

The Effects of a Vocabulary-Intensive Reading Intervention
on the Reading Skills of Grade Two Children

by

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	ii
LIST OF TABLES	iv
ABSTRACT.....	v
ACKNOWLEDGEMENTS.....	vi
CHAPTER ONE: Literature Review	1
The Development of Reading Skills	1
Phonological Processing.....	3
Decoding/Phonics	4
Word Reading.....	6
Vocabulary.....	7
Reading Fluency	9
Reading Comprehension.....	11
Reading Skills and Academic Achievement	12
Learning Disabilities	14
Reading Disabilities.....	15
Reading Interventions	17
Phonological Awareness-based Interventions	20
Vocabulary-based Interventions	23
Summary	28
CHAPTER TWO	30

Introduction	30
Reading Skills	30
Vocabulary-Enriched Interventions	33
Current Study	35
Method	35
Participants.....	35
Measures	36
Demographic Questionnaire	36
Measures of Phonological Awareness.....	37
Measures of Phonological Processing	39
Measures of Word and Nonword Reading	40
Measures of Reading Fluency	41
Receptive Vocabulary	41
Vocabulary Intervention	42
Procedure	42
Recruitment	42
Pre-Intervention Reading Assessment	42
Vocabulary-Intensive Intervention	43
Post-Intervention Reading Assessment	44
Results	45

Descriptive Statistics.....	45
Data Analysis	46
Discussion.....	47
Limitations	53
Future Research	55
Implications for Clinical Practice	56
Conclusion	57
References	59
Appendix A: Demographic Questionnaire	86

LIST OF TABLES

Table 1: Demographic Information	80
Table 2: Mean Scores of Measures for Public vs. Private Schools	81
Table 3: Mean Scores of Measures for Non-ESL vs. ESL	82
Table 4: Demographic Information for Immigrant and Non-Immigrant Participants	83
Table 5: Descriptive Statistics	84
Table 6: Results of T-Tests comparing Pre- and Post Intervention	85

ABSTRACT

Decades of reading research have produced strong evidence for the importance of explicit reading instruction in all reading components; phonological awareness, decoding, vocabulary, fluency, and comprehension to develop proficient reading skills (Kim et al., 2020). The critical role of phonological awareness in developing solid reading skills has been well documented (Baker et al., 2018; Kjeldsen et al., 2014), which explains why phonological awareness training is the first and most widely used intervention to improve children's reading skills. Oral language skills and vocabulary knowledge are also vital factors in reading development (Biemiller, 2012). Research suggests that explicit vocabulary instruction effectively improves language and reading skills (Catts et al., 1999; Stanley et al., 2018). This study examined how a vocabulary-intensive reading intervention affected the reading skills of grade two children. The reading skills examined were phonological processing and awareness, word and nonword reading, reading fluency, and receptive vocabulary. Participants were tested pre- and post-intervention to determine which skills were affected and to what extent. A trained researcher conducted the vocabulary-intensive intervention of between 10 and 30 sessions online. Results indicated no significant differences in mean scores on 13 standardized reading measures from pre-to post-intervention. The changes in reading skills from pre- to post-intervention might have clinical significance within an educational context, as five reading measures' effect sizes were above 0.2. This research aimed to increase knowledge about the effectiveness of vocabulary-based interventions to improve reading skills. This knowledge could inform curriculum decisions regarding preventive vocabulary instruction and remedial intervention.

Keywords: vocabulary, intervention, reading skills

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CHAPTER ONE

Literature Review

Literacy plays a pivotal role in the successful cognitive development of children and provides the tools to help them become contributing members of society. Literacy skills are vital for individuals and communities to achieve a basic quality of life (Joshi & Wijekumar, 2020), with reading skills an essential component of successful literacy and academic outcomes (Lonigan et al., 2000). The importance of early reading skill development is shown in early formal education as the primary objective is to teach children to read (Hulme & Snowling, 2015). Indeed, children who learn to read early and well in the first years of elementary school have the advantage of increased print exposure, which leads to increased general knowledge and understanding of texts read (Cunningham & Stanovitch, 1997). Decades of research have demonstrated the need for a multi-component approach to the practice of teaching children to read. Kim et al. (2020) refers to the Big Five (i.e., phonemic awareness, phonics, vocabulary, reading fluency, and reading comprehension), which are fundamental to acquiring proficient reading skills.

The Development of Reading Skills

Children first need to develop specific pre-reading skills to become fluent and accurate readers. To ensure optimal reading outcomes, it is beneficial to start instruction in these pre-reading skills before formal schooling (Lonigan et al., 2000). Two pre-reading skills have been shown to be important for the successful acquisition of reading skills among young children (Ehri, 1998; Hogan et al., 2005; Hulme et al., 2012; Kim et al., 2010). These skills are (1) phonemic awareness, which is the ability to identify and manipulate letter sounds (phonemes; Brady, 2020; Lieberman et al., 1974) and (2) alphabetic knowledge or the alphabetic principle

(i.e., how the alphabetic writing system functions; Brady, 2020). These two skills are often used as identification measures to assess and predict the later reading skills of kindergarten children. Extensive research has shown that these skills are fundamental to acquiring reading skills in languages with an alphabetic script (Brady, 2020; Ehri, 1998; Lonigan et al., 2000; Muter et al., 2004; Schatschneider et al., 2004). Muter et al. (2004) expanded on this research by demonstrating that the ability to manipulate the sounds in words and letter knowledge measured at the start of formal schooling was responsible for 54% of the variance in reading skills when measured a year later. Additionally, it is advisable to foster phonemic awareness before introducing letter names. This sequencing focuses on the phonemes' sounds first before introducing graphemes (visual letter combinations representing each phoneme) or letter names responsible for each phoneme/sound (Brady, 2020). Although this sequencing may be the optimal method of teaching these pre-reading skills, many children are taught the letter names of the alphabet by parents and teachers before the letter sounds (Ellefson et al., 2009).

To build on this notion, Boyer and Ehri (2011) investigated how best to teach phonemic awareness to preschool readers who already knew the letters of the English alphabet. In this study, participants were taught phonemic awareness in two different ways. In one condition, the readers were taught how to segment and spell words and non-words using letters and mouth pictures that demonstrated the articulatory position of the mouth for each phoneme. In the second condition, readers were taught to use only letters to spell and segment words. This study found enhanced learning of words for the first condition that used letters and mouth pictures. Both groups performed better than a control group that did not receive instruction (Boyer & Ehri, 2011). This study demonstrated that the more explicit phonemic awareness instruction is, in this

case, teaching phonemes in conjunction with visual mouth pictures, the better children grasped this skill. Once there is a solid understanding of phonemic awareness and letter knowledge, phonological processing is the first reading skill that should be explicitly taught.

Phonological Processing

Phonological processing is the definitive skill strongly related to the acquisition of reading skills and is the most robust predictor of future reading skills. (Baker et al., 2018; Lonigan et al., 2000; Share et al., 1984; Vellutino & Scanlon, 1987). This broad cognitive skill uses language sounds to process oral and written language. Phonological processing includes phonological awareness, phonological working memory, and phonological retrieval (Wagner & Torgesen, 1987). The most extensively studied aspect of phonological processing is phonological awareness, a single, unified ability that allows an individual to recognize, discriminate, and manipulate the sounds in language. More broadly, phonological awareness is an awareness of sounds in spoken (not written) words, and it is demonstrated by abilities like rhyming, matching initial consonants (onset), and phoneme counting (Stahl & Murray, 1994; Torgesen et al., 1992).

The National Reading Panel's 2000 report demonstrated how explicit phonological awareness instruction has a positive and statistically significant effect on reading and spelling skills (NICHD, 2000). The development of phonological awareness in children does not adhere to strict stages but begins with increased sensitivity to smaller parts within words. The ability to detect and manipulate syllables occurs first, followed by onsets, rimes, and then individual phonemes (Anthony & Francis, 2005). Children learn to distinguish between rhyming words and non-rhyming words before they can manipulate the individual sounds within words. Similarly, the skill of blending sounds develops before the segmentation of words occurs.

Research has shown that phonological awareness skills differentially influence reading skills at different ages and grade levels (Hogan et al., 2005). In a longitudinal study, children were assessed in grade two on phonological awareness, non-word, and word reading skills; as expected, it was found that phonological awareness and letter identification measures administered in kindergarten predicted reading achievement. However, by grade four, reading and phonological awareness were so highly correlated that phonological awareness was no longer predictive of reading (Hogan et al., 2005). This finding suggests that phonological awareness plays a hidden or indirect albeit important role in predicting reading skills in older children in higher grades. A strong foundation in phonological awareness allows children to start using these skills to move on to the more complicated task of learning to decode new words.

Decoding/Phonics

Decoding is integral to the process of becoming a successful reader. It is defined as the ability to use one's knowledge of letter-sound correspondences, including knowledge of letter patterns, to accurately pronounce written words (Foorman et al., 2016). Decoding allows children to sound out (i.e., decode) unfamiliar words and recognize familiar words quickly. When learning to read an alphabetic language like English, the research supports explicit and systematic phonics instruction to develop decoding skills which allow children to read words (Brady, 2020; Seidenberg, 2013).

Phonics instruction takes phonological awareness a step further by teaching students the letter-sound correspondences or how letters (graphemes) are related to sounds (phonemes). In English, these relationships are not always consistent; however, there is sufficient consistency that these rules can be beneficial in helping children decode new regular words (Foorman et al.,

1998). However, this does not apply to reading irregular words. In a review of phonics-based instruction for poor English-speaking readers (McArthur et al., 2018), phonics training was effective for ameliorating literacy-related skills. The specific skills that demonstrated the most improvement were the reading fluency of words and non-words and the accuracy of irregular word reading.

There are four types of phonics: analytic, analogy, onset-rime, and synthetic (Parker, 2019). Analytic, analogy, and onset-rime phonics instruction are considered top-down instructional methods, as they begin with memorizing words. Once sight words are memorized, they are used to discover the letter-sound (grapheme-phoneme) correspondences. Analytic phonics requires children to memorize a large bank of sight words, learn the letter sounds at the beginning of words, and finally use other superficial strategies to recognize the rest of the word (Johnston & Watson, 2004). Analogy phonics also requires the memorization of words, and then children are taught to "word-solve" by using parts of words they already know to decode unknown words (Parker, 2019). Onset-rime phonics is considered a sub-type of analogy phonics and also requires the memorization of words, and then children must be taught to use the rime of memorized words to discover other words with the same rime (Parker, 2019).

Synthetic phonics teaches children the function of letter sounds in all positions in words, and they then learn to blend them for pronunciation. (Johnston & Watson, 2004). This type of reading instruction is considered a bottom-up approach, which starts with the basic units of text like the letters of the alphabet and individual phonemes that make up words. Once the alphabet letters are taught, phonemes and letter combinations can be taught with the associated sounds. This process uses the basic unit of the phoneme to decode words and later sentences. The final

step of this process is to build automaticity when decoding. *Automaticity* is the ability to quickly and accurately recognize or decode words with minimal effort (Ardhani, 2011; Parker, 2019).

Various studies have been conducted to explain the effectiveness of teaching phonics through the abovementioned stages. Johnston and Watson (2004) conducted a study in which five-year-old children were taught using three early phonics programs: a synthetic phonics program focusing on letter sounds (grapheme-phoneme), an analytic phonics program with phoneme awareness training, and an analytic phonics program. Children in all conditions received instruction for 16 weeks for 20 minutes per day. The children came from diverse socioeconomic backgrounds; however, children in the synthetic phonics group came from lower socioeconomic backgrounds. The results demonstrated that children taught with the synthetic phonics program demonstrated significantly better reading, spelling, and phoneme awareness skills at the end of the intervention (Johnston & Watson, 2004). The explicit teaching of synthetic phonics is fundamental in early reading instruction as this is how children develop decoding skills that facilitate reading of unfamiliar words (Brady, 2020; NICHD, 2000).

