the low levels of decoding skills of both groups made it impossible for contextual cues to be of benefit and support word recognition. According to the interactive-compensatory model, the poor decoding skills of the participants in both groups resulted in limited contextual facilitation.

Automaticity and Fluency

A number of theories contribute to an explanation of possible reasons for the lack of evidence to indicate that the poor decoders with ALC were able to benefit from more advanced linguistic skills to support their decoding skills. Success in reading relies on the reader having sufficient attentional resources available for decoding and reading

comprehension (Cain & Oakhill, 2011; Samuels, Schermer, & Reinking, 1992). However, there is a limited amount of attention a reader has available for the two tasks. Readers who struggle with decoding skills are likely to focus all their effort on decoding unfamiliar words leaving minimal resources available to integrate meaning from semantic and syntactic cues (Hartas, & Warner, 2000). Conversely, when a reader can read automatically, decoding requires less attention and effort, thus leaving sufficient attention for comprehension (Tan & Nicholson, 1997). Evidence suggests that to improve reading comprehension, it is more efficient to improve decoding skills than it is to improve general knowledge and language skills (Nicholson, 2000). Students in both groups in the present study had low levels of decoding skill, passage comprehension, and reading speed. This finding has implications for the present study suggesting that the participants with poor decoding skills, regardless of level of linguistic comprehension, require remediation that focuses primarily on their word recognition skills.

The importance of working memory for language processing has been demonstrated in numerous studies (e.g., Baddley, 2012). Working memory allows the reader to maintain associations between letters and sounds while processing new associations in order to make connections (Compton, Fuchs, Fuchs, Lambert, & Hamlett, 2011). A strong relationship has been found between reading comprehension problems, below average word recognition skills, and poor working memory (Christopher et al., 2012; Perfetti, 1986; Perfetti & Lesgold, 1979; Swanson, Howard, & Saez, 2006). Perfetti (1984) offered the verbal efficiency hypothesis which suggests that the majority of reading comprehension difficulties experienced by readers are due to limitations in the efficiency of word recognition and working memory. When lower level processes (i.e.,

word recognition and working memory) demand more resources, this leaves limited resources for higher level processes (i.e., comprehension).

There is a distinction made between decoding accuracy and efficient word-level processing. Accurate decoding is not necessarily sufficient for adequate reading comprehension. When decoding is slow and inefficient, there is a decay of the information stored in short-term memory, thus preventing integration of the information from the text and assimilating it with linguistic knowledge (Marslen-Wilson & Tyler, 1980). Perfetti (1986) investigated the word identification skills of children who presented with poor reading comprehension. He found that, although the children appeared to have no difficulties with word recognition, their word identification speed was below average. He theorised that this was due to their working memory requiring a disproportionate amount of processing capacity while decoding, leaving little capacity for reading comprehension. Perfetti (1986) referred to working memory existing as a 'bottleneck' in reading comprehension. He argued that skilled reading does not require a larger capacity for working memory, rather, it requires efficient use of working memory. These difficulties appear to apply to the students in the present study. In addition to low levels of decoding skills, the participants' reading speed and reading comprehension were below average.

The participants in the present study with ALC did not demonstrate evidence of benefiting from their higher linguistic levels. There were no significant differences between the two groups in the number of highly similar and acceptable graphic, phonemic, semantic and syntactic oral reading errors, or self-corrections. The problems faced by the students in this study are explained by the verbal efficiency hypothesis (Perfetti, 1984), and studies examining the role of the central executive in reading (Carretti, Borella, Cornoldi, & De Beni, 2009). It appears that the effort involved in

decoding places a heavy load on the attention and memory of poor decoders. Consequently, processing capacity is focused solely on decoding, leaving insufficient resources to attend to grammatical structures and generate meaning (LaBerge & Samuels, 1974). A study that evaluated the performance of typical and poor readers on syntactic tasks found that both groups performed at similar levels when a heavy load was not placed on working memory (Mann, Shankweiler, & Smith, 1984).