Word Reading

Ehri (2014, 2020) describes word reading development in four phases labeled according to the knowledge each requires to read and spell words. The first phase is the pre-alphabetic phase when readers depend on visual and contextual cues to read words. The two critical foundational skills in this phase are letter knowledge and phonemic awareness. To progress to the second phase, beginning readers must know the letter shapes, names, and sounds (Ehri, 2020). The second phase is the partial alphabetic phase, when they have learned letter names and sounds but cannot decode unknown words. The third phase is the complete alphabetic phase, in

which there is an understanding of grapheme/phoneme (letter/letter-sound) correspondence, and readers can decode words. The fourth and final phase is the consolidated alphabetic phase, in which the reader has accumulated many words in lexical memory. During this phase, the reader knows multiple spelling patterns that allow for decoding of multi-syllabic words (Ehri, 2020).

The reading process has two basic cognitive tasks, the first being the ability to recognize printed words (decoding) and the second is extracting meaning from those words (reading comprehension). In a two-year longitudinal study, Muter et al. (2004) investigated the role of reading-related variables in early word recognition and reading comprehension. Results of that study indicated that early phonological skills and letter knowledge consistently predicted word recognition skills in preschool children. In contrast, vocabulary knowledge, word recognition, and grammatical skills predicted reading comprehension. These findings demonstrated how crucial it is to address all components in reading instruction, as different skills influence different facets of reading.

Vocabulary

Developing an extensive vocabulary follows the process of phonological awareness and word reading ability when it comes to facilitating the process of reading acquisition. Vocabulary is defined as the knowledge of words and word meanings (Beck & McKeown, 2007; Perfetti, 2010). A large and rich vocabulary knowledge plays a crucial role in forming a successful reader as a reader cannot understand text without knowing what most of the words mean (Beck & McKeown, 2007; Biemiller, 2012; Biemiller & Boote, 2006). Prior to school entry and formal reading instruction, young children learn novel words during conversations and social interactions with those people in their environment. The differences in home language and

family backgrounds means that there is a big difference in the development and subsequently the size of children's vocabulary (Rowe et al., 2012). For some children the quality of these daily interactions may not be sufficient to develop a rich vocabulary. The limitations of vocabulary growth through oral interaction require that children be actively and explicitly taught more sophisticated vocabulary words and their different contexts.

Early literacy programs typically emphasize the benefits of reading to children, and these practices have proven effective in ameliorating oral language skills (Lonigan & Whitehurst, 1998). The growth of vocabulary can start before children even learn to read. Robbins and Ehri (1994) found that reading storybooks to kindergarten students who were non-readers increased their understanding of the meanings of words and was influential in building their vocabulary. The findings indicated that four exposures to a novel word were necessary for word learning. Sénéchal and LeFevre (2002) described storybook reading with a discussion of the story content and word meanings as an informal literacy activity. They demonstrated that this informal literacy activity improved receptive language skills and listening comprehension.

The evidence suggests that trade books beyond a child's independent reading level are a rich resource that can facilitate vocabulary development (Biemiller & Boote, 2006). Trade books are often described as "read-alouds" and include more complicated structures and vocabulary. When children in kindergarten and grade one from a low-achieving elementary school were read read-aloud books and then taught sophisticated words from therein, it indicated that it is feasible for young children to learn more challenging words (Beck & McKeown, 2007). This type of explicit vocabulary instruction demonstrated that it is possible to increase word knowledge with

rich instruction. Furthermore, the more instruction received, the greater the gains in word learning.

The individual differences in children's vocabulary knowledge also play a crucial role in response to intervention. In a correlational study by Silverman and Crandell (2010), differential responses were observed in a population of prekindergarten and kindergarten children. Teachers were observed during three language arts blocks, and children were assessed on word and general vocabulary knowledge. For children with low pre-test vocabularies, acting out and illustrating words were the most effective. For children with higher pre-test vocabularies, strategies like explicit teaching how to use words in a new context and defining words within storybook reading or conversations had a more significant effect.

With the pivotal role that vocabulary knowledge plays in children's reading, it is essential to determine how best to increase children's vocabulary (Robbins & Ehri, 1994). Research has shown that vocabulary instruction is also causally related to reading comprehension. Studies have demonstrated that vocabulary interventions directly increase children's reading comprehension, specifically of taught words in texts (Elleman et al., 2009; Wright & Cervetti, 2017). This link between vocabulary and reading comprehension is essential for effective communication and significantly influences academic achievement (Beck et al., 1982; Ehri et al., 2001; Pullen et al., 2010). Fluency is the next component of reading that needs to develop for an individual to become a successful reader.

Reading Fluency

Fluency was initially defined as the ability to read words quickly and accurately; however, this definition has expanded to include the appropriate use of phrasing and emphasis to

make reading sound like it is being spoken (Hooks & Jones, 2002; Kim et al., 2020). Words that are recognized instantly and read accurately are called sight words. These words no longer need to be decoded but are read automatically; this is how reading fluency develops. Word and sentence-level reading fluency are essential for the reader to develop. For children who have difficulties with reading fluency, this often also leads to difficulties understanding what they are reading (Chard et al., 2002). The cognitive resources of these children are so focused on attention and working memory when reading which diminishes their ability to interpret the content of what is being read (Kim et al., 2010; Kim & Wagner, 2015).

In a study by Metsala and David (2020), a decoding-focused intervention was used on a sample of eight- to ten-year-old children with a reading disability in fluency. These were children who had difficulty with both accurate and quick reading. The study found that the decoding-focused intervention effectively improved reading fluency and comprehension. These findings also highlighted the role of *automaticity* in reading fluency. Another model of reading introduced by Ehri (1998) proposes the concept of orthographic mapping, which is the process whereby individuals store words in their long-term memory. Orthographic mapping allows for "automatic" word recognition and leads to the development of sight word learning, as described earlier. Sight word learning is essential to the reading process as it allows the reader to focus on understanding a text instead of constantly needing to decode words individually. These skills then facilitate the process of sentence-level reading and understanding with "*comprehension*" as a final stage of reading acquisition.

Reading Comprehension

Comprehension refers to the ability to construct meaning from text (Ricketts et al., 2007; Silverman et al., 2020). Comprehension is a crucial skill to develop, as it directly influences achievement in all academic areas which subsequently shapes the educational and vocational trajectories of children as they move into adulthood (Duff, 2018). Over the years, researchers have tried to explain the complex relationships between different reading skills and which of these skills directly influence reading comprehension. Gough and Tunmer (1986) proposed the simple view of reading, consisting of a formula that includes decoding and language/listening comprehension. The formula is defined as decoding multiplied by language/listening comprehension, which equals reading comprehension ($D \times LC = RC$). This approach posits that a student with poor decoding and/or poor listening/language comprehension will also have poor reading comprehension ability.

Children with good comprehension can understand and interpret what they read. Proficient readers use comprehension strategies to help them understand what is being read (Pressley et al., 1992). One common comprehension strategy is using previously acquired background knowledge to recognize and relate concepts they are reading (Taylor, 2018). A second comprehension strategy is to generate questions about the material being read. The generation of questions while reading allows a child to deepen their understanding by connecting the information being read with their general knowledge. This strategy also promotes better recall of the information read (Rosenshine et al., 1996).

Clarke et al. (2010) conducted a randomized controlled trial in which text-comprehension and oral-language training were used to determine which was most effective in improving the

reading comprehension of 8- to 9-year-old children. The findings demonstrated that the oral language training resulted in the most long-term improvement in reading comprehension. All reading skills play a role in a child's ability to decode and understand text, which directly affects their academic achievement. Understanding the relationship between reading skills and academic achievement is essential as this plays a vital role in every child's occupational and social outcomes.

Reading Skills and Academic Achievement

Reading is considered the primary method of facilitating the effective transfer of knowledge in all academic areas (Cawley et al., 1990) and academic success is dependent on the ability to read and understand text (Duff, 2018). Early childhood literacy and its benefits have been extensively researched over the past three decades, and the vast amount of knowledge gathered has focused on the importance of early literacy on children's future academic achievements (Piasta et al., 2012). The development of reading skills is critical to the academic trajectory of children. Foorman et al. (1996) found that children who are poor readers in the late elementary years will continue to have academic difficulties throughout their schooling. These academic struggles put these children at higher risk for academic failure, school dropout, unemployment, and even incarceration (Newman et al., 2010).

Children with solid reading skills tend to read more independently than students who find reading challenging. More reading leads to increased vocabulary knowledge, reading comprehension, fluency, and general knowledge, resulting in higher scores in all academic subject areas. The "Matthew effect" proposed by Stanovitch (1986) suggests that the rich get richer in reading, and the poor get poorer. So, children who have difficulties with early reading

begin to dislike it and read less, whereas strong readers read more and become better. Strong reading skills are predictive of successful academic outcomes, as a good reader is more easily able to read to learn once they have learned to read. In more recent research, word reading skills of children in fourth grade were related to the rate of change in vocabulary growth from grade four to grade ten, providing substantial support for the Matthew effect (Duff et al., 2015).

Kastner et al. (2001) investigated the relationship between oral language skills and academic achievement in grade one children. This early study demonstrated that verbal or language-based skills correlate with later academic performance. There is a reciprocal relationship between oral language and reading (Kamhi & Catts, 1989, as cited in Catts, 1989; Ouellette, 2006), so it follows that a child with strong oral language skills will be more likely to develop strong reading skills. As argued above, these strong reading skills translate into greater knowledge acquisition and more successful academic outcomes.

Reading comprehension also significantly influences academic achievement as it relates to a deep understanding of the text (Beck et al., 1982; Ehri et al., 2001; Pullen et al., 2010; Wright & Cervetti, 2017). Akbash et al. (2016) focused on the influence of reading comprehension on the mathematics and science achievement of secondary school children. This study demonstrated a strong relationship between reading comprehension and the success of secondary school students in their science and math classes. In the early elementary grades reading was prevalent in the curriculum; however, there is lack of advanced literacy instruction in the higher grades. The decreased instruction has had a measurable influence on postsecondary academic performance. The capability of high school students to read challenging texts has predicted their academic performance in university-level math and science courses (ACT, 2005).

The importance of strong reading skills to successful academic outcomes demonstrates the importance of ensuring all children learn to read fluently and accurately irrespective of socioeconomic status, background, or learning difficulties.

Learning Disabilities

The adverse effects of learning disabilities and a rapid increase of learning disabilities in the education system have resulted in a growing body of research dedicated to a better understanding of these disabilities (Bizier et al., 2015). The definition of a *learning disability* is an ongoing controversy in learning research as there are currently two main diagnostic frameworks with different definitions currently used in Canada to diagnose learning disabilities, The Learning Disabilities Association of Canada (LDAC) definition; and the Diagnostic and Statistical Manual of Mental Disorders-5th Edition (DSM-5) definition (Schroeder et al., 2020).

The LDAC (2021) definition of a learning disability specifies that for a diagnosis of a learning disability to be given, there needs to be an unexpected discrepancy between cognitive ability (IQ) and academic achievement. To provide a diagnosis of a learning disability, the LDAC criteria also requires a causal link between the academic challenges and the processing deficits. This requires the administration of cognitive processing tests like phonological processing, processing speed, working memory, visual-motor perception, and attention (LDAC, 2021). In contrast, the DSM-5 (American Psychiatric Association, 2013) requires learning and using academic skills difficulties to be present for a minimum of six months despite the provision of interventions that target the difficulties. Unlike LDAC, the DSM-5 criteria do not require an ability-achievement discrepancy or evidence of specific cognitive processing deficits. The other diagnostic criteria that must be met are that the affected academic skills are

significantly and quantifiably below those expected for the individual's chronological age, identified during school-age years, and are not better accounted for by other factors like an intellectual disability, uncorrected visual or auditory acuity, other mental or neurological disorders, psychosocial adversity, lack of proficiency in the language of academic instruction, or inadequate educational instruction. If all the abovementioned criteria are met, then according to the DSM-5 a Specific Learning Disorder (SLD) can be diagnosed. Three domains of SLD are identified in the DSM-5: reading, writing, and mathematics. For the purposes of the current review, the term learning disability will be used as this is the used and understood term by teachers and parents. It is estimated that between 15 and 20 percent of children in Canada have a diagnosis of a reading disability (Dyslexia Canada, 2021).