With parallels to the verbal efficiency hypothesis, the phonological processing limitation hypothesis (Shankweiler & Crain, 1986) accounts for the difficulty experienced by poor readers to utilise semantic and syntactic cues to support their reading. This theory proposes that poor text comprehension is due to difficulty accessing a phonological representation on account of a phonological 'bottleneck'. Consequently, this places a heavy demand on working memory and difficulty retaining information in short-term memory. It was found that children with decoding difficulties displayed deficits in short-term recall of phonological information and an inability to understand complex sentences (Shankweiler & Crain, 1986). Ramus and Szenkovits (2008) have contributed to this theory by positing that short-term memory and retrieval speed demands cause reading difficulties and contribute to reading comprehension problems. This hypothesis presents an explanation for the lack of highly acceptable syntactic and semantic errors made by the participants in the ALC group in the present study.

Another model of interest that conceptualises word recognition processes is the connectionist model (Plaut, McClelland, Seidenberg, & Patterson, 1996). This model describes word recognition as involving parallel processes: a phonological pathway that involves phonological and orthographic representations, and a semantic pathway that involves contextual and linguistic knowledge. The model holds that if one of these

pathways is weak, the other will demonstrate evidence of compensating. In the early stages of reading, the phonological pathway requires a greater proportion of resources to establish connections between phonology and orthography (Nation, 2005). However, the participants in the present study were not in their early stages of reading. Rather, they had been receiving formal reading instruction for between three and seven years. According to the connectionist model, the participants in this study with ALC would be expected to utilise their stronger vocabulary and semantic knowledge to support the semantic pathway. However, analysis of the oral reading errors of the ALC group did not show evidence of the semantic pathway compensating for their poor decoding skills. This would suggest that weak decoding skills prevent a reader from engaging in comprehension processes.

The results from the present study are consistent with Gough's (1996) 'false friend' hypothesis. This hypothesis describes context as being available when a reader does not need support and unavailable when a reader does need support. Students in the present study, even those with stronger linguistic comprehension skills, were unable to activate context cues sufficiently to make more accurate guesses when faced with unfamiliar words. This appears to be due to their decoding skills being too poor to allow a close graphic approximation to the words in the text.

Matthew Effects

Models that attribute poor decoding to phonological processing difficulties in working and short-term memory also reflect negative Matthew effects (Stanovich, 1986). Matthew effects describe the phenomenon whereby early reading success has cumulative advantages for readers, while early reading difficulty has cumulative disadvantages. This theory contends that skilled readers engage in more reading opportunities due to reading success, thus facilitating practise of reading skills. This

additional practise results in a reader's skills and processes, such as the ability to efficiently process phonological information in working memory, becoming more efficient (Tunmer & Chapman, 1996). Readers who experience reading success benefit from positive Matthew effects in a relationship of reciprocal causation (Tunmer & Chapman, 2007). Increased reading experience results in advantages in a range of language and cognitive abilities such as vocabulary growth (Stanovich et al., 1984); the development of verbal working memory (Ellis & Large, 1987) and phonological processing in short-term memory (Ellis, 1990); improvement in comprehension skills such as integration and inference (Cain & Oakhill, 2011); increases in reading fluency (Samuels, 2002); improved semantic skills (Vellutino et al., 1995); an expanded knowledge base that facilitates further learning (Stanovich, 1986); and positive motivational outcomes that result in selection of more challenging texts, increased reading, and perseverance (Quirk, Schwanenflugel, & Webb, 2009). Conversely, poor readers have been shown to read less, thus engaging in decreased opportunities to practise reading skills (Biemiller, 1977; Cain & Oakhill, 2011; Catts et al., 2012; Juel, 1988). Consequently, readers who experience difficulty with the reading process experience a "causal chain of escalating negative side effects" (Stanovich, 1986, p. 275). The resulting lack of reading practise delays the development of fluency and speed, and decreases exposure to new vocabulary and advanced grammatical and discourse knowledge (Stanovich, 1986). Additionally, reading failure can lead to negative self-perceptions of success, poor motivation, and behaviour issues (Butkowsky & Willows, 1980; Chapman & Tunmer, 2003).