Reading Disabilities

The most common and highly researched learning disability is a reading disability (Beitchman, & Young, 1997). A reading disability as with all learning disabilities, is neurobiological in origin and typically manifests early in a child's development (Fletcher & Grigorenko, 2017). According to the DSM-5 (2013) the symptoms of a reading disability can include poor decoding and spelling skills and difficulty with accurate and fluent word recognition or poor reading comprehension. Hulme and Snowling (2016) have further distinguished between two different types of reading disability. The first on this list is *dyslexia*, defined as having difficulties in identifying speech sounds and understanding letter-sound correspondence, which results in poor decoding abilities. The second type of disability is *in comprehending the text that is read*.

The past three decades of reading research have produced strong evidence that most reading disabilities are rooted in phonological impairments, specifically in deficits in the representations and processing of speech sounds (Torgesen et al., 2014; Vellutino et al., 2004). Furthermore, children who score well on tests of phonological awareness prior to entering school usually become proficient readers (Bar-Kochva & Nevo, 2019). Research indicates that phonological awareness training can improve both phonological awareness and broader reading skills (Byrne et al., 2000). There is also evidence that some reading disabilities result from difficulties with broader oral language abilities like weak vocabulary skills (Duff et al., 2008).

Explicit reading instruction is integral to preventing and intervening when children experience reading difficulties. All children require instruction in the same reading components (i.e., phonemic awareness, decoding, vocabulary, reading fluency, and reading comprehension); however, for children at risk of reading difficulties or reading disabilities, this instruction needs to be even more explicit and intensive (Foorman & Torgesen, 2001). The traditional approach to literacy is that entry into the education system constitutes the start of literacy development and instruction; however, more recently, the concept of emergent literacy has been introduced. Emergent literacy suggests that literacy develops along a continuum with origins early in a child's life (Lonigan et al., 2000). This approach has demonstrated the influence of environmental factors on a child's reading development. Environmental factors such as the home literacy environment may indicate a child's risk of developing reading difficulties or a reading disability (Snow et al., 1998).

There are four cognitive constructs that predict children who are at risk of failing to develop grade-level reading skills (Fletcher et al., 2007 as cited in Stuebing et al., 2015). despite

adequate reading instruction and a literacy-rich home environment. The constructs are phonological awareness, rapid letter naming, verbal working memory, and oral language (vocabulary). Children diagnosed with a reading disability require instructional intervention and additional support; however, even those without a diagnosis may find developing these skills challenging and need and deserve remedial help. (Ontario Human Rights Commission, 2022).

Reading Interventions

A reading intervention is a program in addition to the existing literacy curriculum which is different from regular classroom reading instruction as it is specifically designed for students who are experiencing difficulties with reading or who have a diagnosis of a reading disability (Wanzek & Vaughn, 2007). Reading interventions that are consistently effective in ameliorating reading skills are referred to as evidence-based interventions (EBIs) (Canadian Psychological Association, 2012). The Canadian Psychological Association (CPA) considers an intervention evidence-based when it is based on research findings published in a peer-reviewed journal and studied using randomized controlled trials (CPA, 2012).

Reading interventions are evidence-based if they consistently improve children's reading skills when applied comprehensively. It is critical that evidence-based interventions are accurately and consistently implemented by teachers to maximize student achievement (Kretlow & Bartholomew, 2010). The overriding goal of reading interventions is to help a struggling reader develop into a competent and independent reader who can understand a diverse range of texts easily and for different objectives (Lovett et al. 2020).

There is a clear consensus in the research that explicit and systematic instruction is the most effective method of teaching children to read (Brady, 2020; Foorman et al., 2003; NICHD,

2000). This research has also allowed researchers to identify the critical components that constitute effective reading interventions. These components are the intensity, duration, and supportiveness of the intervention. Torgesen (2000) highlighted the pivotal role of the intensity of instruction in reading success. The intensity of instruction can be increased in three ways; by providing small group-based instruction, spending more time on the instruction, and increasing the explicit nature of the instruction (Hall & Burns, 2018; Torgesen, 2000). The second component is the timing of reading interventions (Foorman et al., 2003). The reading ability of children is established at an early age. It has been shown that 74% of children identified as reading disabled in the third grade remain so in the ninth grade due to poor decoding ability (Francis et al., 1996). There is strong evidence that the long-term outcomes of children are enhanced when learning difficulties are identified at earlier stages and provided with the appropriate intervention programs (Beitchman & Young, 1997; Ihora & Olvera, 2014; Wanzek & Vaughn, 2007; Wanzek et al., 2016). Based on previous intervention-based studies, the recommended age to identify children with reading disabilities and deliver interventions is in or before grade three (Foorman et al., 2003; Wanzek & Vaughn, 2007; Wanzek et al., 2016). An early diagnosis of a reading disability, followed by an evidence-based intervention, is a valuable tool to minimize the detrimental influence of weak reading skills (Kjeldsen et al., 2014).

The third component that plays a role in the effectiveness of reading interventions is the student-to-teacher ratio combined with teacher training. (Foorman et al., 2003). Intuitively one would presume that one-on-one support for readers with difficulties or disabilities would be most effective; however, there is mixed research on the influence of group size on intervention effectiveness. Wanzek and Vaughn (2007) synthesized extensive reading intervention studies

wherein an intervention was defined as a program that included 100 or more sessions. All interventions included in this study were used with children identified with a reading disability in grade three or below. Overall, these long interventions demonstrated positive outcomes for students with reading disabilities or difficulties. The largest effect sizes were seen in those studies that employed both phonics instruction and text reading. Larger effect sizes were also noted in studies in which smaller groups were used, and intervention was provided early (grade K-one).

In a more recent study (Okkinga et al., 2018), the effectiveness of reading strategy interventions for children in grades three and above were examined. As opposed to small group interventions, these were conducted in whole classrooms with the teacher as an instructor. This meta-analysis demonstrated that reading strategy interventions in the whole classroom are effective and especially beneficial for students in grades three to eight. The conclusion that can be drawn from some of this research is that small group interventions may be more beneficial for younger children (grade three and below) than for older children (above grade three). According to the Right to Read Inquiry, it is the basic right of each child to learn to read and to have access to the best evidence-based instruction and interventions available to achieve this (Ontario Human Rights Commission, 2022).

Research has indicated that reading disabilities or difficulties often result from phonological awareness deficits (Hatcher et al., 2004; Torgesen et al., 2014). Children with phonological awareness deficits have difficulties differentiating and segmenting sounds within words (Bishop & Snowling, 2004) which impairs their ability to decode and read words (Carlson et al., 2013). Thus, phonological awareness interventions are usually implemented first to try and

remediate the reading difficulties. The next section of this chapter discusses phonological awareness-based interventions and their effectiveness.

Phonological Awareness-based Interventions

To adequately address the needs of children with reading disabilities or difficulties, it is crucial to determine how best to intervene and what reading skills should be targeted to ensure the best outcomes. Catts et al. (2001) identified five variables that uniquely predict grade two reading outcomes in a sample of kindergarten children. The five variables were letter identification, sentence imitation, phonological awareness, rapid naming, and mother's education. There is a broad consensus on the pivotal role that phonological awareness skills play in developing decoding skills, and good decoding skills are predictive of higher reading achievement (Kjeldsen et al., 2014; Schuele, & Boudreau, 2008; Vellutino et al., 2004).

Phonological awareness interventions often combine phonological awareness and phonics training. The combination positively influences word reading (Foorman et al., 2003). For children with low phonological manipulation skills, phonological training with letter-sound correspondence training effectively improved their phonological and word-level reading skills (O'Connor et al., 1995). There is also an additional benefit to integrating phonological awareness and alphabetic training, as this results in higher phoneme segmentation, letter-sound fluency, and word reading skills (Oudeans, 2003).

Kjeldsen et al. (2014) found that children who received a phonological awareness program in kindergarten scored significantly higher on decoding measures in grade three than those that did not. Furthermore, children in the intervention condition scored higher on reading comprehension in grade nine. This extends the research to demonstrate that the two different

reading skills of decoding and comprehension are positively influenced by a phonological intervention, albeit at different times in a child's education.

Phonological awareness training has even been found to be effective across alphabetic languages. Children in grade one French immersion who were identified as being at-risk for reading in English were provided with a phonological awareness intervention with letter-sound instruction showed significant gains in both French phonological awareness and word reading (Wise et al., 2016). Phonological awareness interventions have also been found to be successful when embedded into shared book reading, a strategy usually used to expand oral language. In a sample of preschool children, when a phonological awareness intervention was combined with shared storybook reading, the findings showed improvement in rhyme production and sounds, alliteration, and initial sound knowledge (Ziolkowski & Goldstein, 2008).

Despite the evidence for the effectiveness of evidence-based phonological awareness interventions, some children do not acquire the ability to identify printed words efficiently; hence they are called "treatment resisters" (Fuchs & Fuchs, 2006; Torgesen, 2000). A review study by Torgesen (2000) showed that 10 to 46% of participants did not respond to a phonologically based intervention. The variables most often associated with individual differences in intervention response are rapid naming, problematic behaviour, phonological awareness, alphabetic principle, memory, and IQ (Torgesen et al., 1999). Similarly, in a population of children identified as at-risk for reading problems and emotional disturbances, the effect of an intensive preventive prereading intervention on phonological awareness, word reading, and rapid naming skills was conducted (Nelson et al., 2005). A small group of children was categorized as non-responders, as they did not show satisfactory gains in the three reading skills identified

(phonological awareness, word reading, and rapid naming). It is notable in these studies that oral language skills (vocabulary) were not assessed as a potential predictor of response to intervention.

It is beneficial to understand the characteristics of the minority of children who do not respond to phonological awareness interventions to attempt an alternative intervention to improve their literacy skills (Duff et al., 2008). Catts et al. (1999) investigated the individual contributions of phonological processing and oral language abilities to the reading skills of grade two children. It was found that phonological processing and oral language uniquely contribute to reading achievement. This would indicate that both kinds of interventions are beneficial and can improve reading skills in this demographic. Duff et al. (2008) implemented an alternative oral language skills intervention with children who demonstrated a poor response to regular phonological awareness reading interventions. This intervention included a combination of oral reading and phonological training together with rich vocabulary instruction. The findings demonstrated improved reading, phonological awareness, and language skill measures (Duff et al., 2008) which supports the effectiveness of a vocabulary-based intervention to improve children's language and literacy skills.

There is much variability in how children respond to reading interventions and the children who show the least response usually have significant phonological impairments (Nelson et al., 2003) or exhibit deficits in oral language skills which includes vocabulary (Duff et al., 2008). Vocabulary instruction has been shown to improve comprehension and more generally benefit overall reading (Elleman et al., 2009; Clarke et al., 2010). This research provides a

rationale for oral language or vocabulary interventions to improve the literacy outcomes for children. The following section will discuss the evidence on vocabulary-intensive interventions.

Vocabulary-based Interventions

Knowledge of words and their meanings is vital to developing reading proficiency in children (Biemiller, 2012; Cain et al., 2001; Kastner et al., 2001; Vellutino, 2004). It has been well-documented that children enter formal education with varying oral language skills and vocabulary levels. Some children are exposed to plenty of books and rich oral language experiences, whereas others have had limited exposure to language and word meanings (Hart & Risley, 1995). There is a compelling effect of socioeconomic disadvantage on early language development, with up to 50% of young children from low socioeconomic backgrounds experiencing language delays (Ginsborg, 2006). Research has focused explicitly on vocabulary, and it has been shown that there is a profound difference in vocabulary knowledge between children from low socioeconomic backgrounds compared to children from high socioeconomic backgrounds (Beck & McKeown, 2007).