The results of the present study suggest that the participants' poor decoding skills may be a result of negative Matthew effects due to a lack of reading practise. Consequently, this has caused impaired comprehension processes. Decoding deficits

result in poor lexical representations in semantic memory which prevent access to word meanings that support decoding and comprehension. Furthermore, inefficient word identification processes require excessive mental resources that are devoted to word identification rather than comprehension. Consequently, insufficient resources are available for comprehension processes that utilise syntactic and semantic cues. Due to the effort required for reading, according to Matthew effects, the participants' poor decoding skills have cumulative disadvantages due to less opportunities to improve their reading skills.

Determining the underlying cognitive processes that play a role in reading difficulties has proven challenging, and research in this area is in its infancy (Vidyasagar & Pammer, 2010). While a significant amount of evidence indicates that phonological deficits play a central role in reading difficulties, research continues to demonstrate that visual, auditory and attentional factors also play a role (Blau, van Atteveldt, Ekkebus, Goebel, & Blomert, 2009; Peterson & Pennington, 2012). In a study examining a range of neurocognitive factors (e.g., phonological skills, selected and sustained attention, visual processing, executive function) in poor and good readers, it was found that 18.3% of the poor readers displayed only phonological deficits while 76.6% of the poor readers displayed phonological and other cognitive impairments (Menghini, Carlesimo, Marotta, Finzi, & Vicari, 2010). A study examining the aetiology of reading difficulties and attention deficit hyperactivity disorder concluded that reading difficulties represent "a multifactorial aetiology that leads to multiple correlated cognitive weaknesses" (Willcutt et al., 2010, p. 1356). The present study did not look at these possible causal factors as they were not the main focus of the study.

Despite research evidence to indicate that many children with weak decoding skills demonstrate difficulties with working and short-term memory, these studies have not

adequately informed intervention (Elliott & Grigorenko, 2014). This may be due to the complexity of the factors involved in working memory, short-term memory, and word recognition skills (Laasonen, Virsu, Oinonen, Sandbacka, & Salakari, 2012). Interventions that are designed to support reading performance by directly addressing working and short-term memory have reported short-term gains and have failed to generalise to academic performance (Redick et al., 2013; Shipstead, Redick, & Engle, 2012). Additionally, while perceptual and attentional processes have been associated with reading difficulties (Amitay, Ben-Yehudah, Banai, & Ahissar, 2002), it is unclear whether these processes play a causal role or co-occur with reading problems (Pennington & Bishop, 2009). Again, the present study did not look at these possible causal factors as they were not the main focus of the study.

Implications and Recommendations

The findings of the present study have educational implications for the remediation of reading difficulties. The lack of significant differences between the two groups on standardised reading tests and in a comparison of oral reading errors suggests that, regardless of the reader's level of linguistic comprehension, children who struggle with decoding require intervention focused primarily on developing efficient and automatic word recognition skills. Once decoding becomes more efficient, mental resources are available for comprehension (Nation, 2005). Furthermore, when a reader relies primarily on grapheme-phoneme relationships to decode, context is a helpful strategy that can be used to identify partially decoded and irregularly spelled words, and confirm hypotheses (Tunmer et al., 2006). The present study did not examine examples of context supporting decoding because the participants were unable to decode unfamiliar words to a level at which they were able to make use of context. It is unclear the level at which decoding skill is required for context cues to provide support. Tunmer and

Chapman (1999) reported the results of a study in which context enabled the child to accurately read partially decoded attempts like “stowmatch” when the context was helpful, e.g., “The football hit her in the stowmatch”. In view of the present results for poor decoders, readers with a higher level of decoding skill may be necessary to benefit from contextual support.

How to teach word recognition skills is a contentious issue. Code-emphasis and meaning-emphasis approaches to instruction have been the subject of the ‘great debate’ (Chall, 1967) for several decades (Center, Freeman, & Robertson, 2001). A meta-analysis of reading intervention studies found that systematic phonics instruction had the greatest effect on decoding, sight word reading, and reading comprehension than other forms of instruction such as whole language and whole word approaches (Ehri et al., 2001). Most poor readers can successfully be taught phonological decoding skills and make gains in reading through participation in evidence-based intervention programmes (Lovett & Steinbach, 1997; Moats & Foorman, 1997; Torgesen et al., 1997). Evidenced-based instructional components include explicit, systematic instruction in phonological decoding, alphabetic coding skills and word-level strategies, with opportunities to practise skills in isolation and while reading connected text (Slavin, Lake, Chambers, Cheung, & Davis, 2009; Vellutino et al., 2004). In addition, repeated reading of text has been found to increase the speed of word recognition by facilitating an increase in the length of the unit of identification from letter-by-letter processing to automatic processing of whole words (Perfetti & Hart, 2001). Early intervention for at-risk readers is essential to minimise reading difficulties (Scanlon, Vellutino, Small, Fanuele, & Sweeney, 2005; Vellutino et al., 1996; Vellutino et al., 2000). Furthermore, due to the increasing text demands as children get older, and the reader’s changing needs over time (Leach, Scarborough, & Rescorla, 2003; O'Connor,

Fulmer, Harty, & Bell, 2005), those who continue to struggle with reading require structured and systematic interventions (Slavin, Lake, Davis, & Madden, 2011). The results of the present study suggest that the main intervention required for these children is instruction in decoding skills. However, this finding requires investigation by further research.

Focusing intervention on word recognition skills is not to minimise the importance of developing language skills. Increasing vocabulary size and knowledge supports the ability to decode unknown words and provides the reader with access to word meanings and conceptual structures (Connor et al., 2004; Scarborough, 1991; Snowling et al., 2003). Furthermore, improving syntactic knowledge assists with the reader's understanding of the grammatical structure of the text. The importance of language skills is demonstrated by the reciprocal relationship between linguistic comprehension, vocabulary skills, and reading comprehension (Berger & Perfetti 1977; Perfetti & Hogaboam, 1975; Verhoeven & Van Leeuwe, 2008). Linguistic skills and knowledge ease the cognitive load by turning comprehension into a task of recognition rather than a task requiring problem-solving (Perfetti & Lesgold, 1979). The importance of improving linguistic skills is further supported by evidence demonstrating that as word recognition skills improve, reading comprehension becomes constrained by level of linguistic comprehension (Verhoeven & Van Leeuwe, 2008). The results from the present study suggest that developing language skills is not as important as developing decoding and word recognition skills for struggling readers. This is supported by the results indicating that the ALC group were not supported by their linguistic advantage when decoding.

While the poor decoders in the present study represent a heterogeneous group, it is important to consider the implications of subgrouping poor decoders. There is an

assumption that subgrouping is beneficial for the purposes of appropriate intervention. This is due to the assumption that qualitative differences exist between the groups, and there is variance in their long-term prognosis of reading ability. However, other research demonstrates that poor decoders with BALC benefit from the same intervention focused on word recognition skills as poor decoders with ALC (Torgesen et al., 1999; Vellutino et al., 2000). Thus, for the purposes of informing intervention designed to improve decoding skills, research does not support the subgrouping of poor decoders. The recommendation not to separate poor readers into categories according to their linguistic skills is supported by the results of the present study. Neither group of poor decoders was able to make more qualitatively accurate guesses of words despite one group having higher levels of linguistic comprehension.

Poor readers exist on a continuous distribution rather than distinct categories (Catts et al., 2003). Consequently, subgrouping poor decoders requires the establishment of criteria and cut-off scores. Imposed boundaries often result in the creation of exclusionary factors. While controversial, common definitions of dyslexia include exclusionary factors such as low intelligence, sensory impairment, socio-economic disadvantage, poor schooling, and emotional/behavioural factors (Fletcher, 2009; Lyon, 1995). Consequently, this raises equity issues - those who do not meet the criteria are denied access to resources. For example, an exclusionary factor such as socio-economic disadvantage results in children from disadvantaged regions not having access to the same support as children from higher socio-economic areas. There is no evidence to currently support differentiating between children who struggle with reading due to neurobiological or environmental factors (Elliott & Grigorenko, 2014). Excluding some poor readers from access to support, and creating differential forms of intervention and expectations, creates an inequitable system and has no moral or theoretical justification.