Much of the research has focused on younger children; however, this difference in vocabulary knowledge has also been noted in adolescents (Spencer et al., 2012). Similarly, with the diversification of school populations and more children speaking English as a second language, it is relevant to understand vocabulary knowledge's role in the academic achievement of English Language Learners (ELLs). Bilingual children show weaknesses in the vocabulary of their second language and reading comprehension skills despite no differences in their cognitive skills compared to first language English speakers (Babayiğit et al., 2022).

In schools, the average child gains approximately 6000 root word meanings by the end of grade two (Biemiller, 2005). Children in the lower quartile have gained approximately 4000, and children in the upper quartile have gained approximately 8000 root word meanings. Every 1000 root word meaning is equivalent to one grade level, so there can be a four-year grade level difference between children in the same class. However, school attendance alone has been shown to have minimal effect on the growth of vocabulary knowledge (Biemiller & Boote, 2006). To attempt to close the vocabulary knowledge gap that is proven to exist between children before formal education even begins, the focus of schools should be on implementing the most effective vocabulary instruction.

An early link between vocabulary and comprehension was identified by McKeown et al. (1983) with a simple intervention conducted with a sample of grade four students. Over five months, the students were taught 104 words and were compared with a control group who did not receive this instruction. Students in both groups were then tested on the accuracy of word knowledge, speed of lexical access, and comprehension of the stories that contained the vocabulary words taught. Students in the experimental condition demonstrated superior performance on all measures, supporting the link between vocabulary instruction and comprehension. Furthermore, Hart and Risley (2003) demonstrated that the size of children's vocabulary at the age of three is related to comprehension and learning to read at the end of grade three.

Ouellette (2006) delved deeper into the link between oral vocabulary and specific reading skills like decoding, visual word recognition, and reading comprehension. A distinction is often made between the breadth and depth of vocabulary. Breadth refers to the number of words

known, and depth refers to how well words are known (Read, 2004). It was found that decoding ability was predicted by receptive vocabulary; visual word recognition was predicted by expressive vocabulary breadth; and the depth of vocabulary knowledge predicted reading comprehension.

Many children who learn to read in grades one and two cannot comprehend the books they are required to read in grades three and four (Biemiller, 2012). The main reason identified for this inability to understand what is being read is a deficit in vocabulary knowledge (Lescaux & Kieffer, 2010; Silverman & Crandell, 2010). Statistically, significant improvements have been noted in reading comprehension when oral-language training interventions are implemented (Clarke et al., 2010). In addition, the lexical restructuring model explains how vocabulary growth in children is linked to increased phonemic awareness skills, which are related to reading skills. By increasing the number of words in a child's lexicon, the child becomes more sensitive to sub-lexical details, encouraging the extension of phonemic awareness (Walley et al., 2003).

The research clearly demonstrates the strong relationship between reading comprehension and vocabulary (Elleman et al., 2009; Wright & Cervetti, 2017). Reading comprehension scores are associated with the breadth of vocabulary knowledge which refers to the number of words known (Stanley et al., 2018). In addition, reading comprehension is also associated with the depth of vocabulary knowledge which refers to how rich an understanding an individual has of a word, for example how to use the word in different contexts (Ouellette, 2006; Procter et al., 2012). It is thus important to determine the most effective ways to enhance the vocabulary knowledge of all children, especially those who enter school with a vocabulary deficit because of being an English Language Learner or from a disadvantaged background.

The significant differences in vocabulary knowledge between children indicate the need to accelerate their learning with ambitious teaching (Neumann, 2016). The focus should be on implementing the most effective, evidence-based vocabulary interventions. Most research aims to assess and understand the effects of a vocabulary intervention in young children on receptive and expressive language development. Two instructional practices that expand children's vocabulary and improve comprehension are consistent vocabulary instruction (Beck et al., 1982) and the explicit teaching of target vocabulary words when reading (Brett et al., 1996).

The most critical factor that influences the effectiveness of an intervention is the individual delivering the instruction (Marulis & Neuman, 2010; Mol et al., 2009). In a meta-analysis by Marulis and Neuman (2010), the largest effect sizes occurred when the researcher delivered the intervention compared to when the childcare providers or parents did. Training for parents and childcare providers was insufficient to implement the training programs faithfully. Similarly, in a meta-analysis by Mol et al., (2009), the largest effect sizes happened when carried out by the researchers. It was noted that teachers found it more challenging to encourage the same development in the language and literacy skills as the researchers. These results demonstrate the importance of interventions being generalizable to real-world settings.

Shared storybook reading is a powerful strategy that exposes children to rich oral language far greater than what they can gain from conversation alone (Coyne et al., 2007). Listening to a story has beneficial effects on children's emergent literacy skills and results in incidental vocabulary learning (Coyne et al., 2007; Pullen et al., 2010). Although the incidental exposure to words during storybook reading can improve the vocabulary repertoire of children, this is even more effective when used in conjunction with direct vocabulary instruction. Penno et

al. (2002) conducted a study in which grade one children were assigned to one of two storybook conditions. Both groups were engaged in shared storybook reading, but the experimental group also received explanations of specific target words during the read-aloud. The results indicated enhanced learning when the instructor provided explanations. This type of learning is described as embedded instruction, as it entails children learning the meaning of words embedded in the text during the shared storybook reading time (Coyne et al., 2007).

The third approach to shared storybook reading is explicit rich instruction or extended vocabulary instruction as it is often called. Extended vocabulary instruction is the explicit teaching of words that provides contextual and definitional information. This instruction exposes a child to specific target words within different contexts. Several studies have indicated that extended or explicit rich instruction results in the most word learning of the three approaches (Beck et al., 1982; Coyne et al., 2007; Stahl & Fairbanks, 1986). A meta-analysis by Marulis and Neuman (2010) further supported this pedagogical approach as the effect of vocabulary interventions with explicit instruction of word meanings showed more significant effect sizes than implicit instruction. In addition, these effect sizes increased when explicit instruction was combined with practice and review.

Another critical factor identified was the effect of the intervention group size on intervention effectiveness. There is mixed research on which intervention group size is most effective. Wanzek and Vaughn (2007) found larger effect sizes for interventions when groups were smaller; however other studies have shown that whole group instruction is just as effective as small group instruction (e.g., Pullen et al., 2010). More specifically, it has been found that smaller group sizes are especially effective for children up to grade three, whereas reading

strategy interventions in the whole classroom are beneficial for grades three to eight (Okkinga et al., 2018; Wanzek & Vaughn, 2007). Although, there is still much to learn regarding the influence of vocabulary intervention on all reading skills, the research suggests that vocabulary is a key component to enhance reading outcomes.

Summary

The development of reading skills is one of the most critical tasks children need to master due to the far-reaching repercussions for academic, social, and occupational outcomes. The literature discussed in this chapter suggests that reading disabilities or difficulties often result from phonological processing skills deficits. Phonological awareness interventions generally improve these skills; however, some children do not demonstrate adequate reading improvement (Fuchs & Fuchs, 2006; Torgesen, 2000; Torgesen et al., 2014). Research has shown that children enter formal education with significant differences in language skills and vocabulary levels (Hart & Risley, 1995). Groups especially prone to lower levels of vocabulary knowledge are children from low socioeconomic backgrounds or second-language English speakers (Beck & McKeown, 2007; Ginsborg, 2006). Vocabulary-enriched interventions have demonstrated effectiveness in improving oral language skills and reading comprehension and, as such, may be a viable option for these children who do not respond to phonological processing interventions or enter school with significant vocabulary deficits (Clarke et al., 2010; Marulis & Neuman, 2010; Beck & McKeown, 2007; Beck et al., 1983). Although especially necessary for these groups of children, explicit and systematic vocabulary instruction has not always been a priority in school curricula (Baumann, et al. 2003). According to the NICHD (2000) report, vocabulary instruction is an integral component in the development of reading, which emphasizes the relevance of this type

of vocabulary instruction for all children and not only those at risk of reading disabilities or difficulties. The study described in the following chapter investigated the effects of a vocabulary-intensive intervention on the reading skills of grade two children.

CHAPTER TWO

The Effects of a Vocabulary-Intensive Reading Intervention on the Reading Skills of Grade Two Children

Introduction

Literacy skills are integral to successful academic, social, and occupational outcomes for all individuals and, as such, have far-reaching repercussions for the quality of life of communities (Joshi & Wijekumar, 2020). Reading is the most effective way to transfer knowledge in all academic areas (Cawley et al., 1990). Children who develop early solid literacy skills demonstrate better academic achievements later in life (Piasta et al., 2012). Early and robust reading skills give children the advantage of increased print exposure, which leads to increased general knowledge and understanding of text (Cunningham & Stanovitch, 1997).

Reading Skills

Two fundamental pre-reading skills in alphabetic orthographies (i.e., languages that use symbols for individual sounds; Conrad, 2016) are alphabetic knowledge (i.e., how the alphabetic writing system functions; Brady, 2020) and phonological awareness (i.e., the awareness of sounds in spoken words) (Ehri, 1998, 2020; Kim et al., 2010; Muter et al., 2004; Stahl & Murray, 1994). A large body of research has demonstrated the importance of a multi-faceted approach that is most effective when teaching children to read. The research has focused on five primary reading skills (phonemic awareness, decoding (phonics), vocabulary, reading fluency, and reading comprehension), which facilitate the development of proficient reading skills (Kim et al., 2020). Some children struggle to master the skills needed to become fluent readers, and if these deficits are severe enough, they may be diagnosed with a learning disability.

A *learning disability* is a neurobiological disorder (Fletcher & Grigorenko, 2017) that can manifest as deficits in reading, writing, or mathematics. Two types of reading disabilities have been identified. The first is defined by difficulty with fluency and accurate decoding, and the second is defined by difficulty comprehending text (DSM-5, 2013; Hulme & Snowling, 2016). Most reading disabilities are rooted in phonological awareness deficits (Torgesen et al., 2014; Vellutino et al., 2004). However, other factors like socioeconomic status, socioemotional resilience, or quality of instruction can also influence reading acquisition (Catts & Petscher, 2022). To effectively improve reading disabilities or difficulties, it is vital to implement evidence-based interventions that offer specialized and structured instructional hours in addition to the existing literacy curriculum (Ontario Human Rights Commission, 2022).

The essential components of an effective intervention include early assessment, diagnosis, and remediation in the form of explicit and systematic instruction. (Foorman et al., 2003; Hall & Burns, 2018). Early intervention targets reading deficits before they become established and intractable (Coyne et al., 2001). It is well established that phonological awareness interventions facilitate reading development in struggling readers (Melby-Lervåg et al., 2012; NICHD, 2000); however, targeted oral language interventions which includes explicit instruction in vocabulary words have also improved phonological awareness skills (Duff et al., 2008). Children who do not improve with reading interventions often demonstrate significant phonological impairments (Nelson et al., 2003) or oral language deficits (Duff et al., 2008). Research has shown that oral language and phonological processing uniquely contribute to reading achievement (Catts et al., 1999). These unique contributions reinforce the need for children to receive instruction in all reading components to ensure optimal reading development.

Phonological skills are vital to developing decoding skills, but oral language skills in the form of vocabulary provide the basis for skilled reading comprehension (Muter et al., 2004; Oakhill et al., 2003).

The research on the influence of vocabulary interventions on reading is not as comprehensive as that on phonological awareness interventions. It is an area of research focused on understanding how vocabulary instruction can help struggling readers (Elleman et al., 2009) and broaden comprehension (Clarke et al., 2010). A comparison of phonological awareness and oral language interventions demonstrated that phonological awareness training fostered decoding ability and oral language improved vocabulary, grammatical skills, and comprehension (Clarke et al., 2010). This finding concurs with the National Early Literacy report (2008) and the National Reading Panel report (2000) that support the benefits of a multi-faceted approach to reading instruction that includes phonological awareness, phonics, vocabulary, reading fluency, and reading comprehension.