Furthermore, subgrouping poor decoders based on exclusionary factors may have grave ramifications for the individual and society. In the present study, both groups of poor decoders were from mid to high socio-economic areas. Neither group had superiority over the other in the qualitative nature of their reading errors. This suggests that discriminating on the basis of linguistic skills, which is often used as an indicator of socio-economic status and is implicit in the SVR, would not make any difference for the purposes of remediation. It appears that both groups have the same fundamental issues of poor decoding and require instruction that is focused on decoding rather than language.

A needs-based approach allows intervention to be designed to support the child's identified areas of need. This is particularly important due to the multiple deficits associated with reading difficulties. Exposure to a high quality classroom reading programme may not adequately support progress in reading (Mathes, et al., 2005; McCandliss et al., 2003). Response to Intervention (RTI) is an approach that provides early identification of students with persistent reading difficulties and evidence-based intervention (Al Otaiba et al., 2011; Wanzek & Vaughn, 2008). RTI offers successive tiers of increasing intensity of support with ongoing assessment to monitor a child's progress (Deshler, Mellard, Tollefson, & Byrd, 2005; Fuchs & Fuchs, 2006; Snowling & Hulme, 2011; Tunmer & Greaney, 2008; Vaughn, Denton, & Fletcher, 2010). This approach removes the focus of the problem from being located within the child to focus on the child's response to the current intervention (Fletcher & Vaughn, 2009; Fuchs & Fuchs, 2009). In the present study, the appropriate response would be to provide intensive instruction in decoding and word identification skills for both groups in order to provide the students with the skills that good readers have in abundance. In contrast, the present literacy curriculum in New Zealand emphasises linguistic skills. This may

not be a helpful response to the needs of poor decoders. Furthermore, this raises the question as to whether instruction for poor readers should be different to the regular classroom approach that is currently used in New Zealand. It appears that, instead of focusing on giving primacy to context cues, instruction should focus on teaching decoding ability.

Limitations of the Present Study

It is necessary to consider the limitations of the study when generalising the results. The results of this study revealed no significant differences between the groups in the use of graphic, phonemic, semantic, and syntactic cues when readers identified unfamiliar words. A result that shows no significant differences does not mean that differences do not exist, merely that they were not found in the present study. A second limitation was that random sampling was not used to select the participants for the study. Instead, participants with poor decoding skills were identified by their teachers based on reading assessment results. Third, the participants were from mid to high socio-economic schools which is not representative of all schools in New Zealand. However, this was also a strength of the study in that socio-economic differences did not confound the results. A fourth limitation was that the sample was limited in size to a total of 36 participants and there were 18 participants in each group. To avoid a Type II error, sample size is important to ensure statistical power. A larger sample would have had more power and may have produced statistically significant differences that were not found in this study. However, the sample size used in this study was similar to the sample size in other studies examining oral reading errors (Gillam & Carlile, 1997; Laing, 2002; Thomson, 1978; Warde, 2005). A fifth limitation was the age range of the participants. The range in age from 8 years 4 months to 12 years 5 months may have affected the results. A sixth limitation was that due to the relatively small number of

participants, gender, age, and ethnicity analyses were not performed. It would be worthwhile for future studies to examine the differences between poor decoders with ALC or BALC from diverse backgrounds and differentiated by gender. A seventh limitation was the measure used to assess linguistic comprehension. While the assessment consisted of a standardised test with high reliability, it was a relatively short test of receptive and expressive vocabulary, and sentence comprehension. Future studies could include an extended text to assess of linguistic comprehension.