Children from low socioeconomic backgrounds often enter school with poor vocabulary skills compared to their peers, which puts them at an immediate disadvantage in learning literacy skills (Beck & McKeown, 2007; Ginsborg, 2006). There has been a significant increase in newly immigrated Canadians in the Canadian school system. Many of these children come from homes where English is not their first language (Statistics Canada, 2019). Both groups of children could benefit from systematic and explicit vocabulary instruction; however, new vocabulary learning often happens incidentally in the school system. Incidental learning is not conducive to closing the gap between in children who start school with a deficit in vocabulary (Biemiller, 2012), and often these children are misdiagnosed with learning disabilities (Biemiller, 2010 as cited in

Biemiller, 2012). Vocabulary-intensive interventions could be vital to attempting to close the vocabulary gap between children. Although the benefit of vocabulary interventions is evident for children who experience reading difficulties, all children could benefit from extensive oral language instruction. The following section will examine the components of an effective vocabulary intervention to understand what practices are most successful in expanding a child's vocabulary.

Vocabulary-Enriched Interventions

Reading research has shown that children enter formal schooling with significant differences in early literacy experiences (Ginsborg, 2006; Pullen et al., 2010). Children from low socioeconomic and disadvantaged backgrounds experience some of the most significant language delays and vocabulary deficits (Beck & McKeown, 2007; Ginsborg, 2006). Similarly, English Language Learners (ELLs) often enter school with less vocabulary knowledge than English native speakers (Babayiğit et al., 2022).

The knowledge of word meanings is integral to success as a reader, and research has consistently shown that the most prominent role that vocabulary plays in reading is the strong association it has with comprehension (Biemiller & Boote, 2006; Hart & Risley, 2003; McKeown et al., 1983). Research shows that the expansion of oral language skills improves reading comprehension (Clarke et al., 2010; Lescaux & Kieffer, 2010). Ouellette (2006) specifically demonstrated that the depth of vocabulary knowledge is a significant predictor of reading comprehension. Depth of vocabulary knowledge includes three features: precision of meaning, comprehensive word knowledge, and networking knowledge (Read, 2004). Vocabulary depth is more difficult to measure than vocabulary breadth, but some examples of how it can be

measured are word definition tasks or multiple-choice tasks that require the individual to choose the correct synonym from four options (Ouellette, 2006).

Vocabulary knowledge is essential to learning to read and reading to learn (Pullen et al., 2010). Reading to children has always been touted as integral to improving literacy levels and oral language skills (Lonigan & Whitehurst, 1998; Pullen et al., 2010). Guided storybook reading with a discussion of word meanings and story content is an informal literacy activity that improves receptive language skills and listening comprehension (Sénéchal & LeFevre, 2002). Trade books or "read-aloud" books have more complex structures and vocabulary and are often used to expand young children's vocabulary. The more explicit the vocabulary instruction, the more effective it is, and the more instruction received amplifies the word learning (Beck & McKeown, 2007).

The research has shown that the individual delivering the intervention plays the most prominent role in the success of the intervention. Specifically, when researchers implement an intervention, the effect sizes are larger than when childcare providers, parents, or even teachers did (Marulis & Neuman, 2010; Mol et al., 2009). Guided storybook reading with contextual and definitional instruction results in the most word learning (Coyne et al., 2007). Other factors that make a successful intervention are the intensity of instruction, which can be increased by implementing smaller group sizes and extending the length or explicit instruction of the intervention (Hall & Burns, 2018).

The benefits of vocabulary instruction extend beyond comprehension as it positively influences reading ability (Clarke et al., 2010; Elleman et al., 2009). According to the lexical restructuring model (Walley, 1993), vocabulary growth improves phonemic awareness. These

benefits of vocabulary instruction provide a rationale for vocabulary interventions to enhance literacy skills among children. Moreover, it is vital to ensure that the best instructional and intervention practices are employed in schools to try and close the vocabulary gap among young children when they enter school (Ontario Human Rights Commission, 2022; Pullen et al., 2010). The current study aims to expand the literature on the effectiveness of vocabulary-enriched interventions on reading skills.

Current Study

The present study aimed to determine whether there was a change in reading skills (measured by mean subtest scores) from before to after the implementation of a vocabulary-intensive reading intervention in a sample of grade two children. The intervention encompassed individual and shared storybook reading, learning new words (target words of the lesson), discussion of target words and the contexts in which they can be used, and activities to reinforce the meanings of the target words. Specifically, the study examined the following exploratory research question: does a vocabulary-based intervention enhance the reading skills of grade two children? It was hypothesized that a vocabulary-intensive intervention would improve the reading skills of grade two children. Reading skills were measured pre-intervention and post-intervention. Either standard or raw scores were used to examine if there was an improvement in reading skills.

Method

Participants

Thirty-six children enrolled in grade two were recruited to participate in this study. Participants (20 males, 16 females) were recruited from the Halifax Regional Municipality

(HRM) and surrounding areas via social media and community outlets. All participants were between the ages of seven and eight ($M_{age} = 7.25, SD = 0.44$). Inclusion criteria required that all participants have normal or corrected vision and normal hearing and be enrolled in either English or French immersion instruction. Participants were required to access the internet and a computer, as both assessment and reading intervention sessions were conducted online.

Measures

This study used a standardized battery of measures to assess participants' reading and non-reading skills. Due to the Covid-19 pandemic and an inability to collect data in Halifax Regional Centre for Education (HRCE) schools, an online testing option was used to complete the data collection and delivery of intervention sessions.

Demographic questionnaire

A language and demographic questionnaire (Appendix A) developed by the researcher was given to the parents of participants. The questionnaire provided information on whether the child had previously attended a school outside Canada followed by their name and school. If answered yes, parents provided details of the specified country and the length of time the child attended school outside of Canada. They also provided information on languages spoken at home. If there was more than one language spoken at home parents were referred to some follow up questions such as: when did the child learn their native language; if the child has an alternate first language, which languages the child speaks at home; and which language the child speaks best. The questionnaire gathered data on the regularity with which the child speaks his/her native language and English to family members (father, mother, siblings, grandparents, and friends). A 5-point Likert scale (1= Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, 5 = Always) was

used to measure how often each language is spoken to each family member. A 5-point Likert scale (1= more than 2 hours per day, 2 = 1-2 hours per day, 3 = 2-5 hours per week, 4 = less than 2 hours per week, 5 = never) measured the amount of TV or videos each child watches in their native language. A 5-point Likert scale (1= never, 2 = less than 2 hours per week, 3 = 2-5 hours per week, 4 = 1-2 hours per day, 5 = more than 2 hours per day) measured the amount of TV or videos each child watches in English. These measures indicated each child's exposure to English and other languages in the home. Similarly, a 5-point Likert scale (1= more than 2 hours per day, 2 = 1-2 hours per day, 3 = 2-5 hours per week, 4 = less than 2 hours per week, 5 = never) was used to measure how often each child reads in their native language. Similarly, a 5-point Likert scale (1 = never, 2 = less than 2 hours per week, 3 = 2-5 hours per week, 4 = 1-2 hours per day, 5 = more than 2 hours per day) was used to measure how often each child read in English.

Towards the end of the questionnaire, parents were asked to provide information on their native language, native country, the age of the parent when they moved to Canada (if relevant), occupation before and after moving to Canada, and the highest level of education attained. They also rated their ability to understand, speak, read, and write English and their native language on a 10-point Likert scale (1 = none to 10 = very fluent).

Measures of Phonological Awareness

Comprehensive Test of Phonological Processing (CTOPP-2; Wagner et al, 2013). Four subtests from the CTOPP-2 were used. The *Elision* subtest measures the ability to remove phonological segments (phonemes) from spoken words to form another real word. Children were asked to say one word and then remove either the onset, rime or middle phoneme of the word and say what was left. For example, "say pancake. Now say pancake without saying

pan." Children could receive a maximum score of 34 on this subtest. The items were administered in order with a discontinue rule of three errors in a row. The published reliability for the Elision subtest is $\alpha = .92$ (7-year-olds) and $\alpha = .93$ (8-year-olds). The published validity is $\alpha = .45$ (7-year-olds) and $\alpha = .50$ (8-year-olds).

The *Blending Words* subtest measures the ability to blend sounds to form words. Children were presented with the word segments on an audio recording and were required to blend them together. For example, "what word do these sounds make? Foot-ball." The audio recording could be repeated once. Children could receive a maximum score of 33 on this subtest. The items were administered in order with a discontinue rule of three errors in a row. The published reliability for the Blending Words subtest is $\alpha = .81$ (7-year-olds) and $\alpha = .79$ (8-year-olds). The published validity is $\alpha = .29$ (7-year-olds) and $\alpha = .30$ (8-year-olds).

The *Phoneme Isolation* subtest measures the ability to isolate individual sounds within individual words. For example, "what is the first sound in the word top?" Children could receive a maximum score of 32 on this subtest. The items were administered in order with a discontinue rule of three errors in a row. The published reliability for the Phoneme Isolation subtest is $\alpha = .91$ (7-year-olds) and $\alpha = .87$ (8-year-olds). The published validity is $\alpha = .48$ (7-year-olds) and $\alpha = .37$ (8-year-olds).

The *Nonword Repetition* subtest measures the ability to blend sounds to form nonwords. Children were presented with the made-up words on an audio recording and required to repeat them. The recorded made-up word could only be played once. Children could receive a maximum score of 32 on this subtest. The items were administered in order with a discontinue rule of three errors in a row. The published reliability for the Nonword Repetition subtest $\alpha = .70$

(7-year-olds) and $\alpha = .75$ (8-year-olds). The published validity is $\alpha = .25$ (7-year-olds) and $\alpha = .26$ (8-year-olds).

Measures of Phonological Processing

Rapid Automatized Naming and Rapid Alternating Stimulus Tests (RAN/RAS; Wolf & Denckla, 2005). The *RAN Digits* is a timed subtest that measures how quickly a participant can name 50 randomly arranged digits. Five rows of ten digits (from 0 to 9) in each were presented, and the participant was required to say them as quickly as possible. Total time taken to complete the subtest is recorded in seconds. The administrator also specified the number of errors and self-corrections made. According to the published manual, the reliability for the RAN Numbers subtest is $\alpha = .91$ (7-year-olds) and $\alpha = .82$ (8-year-olds).

The *RAN Letters* is a timed subtest that measures how quickly a participant can name 50 randomly arranged letters. Five rows of ten letters in each were presented, and the participant was required to say them as quickly as possible. Total time taken to complete the subtest is recorded in seconds. The administrator also specified the number of errors and self-corrections made. According to the published manual, the reliability for the RAN Letters subtest is $\alpha = .91$ (7-year-olds) and $\alpha = .84$ (8-year-olds).

The *RAS 2-Set Letters and Digits* is a timed subtest that measures how quickly a participant can name 50 randomly arranged letters and digits. Five rows of ten digits/letters were presented, and the participant was required to say them as quickly as possible. Total time taken to complete the subtest is recorded in seconds and the administrator also specified the number of errors and self-corrections made. According to the published manual, the reliability for the RAS Letters and Numbers subtest is $\alpha = .90$.

The *RAS 3-Set Letters, Digits, and Colors* is a timed subtest that measures how quickly a participant can name 50 randomly arranged letters, digits, and colors. Five rows of ten digits/letters/colors were presented, and the participant had to say them as quickly as possible. Total time taken to complete the subtest is recorded in seconds and the administrator also specified the number of errors and self-corrections made. The reliability for the RAS Letters subtest is $\alpha = .91$.

Measures of Word Reading and Non-word Reading

The Woodcock-Johnson IV Tests of Achievement (WJ IV ACH; Schrank et al., 2014). Two subtests from the WJ IV were used. The *Letter-Word Identification* (WID) subtest assesses children's word reading skills. This subtest contains 78 items arranged in order of increasing difficulty. The words are presented in sets, and the participants were asked to say them in the same order as they appear in each set. A maximum score of 78 could be achieved for this test, reflecting the number of words read correctly. The reliability for the Letter-Word Identification subtest is $\alpha = .84$ (7-year-olds) and $\alpha = .94$ (8-year-olds).

The *Word Attack* (WAT) assesses children's nonword reading skills. This subtest contains 32 nonwords arranged in order of increasing difficulty. The nonwords are presented in sets, and the participants were asked to say them in the same order as they appear in each set. A maximum score of 32 could be achieved for this test, reflecting the total number of nonwords read correctly. The reliability for the Word Attack subtest is $\alpha = .84$ (7-year-olds) and $\alpha = .94$ (8-year-olds).

Measures of Reading Fluency

Test of Word Reading Efficiency (TOWRE-2; Torgesen et al., 2012). Two subtests from the TOWRE-2 were used. The *Sight Word Efficiency* (SWE) subtest measures the ability to read a list of real words as fast as the participant can in the given 45 seconds. A maximum score of 108 could be achieved, reflecting the number of words read correctly in 45 seconds. The reliability for the Sight Word Efficiency subtest is $\alpha = .93$ (7-year-olds) and $\alpha = .94$ (8-year-olds). The published validity is $\alpha = .70$ (7-year-olds).

The *Phonemic Decoding Efficiency* (PDE) subtest measures the number of pronounceable nonwords a child can accurately decode within 45 seconds. A maximum score of 66 could be achieved in this test, reflecting the number of nonwords read correctly in 45 seconds. The reliability for the Phonemic Decoding Efficiency subtest is $\alpha = .86$ (7-year-olds) and $\alpha = .94$ (8-year-olds). The published validity is $\alpha = .78$ (7-year-olds).

Receptive Vocabulary

The Peabody Picture Vocabulary Test-5 (PPVT-5; Dunn, 2019). The PPVT-5 was used to measure the receptive vocabulary knowledge of participants. The PPVT-5 is a 240-item test with the starting point determined by the participant's age. The administrator said the word and the participant had to choose from four pictures shown for each item. The test items are organized from easiest to most difficult. To meet the basal requirement, participants must have three consecutive correct responses. Once six consecutive incorrect responses were recorded in one set, the administration stopped. The published reliability for the PPVT is $\alpha = .97$.

Vocabulary Intervention

An adapted version of the "Take Aim! At Vocabulary" intervention by Read Naturally (Ihnot, 2020) was used. The study's primary investigator developed the adaptation of "Take Aim! At Vocabulary." "Take Aim! At Vocabulary" is originally designed for students in grade four and up; therefore, the researcher adapted the intervention by using age and grade-appropriate material. The "Take Aim! At Vocabulary" intervention combines oral reading with phonological training and vocabulary instruction.

Procedure

Recruitment

Participants were recruited using posters posted on social media sites multiple times throughout the study. Once the participants' parents e-mailed the lead researcher and expressed interest in the study, they were provided with the study's detailed information letter, consent, and demographic form. Once the participants' parents had read and understood the information in the consent form, they were required to sign and return the form to the researcher. After acquiring the initial consent from the parents, a research assistant contacted all the parents via e-mail to set up a convenient time for the first testing session.

Pre-Intervention Reading Assessment

The study was administered online using the Skype application. All participants completed a testing (reading assessment) session which was heavily dependent on the individual speed of each participant. If a participant was not able to complete their assessment in one session, they were scheduled for a follow-up session. Each session lasted for an hour. Once a convenient time was set up for the reading assessments, the research assistant sent a Skype link

to the participating family before their arranged time. If a participant required more than one testing session, their second session was scheduled within a week of their first session.

Flexibility was required to accommodate the schedules of the participants and their parents. A total of 16 psychoeducational tests were administered which assessed word reading, phonological retrieval, phonological awareness, phonological working memory, word reading, non-word reading, vocabulary, and non-verbal intelligence. The measures of non-verbal intelligence were not examined for the purpose of this study. Once both reading assessment sessions were completed, the participant's parent was sent a \$10 e-gift card from Chapters as compensation.

Vocabulary-Intensive Intervention

Following the reading assessment, participants were randomly assigned to groups of four children and invited to participate in the vocabulary-enriched intervention program. These groups were decided according to the order in which participants completed the reading assessments. There was a minimum of 10 to a maximum of 30 instructional sessions, and the number of sessions each participant received was decided by the participants' parents and was dependent on how much time they could commit to the intervention. Twenty-five participants (69.4%) participated in 10 intervention sessions, eight (22.2%) participated in 20 intervention sessions, and three (5.56%) participated in 30 intervention sessions. These intervention sessions were taught online by a trained researcher and each session included three main steps. In step one, there was a verbal introduction to the vocabulary (six carefully selected targeted words for each story, e.g., watched, Blanket, followed, sighed, still, and think), and students were required to repeat the words after the researcher while reading them off a PowerPoint slide.

During this step, the researcher provided no definitions of the words; however, they drew attention to those words that started with capital letters. In step two, the participants read the target words aloud as a group, and then the researcher reread the words aloud. While reading the story, the researcher stopped at the target vocabulary words and elicited the word meaning from the students. The researcher then clearly and in detail stated the correct definition for each target word. The participants were then required to reread the story on their own.

In step three, the participants worked on three activities. The first activity was a multiple-choice reading activity to determine what the participants remembered from the story about the meaning of each target word. This activity had six questions, one for each target word, and participants could choose from four multiple-choice options. The instructions stated that the participant put an X next to the answer they believed was correct. The second activity, called Vocabulary Practice, included all six target words in a table. Participants were instructed to either write the meaning or definition of the word or to write a sentence using the target word to indicate understanding. The third activity was a matching activity for which participants had to match the target word with the correct definition within the story's context. While the participants engaged in the activities, they could ask the instructor questions but could not view the story. Participants submitted the completed activities before leaving the intervention session. Each intervention session included all three of the above-mentioned steps.

Post-Intervention Reading Assessment

Once the intervention sessions were completed, each participant was contacted via e-mail by a research assistant to complete the post-intervention sessions. This final testing session included 13 of the original 16 psychoeducational tests administered during the first two testing

sessions. This allowed all psychoeducational tests to be completed in one longer session as opposed to two separate sessions. Once the final testing sessions were completed, each participant was sent a \$10 e-gift card from Chapters.

Results

This exploratory study aimed to determine whether a vocabulary-intensive intervention would improve the reading skills of grade two children.

Descriptive Statistics

According to the demographic data gathered, most participants were enrolled in English instruction programs (75%) with only 25% enrolled in French immersion programs. It was found that 11 (30.6%) of the participants had received extra help in reading, eight (22.2%) had received extra help in writing, seven (19.4%) had received extra help in speaking, and three (8.3%) had received extra help in math. Most of the participants were born in Canada (75%). Of the 36 participants, 41.7% came from multilingual homes, with nine languages besides English identified. The education level of both parents was gathered. In this sample, 83.4% of mothers and 55.6% of fathers reported that they had completed an undergraduate degree, graduate, or professional degree. Demographic information is summarized in Table 1. Participants were divided into two sub-groups (i.e., private versus public school and non-ESL versus ESL) to observe any differences in scores on measures between the groups. Upon visual inspection, there were no observable differences between groups on measures. These data are summarized in Table 2 and Table 3. Immigrant vs non-immigrant participants were compared on private vs. public school and on reported extra help received in reading, writing, speaking, and math. The

data showed that non-immigrant participants were more likely to attend private school than immigrant participants. These demographic data are summarized in Table 4.

Data Analysis

All analyses were conducted using standard scores except for the two Woodcock-Johnson IV Tests of Achievement measures (i.e., Letter-Word Identification and Word Attack). The conversion of raw scores to standard scores for these measures was not possible due to lack of access to the manual and electronic scoring software. An alpha level of .05 was used for all statistical analyses.

First, the means and standard deviations were calculated for each of the variables used at both time points. Descriptive statistics are summarized in Table 5. In this sample of 36 grade two students ($M_{age} = 7.25$, $SD = 0.44$), a Pearson correlational analysis was conducted to determine whether the relationships between all the variables were consistent with previous research in this area (e.g., Byrne et al., 2000; Duff, 2018; Landi, 2010; Nation & Snowling, 2004). As expected, there were moderate to strong correlations between all the reading skills assessed in the current study.

Paired-sample t-tests were conducted for each of the 13 subtests used to assess the performance of grade two participants. Variables from two time points were included in the analysis. Analyses showed a significant increase in raw scores for word reading (Letter-Word Identification), $t_{(35)} = -4.26$, $p < .05$, $d = -.71$ and for nonword reading (Word Attack), $t_{(35)} = -5.36$, $p < .05$, $d = -.89$. As mentioned above, standard scores were used to conduct paired sample t-tests for the other reading measures. There were no significant pre- and post-test differences in scores on Elision, $t_{(35)} = -.19$, $p = .85$, $d = -.03$, Blending Words, $t_{(35)} = 1.83$, $p = .08$, $d = .31$,

Phoneme Isolation , $t_{(35)} = -1.39$, $p = .17$, $d = -.23$, Nonword Repetition, $t_{(35)} = .76$, $p = .45$, $d = .13$, RAN Letters, $t_{(35)} = -1.57$, $p = .13$, $d = -.26$, RAN Digits, $t_{(35)} = .97$, $p = .34$, $d = .16$, RAS Letters and Digits, $t_{(35)} = -1.21$, $p = .24$, $d = -.20$, RAS Letters, Digits, and Colors, $t_{(35)} = -.37$, $p = .72$, $d = -.06$, Sight Word Efficiency, $t_{(35)} = 1.13$, $p = .27$, $d = .19$, Phonemic Decoding Efficiency, $t_{(35)} = 1.08$, $p = .29$, $d = .18$, and receptive vocabulary, $t_{(35)} = -1.22$, $p = .23$, $d = -.20$.

The results of the paired t-tests are summarized in Table 6.

Discussion

The current exploratory study aimed to examine whether a vocabulary-intensive intervention would improve the reading skills of a sample of grade two children. It was hypothesized that the vocabulary-intensive intervention would improve the reading skills of grade two children. The findings from the current study do not support the hypothesis.

There was a significant increase between pre-and post-intervention for the word (Letter-Word Identification) and nonword (Word Attack) reading subtests. It should be noted that these findings are likely not clinically meaningful as raw scores were used for these two paired sample t-tests. The changes in these subtest scores are likely typical developmental reading changes that would occur irrespective of the intervention.

The current study findings differed from what has been found in previous research for word reading skills. Bowyer-Crane et al. (2008) determined that post-intervention word reading skills were comparable in two groups of kindergarten children after one group participated in a phonological awareness intervention and the other in an alternative oral language (vocabulary) intervention. These results indicate that both kinds of interventions improved word reading skills in this demographic. Although the current study did not include a phonics intervention condition,

there is one main difference between the Bowyer-Crane et al. (2008) and current study when only the vocabulary interventions are compared. This difference is the age of the participants. The participants in the current study had already completed a minimum of two years of formal schooling, and most had adequately developed word reading skills. According to Ehri's word reading development theory (2014, 2020), this sample of grade two readers was in the third phase of reading development. This is the alphabetic stage when readers understand grapheme/phoneme correspondence and can decode words. As most participants displayed average word reading skills pre-intervention, they may not have improved sufficiently to register as significant. This difference in sample demographics between the Bowyer-Crane and current study sample may explain why there was no significant change in mean scores on the word reading measure.

The vocabulary intervention implemented in the current study included guided storybook reading and explicit instruction of word meanings and contexts. Although there was no significant change in word reading scores in the present study, Coyne et al. (2007) demonstrated that this type of vocabulary instruction, also known as extended vocabulary instruction, results in the most word learning. The effectiveness of various versions of extended instruction is well supported in the literature (Biemiller & Boote, 2006; Wise et al., 2016) and is even more effective when combined with activities in which the words can be reviewed and practiced (Marulis & Neuman, 2010).