An eighth limitation of the present study related to the use of miscue analysis. The use of miscue analysis as a form of reading assessment has been criticised for providing insufficient information regarding the reader's word recognition skills (Walpole & McKenna, 2006). This is attributed to a reader's reliance on context when reading text, and the lack of systematic assessment of word recognition skills when analysing miscues. Criticism has also been directed at the unreliability of miscue identification, the instability of miscue types that readers demonstrate, and the variability of miscues according to the type of text (Leu, 1982; Parker et al., 1992; Wixson, 1979). Additionally, miscue analysis requires inferences to be made about cognitive processes that are unobservable (Hempenstall, 2002). Singleton (2005) contends that the inaccurate assumption that oral and silent reading utilise the same cognitive processes presents a further concern. Despite concerns regarding inadequacies with miscue analysis as a tool to inform assessment and instructional programmes, this tool can be useful for research purposes to provide data to support the understanding of readers' strategy use. Numerous studies have used miscue analysis to compare the oral reading errors of readers of varying ability (Chinn et al., 1993; Gillam & Carlile, 1997; Laing, 2002; Thomson, 1978; Warde, 2005). For the purposes of this study, miscue analysis

facilitated a comparison of the use of graphic, phonemic, syntactic and semantic oral reading errors of poor decoders with ALC or BALC.

Conclusion

In this study, it was predicted that students who were poor decoders but had ALC would make qualitatively more accurate oral reading errors than a matched group of poor decoders who had BALC. This would differentiate the groups and suggest different kinds of instruction for each group. For example, if the ALC group had made errors more similar to the text, this would suggest that reading interventions would do well to focus on building language skills to improve reading ability. However, no differences were found between the two groups on any assessment measures. Thus, the findings of the present study do not support the use of a discrepancy approach based on linguistic comprehension to subgroup poor decoders for the purposes of intervention. The results suggest that poor decoding skills maintain a primary role in reading beyond that of semantics and syntax. Furthermore, when decoding skills are weak, a disproportionate amount of processing capacity is required, leaving minimal resources available to integrate meaning from semantic and syntactic cues (Hartas & Warner, 2000). The present results lead to the conclusion that all children struggling with decoding, regardless of their level of linguistic comprehension, require intervention focused primarily at the word-level. Once word recognition is automatic and fluent, the reader is more likely to be able to access the mental resources needed to engage in reading comprehension processes.

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Appendices

Appendix A: Error Analysis Taxonomy

Name:

No.	Text	Error	GrS	PhS	SyA	SemA	S/C
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

Key:
GrS – Graphic Similarity
PhS – Phonemic Similarity
SyA – Syntactic Acceptability
SemA – Semantic Acceptability
S/C – Self-correct

Coded:
H – High
P – Partial
L – Low
Y – Yes
N - No

Appendix B: Table 7

Percentile Score Means, Standard Deviations, and Summary Group Differences for Oral Reading Errors in Each Category for the BALC Group and the ALC Group.

	Groups						
	BALC (n = 18)		ALC (n = 18)				
	M	SD	M	SD	t	p	d
GrS – High	43.78	23.46	38.44	16.36	.79	.43	.26
GrS – Partial	28.44	11.05	33.11	7.36	1.50	.15	.50
GrS – Low	27.78	22.61	28.44	13.98	.11	.92	.04
PhS – High	35.56	18.86	32.22	16.32	.57	.57	.19
PhS – Partial	28.22	10.76	31.78	8.94	1.08	.29	.36
PhS – Low	36.22	22.98	36.44	15.58	.03	.97	.01
SyA – High	60.22	22.52	63.56	8.22	.59	.56	.20
SyA – Partial	13.11	8.98	15.56	7.63	.88	.39	.29
SyA – Low	26.67	20.21	19.78	9.25	1.31	.20	.44
SemA – High	14.00	8.03	16.00	9.80	.67	.51	.22
SemA – Partial	16.44	9.50	18.22	7.91	.61	.55	.20
SemA – Low	69.78	14.01	65.78	13.80	.86	.34	.29
S/C – Yes	10.22	10.38	8.00	6.29	.78	.44	.26
S/C – No	89.78	10.38	92.00	6.29	.78	.44	.26

Note. GS = Graphic Similarity; PhS = Phonemic Similarity; SyA = Syntactic Acceptability; SemA = Semantic Acceptability; S/C = Self-Corrections; BALC = Below Average Linguistic Comprehension; ALC = Average Linguistic Comprehension.