The findings from the current study did not align with previous studies that employed similar components in their vocabulary interventions. One explanation could be that the intervention sessions for the current study were all conducted online, which may not have been

the optimal method of instruction for this demographic of children. Research has shown that the individual providing the intervention is one of the most influential components of an effective vocabulary intervention. The most significant effect sizes are found in studies where the researcher carries out the interventions (Marulis & Neuman, 2010; Mol et al., 2009). Although the researcher carried out the intervention in the current study, online instruction may not have been as effective as in-person learning, specifically for younger children, as it is more difficult for the instructor to develop rapport and ensure that children attend to the lesson being taught.

As previously mentioned, there was a significant increase between pre-and post-intervention for the nonword (Word Attack) reading subtest. Once again, these findings are probably not clinically significant, as raw scores were used to conduct this statistical analysis. This subtest assessed nonword reading, which is considered a proxy for decoding (Steady et al., 2016). Perfetti (2010) proposes the Decoding, Vocabulary, Comprehension (DVC) reading triangle, which suggests a way to conceptualize reading skills by describing the relationships between the three critical components, vocabulary, decoding, and comprehension. Skills in vocabulary, decoding, and comprehension integrate to determine overall reading ability, and deficits in any of these three skills will limit general reading skills. The DVC reading triangle illustrates these three reading skills' direct and indirect relationships (Perfetti, 2010). This triangle explains how decoding directly influences vocabulary. When words are correctly decoded, the meaning is retrieved, strengthening the connection between the spelling and the word's meaning (Nation & Snowling, 1998). The DVC triangle suggests that if vocabulary increases, this may affect decoding skills; however, the results from the current study do not support this theory. This difference could be explained by the developmental reading phase of

the participants in the current study, as most of these children had well-developed decoding skills, so any changes in vocabulary may have only caused subtle changes to decoding skills.

Similarly, there were no significant differences in means for any of the four phonological awareness subtests. Previous research has suggested that the lexical restructuring model explains how vocabulary growth in children is linked to increased phonemic awareness skills, which are related to reading skills. By increasing the number of words in a child's lexicon, the child becomes more sensitive to sub-lexical details, encouraging the extension of phonemic awareness (Gibbs, 2004; Metsala & Walley, 1998; Walley et al., 2003). The lexical restructuring model suggests that if vocabulary knowledge is increased by implementing a vocabulary-intensive intervention, this may result in improvements in phonemic awareness skills. Significant changes in phonological awareness skills did not occur in the current study. One reason may have been that the intervention did not sufficiently increase vocabulary knowledge to affect a measurable increase in the specific phonological awareness skills measured. Most of the vocabulary interventions (69.4%) in the present study included only ten sessions, so it is possible that the intensity of instruction was not sufficient to generate a significant difference between pre- and post-intervention scores. Intensity of instruction plays a vital role in the effectiveness of an intervention (Torgesen, 2000) and can be increased by increasing the length of the intervention (Hall & Burns, 2018).

Duff et al. (2008) implemented an alternative oral language skills intervention with children who demonstrated a poor response to regular phonological awareness reading interventions. This intervention included a combination of oral reading, phonological training, and rich vocabulary instruction. The findings demonstrated improved reading, phonological

awareness, and language skill measures, demonstrating that vocabulary instruction might improve phonological awareness skills. The current study findings did not align with Duff et al. (2008), despite the explicit teaching of vocabulary words during the intervention. A major difference is that all participants in Duff et al. (2008) had already demonstrated a poor response to previous phonological awareness reading interventions, which indicated reading deficits as opposed to the participants in the current study. This difference in the studies may account for the contrasting responses as the Duff et al. (2008) participants would have started with far lower phonological awareness scores, so the change in scores may have been more significant. In contrast, those in the current study had mean phonological awareness scores that fell within the average range before the intervention.

Surprisingly, there was no significant change or improvement in receptive vocabulary scores from pre-intervention to post-intervention. Intuitively, this is the one reading skill in which one would expect improvement, as this study focused on the explicit teaching of definitional and contextual vocabulary. There is strong evidence from previous studies that there were improvements in vocabulary when children participated in a vocabulary-intensive intervention (Beck & McKeown, 2007; Clarke et al., 2010; Coyne et al., 2004; Duff, 2018).

The current intervention focused on expanding the definitional knowledge of the target words within each story. This instructional strategy has been shown to improve vocabulary depth which as previously mentioned refers to the richness of word knowledge or how well words are known (Ouellette & Beers, 2010). However, the task used to assess vocabulary in this study (PPVT-5) used one-word picture identification, considered a measure of vocabulary breadth (Ouellette, 2006). With the focus of the vocabulary intervention being on expanding vocabulary

depth, it could be that a measure designed to assess vocabulary breadth was not appropriate to capture any subtle improvements.

Biemiller and Boote (2006) demonstrated that the explicit instruction of targeted words increases the likelihood that those words will be remembered. Like the Biemiller and Boote (2006) study, the current study provided explicit instruction on the target words during each intervention session. However, the receptive vocabulary measure (PPVT-5) did not specifically test knowledge of the target words taught during the intervention. Thus, the measure used may not have accurately captured improvements in vocabulary knowledge.

As previously mentioned, the findings for the word and nonword reading measures are based on raw scores and should be interpreted with caution. A limitation of using raw scores is that they do not allow for accurate interpretation of the data. Simply, raw scores do not allow any changes in scores to be understood relative to other participants. Converting raw scores to standard scores allows for comparisons across populations. This calls into question whether significant findings in relation to word and non-word reading are meaningful. To further understand the data, the educational implications of effect sizes (Cohen's *d*) will be discussed in the following section.

To fully understand the data, it is important to examine their statistical significance and meaningfulness (i.e., clinical, or practical significance of a research outcome; Lakens, 2013). Values for statistical significance do not convey the effectiveness of an intervention and there is a benefit to examining the effect sizes to better understand the results (Brignardello-Petersen et al., 2013). Cohen's *d* was used as a measure of effect size in the current study. It has been suggested that when small effect sizes ($d = 0.2$) are based on measures of academic achievement

these can be of interest to educational policies (Hodges & Hedberg, 2007, as cited in Durlak, 2009). In terms of teaching strategies or interventions like the one in this study, effect size is considered a “powerful tool for understanding what strategies will have the biggest influence on student learning and achievement” (Green, 2021, p. 1).

The findings of the current study indicated effect sizes above 0.2 for five of the measures: Blending Words (CTOPP-2), Phoneme Isolation (CTOPP-2), RAN Letters (RAN/RAS), RAS Letters and Digits (RAN/RAS), and Receptive Vocabulary (PPVT-5). In view of the discussion on the interpretation of Cohen’s *d* in educational contexts, these effects sizes indicate that the changes in reading skills from pre- to post-intervention may have some clinical significance within the educational context. This is a useful finding as it indicates that a vocabulary-intensive intervention may have practical implications in the classroom and result in meaningful change in participants’ reading skills.

In 2021, UNESCO recorded a 20 percent increase in children worldwide experiencing reading difficulties. It was hypothesized that this increase was due to the Covid pandemic and children missing extensive amounts of in-person learning. This increase, in addition to decreasing literacy rates, emphasizes the need to ensure the implementation of the most effective interventions to improve children's reading outcomes. The current exploratory study may be a starting point to better understand how vocabulary-intensive interventions and instruction can support children in reaching age-appropriate reading levels.

Limitations

This current study's results must be interpreted considering the following limitations. The initial goal was to implement the study in schools to ensure a large and varied sample; however,

this was not feasible due to the Covid pandemic and the inability to recruit participants from the Halifax Regional Centre for Education (HRCE). The unprecedented pandemic meant participants were recruited from the community and depended on parents who were interested in their children participating in a study and had access to the internet within their homes. This unforeseen change may limit the generalizability of the findings to children from different socioeconomic backgrounds, home environments, and geographical regions.

Online testing presented multiple challenges which may also have influenced the effectiveness of the intervention and the accuracy of the results. The first challenge that influenced most participants was technical difficulties. During the first few sessions, many children required instruction to access the materials and worksheets. These explanations decreased the time spent on the intervention material. More broadly, the results of this study may not be generalizable to the broader grade two student population due to online testing. Although publishers have granted permission to remotely administer the TOWRE-2, CTOPP-2, WJ-IV, PPVT-5, and RAN/RAS, this does not mean that they have been normed or examined in a virtual setting. It is, therefore, acknowledged that this unavoidable adjustment may have influenced the validity of the standardized measures and subsequent interpretation of the results.

A significant limitation of this study was the statistical analyses used. This type of statistical analysis (t-test) ignores the shared variance between variables, increasing the possibility of a Type 1 error.

Another limitation is the ability to infer causality in this study. To infer causality, certain conditions must be met. The first and most important condition is the random assignment of participants to either an experimental or control condition. The inclusion of a control condition

allows the researcher to minimize the effects of other factors. Due to the study design, there was no random assignment of participants to different conditions, rather, all participants were assigned to participate in the intervention. Results should be interpreted with caution as it is difficult to determine which of these limitations or challenges may have influenced the findings of this study. Unfortunately, in the Covid-19 pandemic, many of these limitations were unavoidable.

A final limitation that should be considered in the current study is sample bias. Most participants came from homes that included well-educated parents with one or both parents in professional occupations. The high percentage of parents with post-secondary education and professional occupations suggests that the participants in the sample are predominantly from a middle to upper-socioeconomic background (Chen et al., 2018). Thus, the current study may not be representative of the general population as it does not fully represent the diverse SES backgrounds present in Nova Scotian schools. Despite the limitations of this study, the components of the vocabulary-intensive interventions are well supported by the literature.

Future Research

Future research should focus on the replication of this study in schools. Replicating this study in schools would be more efficient and effective with its access to a more extensive and diverse group of children. If the assessments and vocabulary-intensive intervention occur during regular school hours, more children would also be able to participate in the study. Similarly, the study would not depend on parents to ensure children are available during the required times. It would take the pressure off parents to try and manage the online assessment and intervention sessions. Implementation of this study in schools would also ensure a more varied sample with

participants from different socioeconomic, cultural, and language backgrounds, which should also be an aim for future studies. A more diverse selection of children, specifically those from a range of SES backgrounds, will provide more detailed information on how the individual differences between children and their vocabulary levels influence the effectiveness of this intervention and make it more generalizable to a broader range of children.

Future research could also consider whether there is a difference in response to a vocabulary-intensive intervention based on a child's first language. With the diversification of school populations and the significant increase in newly immigrated Canadians, many children come from homes where English is not their first language (Statistics Canada, 2019). Future research could identify the differential effects of vocabulary instruction and intervention on students with English as a second language which could provide valuable information on how to differentiate instruction and provide additional support if needed for these children. It is a human right to learn to read, and as such, implementing evidence-based interventions that offer specialized instruction for all groups in schools is vital (Ontario Human Rights Commission, 2022).

Implications for Clinical Practice

This study has implications for introducing more comprehensive vocabulary instruction and interventions in the school curriculum. This is firstly due to the practical significance indicated by the effect sizes of five of the reading measures. These effect sizes indicate that implementation of more comprehensive vocabulary instruction and intervention may incur meaningful change in reading skills. Although no causality could be implied, this study adds to the research that overall reading achievement is uniquely influenced by oral language skills

(Catts et al., 1999). This study and the research mentioned suggest the importance of vocabulary instruction and could encourage more systematic and explicit vocabulary instruction in school curricula. Although sweeping changes like this may be challenging, incremental changes may be possible by introducing these vocabulary instruction strategies to teachers for use in their classrooms.