Appendix C: Table 8

Percentile Score Means, Standard Deviations, and Summary Group Differences for the WIAT-II Listening Comprehension and Pseudoword Subtests, and the NARA-III Reading Accuracy, Reading Comprehension and Reading Rate Subtests for the BALC Group and the ALC Group.

	Groups						
	BALC ($n = 18$)		ALC ($n = 18$)				
	M	SD	M	SD	*t*	*p*	*d*
WIAT-II							
Listening Comprehension	14.94	8.62	60.33	17.18	10.02	.00	3.34
Pseudoword	14.97	15.90	10.78	9.47	.96	.34	.32
NARA-III							
Accuracy	7.56	7.25	5.28	4.39	1.14	.26	.38
Comprehension	14.11	17.05	12.22	12.88	.38	.71	.13
Rate	10.00	14.84	15.11	19.66	.88	.39	.29

Note. WIAT-II = Wechsler Individual Achievement Test-Second Edition (Wechsler, 2007); NARA-III = Neale Analysis of Reading Ability-Third Edition (Neale, 1999); BALC = Below Average Linguistic Comprehension; ALC = Average Linguistic Comprehension.

Appendix D: Information Sheet for Principals

MASSEY UNIVERSITY
INSTITUTE OF EDUCATION
TE KURA O TE MATĀURANGA

Does linguistic comprehension support the decoding skills of struggling readers?

INFORMATION SHEET – PRINCIPAL

My name is Michele Blick and I am a qualified teacher and a postgraduate student completing my master's thesis in Educational Psychology. This study is to examine the reading strategies of children who are reading below national standards for their year level. Some of the readers will have average listening comprehension skills and some will have below average listening comprehension skills. The aim of the study is to determine whether the reading strategies used by each group are similar or different.

Some studies suggest that readers with different levels of listening comprehension use different reading strategies. My study will group readers according to their level of listening comprehension. The results will show whether differences exist between the two groups on a range of measures. The findings from this research will be valuable for the purposes of informing instruction and intervention programmes.

Project Procedures

Part A

Potential participants are selected based on their reading age. If a student meets the criteria, I will provide the student's parent(s)/caregiver(s) with an Information Sheet and Consent Form inviting the student to participate. The aim is to have 20 students in each group. This will involve participation from more than one school.

Part B

Student participation in the study will involve spending approximately 30 minutes reading some stories aloud to me from the Neale Analysis of Reading Ability-Third Edition. This task will be familiar to the students as it is similar to the administration of running records. In addition, each participant will read a list of non-words from the WIAT-II and complete a vocabulary task. Assessment will take place in a quiet area at school during school time.

Participation Rights

Your school is under no obligation to accept this invitation. If students from your school decide to participate, they have the right to:

- decline to answer any particular question
- withdraw from the study at any time
- ask any questions about the study at any time during participation
- provide information on the understanding that their name will not be used unless permission is given to the researcher
- request a summary of the project findings when it is concluded

Data Management

Participant test scores will not be shared with anyone except the researcher and the researcher's supervisors. Participants will be allocated a number and identified as such. The data will be collated and no individual student or school data will be identifiable. Data and Consent Forms will be stored separately in a locked cabinet for 6 years. The researcher's supervisors will dispose of the data and Consent Forms.

Ethical Approval

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 15/016. If you have any concerns about the conduct of this research, please contact Dr Andrew Chrystall, Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 ext 43317, email: humanethicsnorth@massey.ac.nz

Project Contacts

If you have any questions or require further information, please feel free to contact me or my supervisors:

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Appendix E: Information Sheet for Parent/Caregiver

MASSEY UNIVERSITY
INSTITUTE OF EDUCATION
TE KURA O TE MATĀURANGA

Does linguistic comprehension support the decoding skills of struggling readers?

INFORMATION SHEET FOR PARENT(S) AND CAREGIVER(S)

My name is Michele Blick and I would like to invite your child to participate in a research study on reading that is for my master's thesis.

I am a qualified teacher and a postgraduate student at Massey University. This study is to examine the reading strategies of children who are reading below national standards for their year level. Some of the readers will have average listening comprehension skills and some will have below average listening comprehension skills. The aim of the study is to see if the reading strategies of each group are similar or different.