School psychologists are well-positioned in schools to recommend vocabulary-intensive interventions for those children identified with reading difficulties. There is currently an effort in education centres to implement Response to Intervention models (RTI). The RTI system promotes universal academic screening, progress monitoring for children identified as at-risk, and increasingly rigorous interventions dependent on progress monitoring (Carlson et al., 2013). There are usually three tiers within most RTI models, with tier one being general classroom education, tier two providing small group, targeted intervention, and tier three providing the most intensive interventions (Al Otaiba et al., 2014). The RTI system aims to provide early intervention to students with learning difficulties and to identify students with a learning disability after adequate instruction and evidence-based interventions have been tried. Currently, in some education centres in Nova Scotia, school psychologists are expected to include 40 % of their time working on tier one interventions. This time could include assistance to help teachers implement more systematic and evidence-based class-wide interventions. This mandate creates an avenue for school psychologists to encourage the use of vocabulary-intensive interventions and instruction in addition to instruction that targets the other reading components.

Conclusion

The current study examined whether a short vocabulary-intensive intervention would enhance the reading skills of grade two children. Previous research has demonstrated the relationship between vocabulary and comprehension, in addition vocabulary has been shown to predict other reading skills like decoding. This study sought to explore if a vocabulary intervention would improve reading skills including word reading, nonword reading, phonological awareness, phonological processing, and receptive vocabulary. Although there were no significant findings in the current study, the effect sizes suggest that a vocabulary-intensive intervention may have practical implications in the classroom and contribute to meaningful change in the participants' reading skills. This study could bring awareness to the importance of systematic and explicit vocabulary instruction as a remedial and preventive tool to improve the literacy skills of all children. Overall, the results could help to inform reading curricula to include a more comprehensive approach to vocabulary instruction and intervention.

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Table 1*Summary of Demographic Questionnaire (N = 36)*

Demographic Information	N	Percent
French Immersion	9	25 %
Non-Canadian born	9	25 %
Multilingual home	22	61.1 %
Received extra help in reading	11	30.6 %
Received extra help in writing	8	22.2 %
Received extra help in speaking	7	19.4 %
Received extra help in math	3	8.3 %
Parent 1 education level		
Moderate	6	16.7 %
High	30	83.3 %
Parent 2 education level		
Not answered	9	25 %
Moderate	7	19.4 %
High	20	55.5 %
Parent 1 occupation level		
Not applicable	6	16.7 %
Non-professional	2	5.6%
Professional	28	77.8 %
Parent 2 occupation level		
Not applicable	9	25 %
Non-professional	3	8.3 %
Professional	24	66.7 %

Table 2*Mean Scores of Measures for Public School (n = 33) vs. Private School (n = 3)*

Measures	Time 1		Time 2	
	Public	Private	Public	Private
Letter Word ID	46.39	49.67	50.61	52.00
Word Attack	18.30	18.67	20.52	21.00
Elision	98.64	98.33	98.94	100.00
Blending Words	85.00	86.67	81.52	80.00
Phoneme Isolation	92.12	98.33	95.61	96.67
Nonword Repetition	81.36	100.00	79.09	96.67
RAN Digits	102.00	100.33	100.18	99.00
RAN Letters	96.30	93.00	98.79	90.33
Letters/Digits	101.70	97.00	103.67	99.67
Letters/Digits/Colours	100.64	104.33	102.15	96.67
Sight Word Efficiency	102.52	103.67	100.70	104.00
Phonemic Decoding	102.15	95.00	100.52	100.67
PPVT	103.39	102.00	104.45	110.33

Table 3*Mean Scores of Measures for Non-ESL (n = 29) vs. ESL (n = 7)*

Measures	Time 1		Time 2	
	Non-ESL	ESL	Non-ESL	ESL
Letter Word ID	46.00	49.43	49.03	57.71
Word Attack	17.34	22.43	19.31	25.71
Elision	96.72	106.43	96.72	108.57
Blending Words	85.17	85.00	81.90	79.29
Phoneme Isolation	92.93	91.43	95.52	96.43
Nonword Repetition	83.28	81.43	80.34	81.43
RAN Digits	100.83	106.14	100.17	99.71
RAN Letters	95.10	99.86	97.03	102.43
Letters/Digits	102.38	96.86	102.28	107.71
Letters/Digits/Colours	101.28	99.57	101.28	103.43
Sight Word Efficiency	102.55	102.86	100.00	105.00
Phonemic Decoding	99.45	110.29	97.69	112.29
PPVT	105.48	94.14	106.62	98.00

Table 4*Demographic Information for Immigrant (n = 9) and Non-Immigrant (n = 27) Participants*

Demographic Characteristics	Frequency	
	Immigrant	Non-Immigrant
Attended public school	9	24
Attended private school	0	3
Received extra help in reading	5	6
Received extra help in writing	4	4
Received extra help in speaking	2	5
Received extra help in math	2	1

Table 5*Descriptive Statistics of all Measures for Time 1 and Time 2 (N = 36)*

Measures	Time 1		Time 2	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Letter Word ID	46.67	12.16	50.72	10.65
Word Attack	18.33	6.58	20.56	6.04
Elision	98.61	12.22	98.89	11.41
Blending Words	85.14	13.71	81.25	12.15
Phoneme Isolation	92.64	12.28	95.56	13.30
Nonword Repetition	82.92	20.61	80.42	15.65
RAN Digits	101.86	16.04	100.08	16.73
RAN Letters	96.03	11.13	97.94	12.75
Letters/Digits	100.31	14.34	103.33	18.05
Letters/Digits/Colours	100.94	14.34	101.58	13.96
Sight Word Efficiency	102.61	16.29	100.86	16.75
Phonemic Decoding	101.56	16.60	100.44	16.47
PPVT	103.28	16.48	104.69	16.08

Table 6*Results of Paired Sample T-Tests for all Reading Measures (N = 36)*

Measures	Time 1		Time 2		<i>t</i> (35)	<i>sig</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Word reading	46.67	12.16	50.72	10.65	-4.26	.00	-.71
Nonword reading	18.33	6.58	20.56	6.04	-5.36	.00	-.89
Elision	98.61	12.22	98.89	11.41	-.19	.85	-.03
Blending Words	85.14	13.71	81.25	12.15	1.83	.08	.31
Phoneme Isolation	92.64	12.28	95.56	13.30	-1.39	.17	-.23
Nonword Repetition	82.92	20.61	80.42	15.65	.76	.45	.13
RAN Digits	101.86	16.04	100.08	16.73	.97	.34	.16
RAN Letters	96.03	11.13	97.94	12.75	-1.57	.13	-.26
Letters/Digits	100.31	14.34	103.33	18.05	-1.21	.24	-.20
Letters/Digits/Colours	100.94	14.34	101.58	13.96	-.37	.72	-.06
Sight Word Efficiency	102.61	16.29	100.86	16.75	1.13	.27	.19
Phonemic Decoding	101.56	16.60	100.44	16.47	1.08	.29	.18
PPVT	103.28	16.48	104.69	16.08	-1.22	.23	-.20

Appendix A: Demographic Questionnaire

Family Language Questionnaire

In order to have better understanding of the factors that influence a child's ability to learn to read, we would like to obtain some information about his/her native language knowledge and language use in the home. We would greatly appreciate it if you would complete the following questions concerning your family and your child who is in the study.

Child's Name: _____

Today's date: _____

Please answer these questions about the child in the study.

1. Name of child's current school _____

(Please indicate whether your child is in French Immersion)

2. Did your child attend school in any country besides Canada?

No. Yes. If yes, how many years?

Which country? _____

3. When did your child learn to speak his/her native language?

First words (months) _____ Sentences (months) _____

4. Has your child ever received extra help in the following areas:

Reading	Writing	Speaking	Math

5. a) Was your child born in Canada? Yes No

b) If your child was not born in Canada, how old was he/she when you moved to Canada? _____

c) In what grade did your child start school in Canada? _____

6. What language or languages are spoken at home?

Main language: _____

Other(s): _____

7. What is your child's first language? _____

What is your child's second language? _____

Other languages: _____

8. What is your child's best language? _____

9. a) How often does your child speak to the members of your household in **your native language**?

	Always	Frequently	Sometimes	Rarely	Never
Parent 1					
Parent 2					
Brothers & Sisters					
Grandparents					

9. b) How often does your child speak to the members of your household in **English**?

	Always	Frequently	Sometimes	Rarely	Never
Parent 1					
Parent 2					
Brothers & Sisters					
Grandparents					

10. a) How often does your child speak to friends in **English**?

	Always	Frequently	Sometimes	Rarely	Never
Friends at school					
Friends in community					

10. b) How often does your child speak to friends in **your native language**? Specify:

	Always	Frequently	Sometimes	Rarely	Never
Friends at school					
Friends in community					

11. How often does your child watch TV or videos in English and in your native language?

	More than 2 hours per day	1-2 hours per day	2-5 hours per week	Less than 2 hours per week	Never
English					

Native Language Specify:					
--------------------------	--	--	--	--	--

12. How often do you read at home in English and in your native language?

	More than 2 hours per day	1-2 hours per day	2-5 hours per week	Less than 2 hours per week	Never
English					
Native Language					

13. Approximately how many books do you have at your house that your child has read or might read (including library books) in English and in your native language?

	1-2	3-5	5-10	10-25	25-100	100+
English						
Native language						
Specify:						

Please answer these questions about yourself.

Circle who is completing this questionnaire: Mother Father Other: _____

14. What is your native language(s)? _____

What is your native country? _____

If you were not born in Canada, at what age did you move to Canada? _____

15. For each of the following **English** language skills, please rate how well you feel that you can currently perform the skill. (Circle one number per skill)

	ability									
	1	2	3	4	5	6	7	8	9	10
Understanding										
Speaking										
Reading										
Writing										

16. For each of the following **native language** skills, please rate how well you feel that you can currently perform the skill. (Circle one number per skill)

	ability									
	1	2	3	4	5	6	7	8	9	10
Understanding	1	2	3	4	5	6	7	8	9	10
Speaking	1	2	3	4	5	6	7	8	9	10
Reading	1	2	3	4	5	6	7	8	9	10
Writing	1	2	3	4	5	6	7	8	9	10

17. Please place an X beside the highest level of education that you have attained.

- _____ Elementary school
- _____ Some high school studies
- _____ Completed high school
- _____ Some college or university studies
- _____ Completed college diploma
- _____ Completed undergraduate degree
- _____ Some postgraduate studies
- _____ Completed graduate or professional degree

18. What is your occupation? _____

If you are a new Canadian and were employed before immigrating to Canada, please indicate your occupation in your former country _____

Questions 19-24 are the same as Questions 14-18 but concern another adult with whom your child lives (for example, his or her other parent or a step-parent), or with whom your child has regular contact (for example, a parent no longer living in the household). If there are several people to whom this might apply, it should be filled out by (or for) the person who has most influenced the language abilities of your child. If there is no one to whom this applies, put a check on the following line _____ and leave Questions 19-24 blank.

19. Relationship of Adult 2 to the student _____

20. What is Adult 2's native language(s)? _____

What is Adult 2's native country? _____

If not born in Canada, at what age did Adult 2 move to Canada? _____

21. For each of the following **English** language skills, please rate how well Adult 2 can currently perform the skill. (circle one number per skill)

	ability									
	none									very fluent
Understanding	1	2	3	4	5	6	7	8	9	10
Speaking	1	2	3	4	5	6	7	8	9	10
Reading	1	2	3	4	5	6	7	8	9	10
Writing	1	2	3	4	5	6	7	8	9	10

22. For each of the following **native language** skills, please rate how well Adult 2 can currently perform the skill. (circle one number per skill)

	ability									
	none									very fluent
Understanding	1	2	3	4	5	6	7	8	9	10
Speaking	1	2	3	4	5	6	7	8	9	10
Reading	1	2	3	4	5	6	7	8	9	10
Writing	1	2	3	4	5	6	7	8	9	10

23. Please place an X beside the highest level of education attained by Adult 2:

- Elementary school
- Some high school studies
- Completed high school
- Some college or university studies
- Completed undergraduate degree
- Some postgraduate studies
- Completed graduate or professional degree

24. Adult 2's occupation: _____

If Adult 2 is a new Canadian and was employed before immigrating to Canada, please indicate occupation in your home country _____

Thank you for completing the Family Language Questionnaire. We look forward to sharing the findings of the project with you.