Some studies suggest that readers with different levels of listening comprehension use different reading strategies. My study will group readers according to their level of listening comprehension. The results will show whether differences exist between the two groups on a range of measures. Findings from this research will advance our ability to help children learn to read.

How will my child be involved?
Participation for your child will involve spending approximately 30 minutes with me reading some short stories aloud and answering some comprehension questions. In addition, your child will read a list of words and complete a vocabulary task. These tasks will be familiar to your child as they are similar to the one-on-one reading assessment that teachers regularly carry out at school. The reading will take place in a quiet area at school close to your child's classroom and classmates. Your child will be asked for their approval before I carry out any assessments and s/he will be able to accept or decline. Your child will also be allowed to go back to the classroom at any time.

There is no obligation for you to accept this invitation at all and it will not affect your child in any way at school if you do not want your child to participate. If you do participate, you can still withdraw from the study at any time up until it finishes at the

end of August 2015. If you agree to your child being in the study, please return the attached Consent Form. Please indicate on the Consent Form if you would like a summary of the results of the study and I will provide this to you when the study is complete.

Participation Rights

If you allow your child to participate, both you and your child have the right to:

- decline to answer any particular question
- ask any questions at any time during the study
- provide information on the understanding that your name and your child's name will not be used unless you give permission to the researcher

Data Management

Your child's test scores will not be shared with anyone except the researcher and the researcher's supervisors. Participants will be allocated a number and identified as such. The data will be collated and no individual student or school data will be identifiable. Data and Consent Forms will be stored separately in a locked cabinet for 6 years. At the end of this time the researcher's supervisors will dispose of the data and Consent Forms.

Ethical Approval

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 15/016. If you have any concerns about the conduct of this research, please contact Dr Andrew Chrystall, Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 ext 43317, email: humanethicsnorth@massey.ac.nz

Project Contacts

If you have any questions or require further information, please feel free to contact myself or my supervisors:

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Appendix F: Information Sheet and Consent Form for Student

MASSEY UNIVERSITY
INSTITUTE OF EDUCATION
TE KURA O TE MATĀURANGA

Does linguistic comprehension support the decoding skills of struggling readers?

INFORMATION SHEET AND CONSENT FORM – STUDENT

Hello, my name is Michele and I am doing a research study for my university thesis in Education. This study is to find out more about how children learn to read.

I am inviting you to help me with the study. What will happen is that you will read some stories out loud to me. When you finish reading, I will ask you some questions about the story. I will also ask you to read some "alien" words that are not real words and choose the best word to describe a picture.

It will take about 30 minutes of your time. 

If you get tired, you can ask for a break.

If you have any questions, you can ask me at any time. 

It is your decision to take part.

- You can say "Yes" 
- You can say "No" 

If you understand what I have told you and you want to take part in the study, please sign your name.

Participant: _____ Date: _____

Appendix G: Consent Form for Principal

MASSEY UNIVERSITY
INSTITUTE OF EDUCATION
TE KURA O TE MATĀURANGA

Does linguistic comprehension support the decoding skills of struggling readers?

CONSENT FORM FOR PRINCIPAL

- I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

- I agree to the school participating in this study under the conditions set out in the Information Sheet.

- I understand that the parent(s)/caregiver(s) of participants will be asked to provide consent for their child to participate, and the student will also be asked for his/her consent to participate.

Signature: _____ Date: _____

Appendix H: Consent Form for Parent/Caregiver

MASSEY UNIVERSITY
INSTITUTE OF EDUCATION
TE KURA O TE MATĀURANGA

Does linguistic comprehension support the decoding skills of struggling readers?

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

- I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.
- I agree to my child participating in this study under the conditions set out in the Information Sheet, and understand that my child will also be asked for his/her consent.

Signature: _____ Date: _____

Full name (printed): _____

Relationship to child: _____

Child's name: _____

Child's date of birth: _____ Ethnicity (optional): _____

I would like a summary of the results: Yes No (please circle)