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The development of reading comprehension skills in children learning English as a second language

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Abstract Reading comprehension is a multi-dimensional process that includes the reader, the text, and factors associated with the activity of reading. Most research and theories of comprehension are based primarily on research conducted with monolingual English speakers (L1). The present study was designed to investigate the cognitive and linguistic factors that have an influence on reading comprehension in English-as-a-Second-Language (ESL) speakers. The cognitive aspects of reading comprehension among L1 speakers and ESL speakers in the seventh grade were investigated. The performance of both groups was compared and the role of some relevant processes, including word reading, word reading fluency, phonological awareness, working memory, and morphological and syntactic awareness were assessed. Within this sample, three groups were examined: (1) children with poor comprehension (PC) in the absence of word reading difficulties (2) children with poor word reading and poor comprehension (poor readers, PR) (3) and children with both good word reading and comprehension abilities (good comprehenders, GC). The results demonstrated that a variety of cognitive processes, such as working memory and phonological, syntactic, and morphological awareness are important for reading comprehension and compromised in poor comprehenders. The GC group performed better than the PC group on all of the cognitive measures, indicating that comprehension depends on a variety of phonological, memory and linguistic processes and that adequate word recognition skill are important for reading comprehension. The prevalence of the ESL and L1 students was similar across the three reading groups. The ESL and L1 students demonstrated similar performance, indicating that the skills underlying reading comprehension are similar in the ESL

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and L1 students. This study demonstrated that ESL students are capable of developing word reading and reading comprehension skills that are as strong as those of their L1 peers.

Keywords ESL · Reading comprehension · Poor comprehenders

Strong literacy skills are a prerequisite for success in contemporary society. Reading proficiency involves the comprehension of a broad array of text types at a high level. The National Assessment of Educational Progress found that 26% of eighth-grade students could not read material essential for daily living, and overall, 68% of secondary students scored below the proficiency level (Perie, Grigg, & Donahue, 2005). Such skills may be of a particular challenge for a considerable number of students with learning disabilities (LD) and students with English as a Second Language (ESL). The current study was designed to provide an understanding of the reading comprehension skills of students with ESL and to understand the components that contribute to successful reading comprehension.

Comprehension is the ultimate goal of reading and comprehension failures can lead to school failures. Approximately 10% of children aged 7–11 years have poor reading comprehension (Nation & Snowling, 1997; Oakhill, 1994). Therefore, there has been an increased interest in attempting to assess and understand comprehension (RAND Reading Study Group, 2002). In their comprehensive report, the RAND (2002) defined reading comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement with written language. Reading comprehension consists of three elements: the reader, the text, and the activity or purpose for reading.

The aim of the present study was to examine reading comprehension while taking into consideration its complexity. By examining the reader, the text and the cognitive skills dimensions, this study aimed to address the types of comprehension difficulties, the reading comprehension of ESL students, and the cognitive processes that are critical to successful word reading and comprehension.

Cognitively based views of reading comprehension emphasize the interactive nature of reading (Rumelhart & Ortony, 1977) and provide a complex description of the reading comprehension process. Text comprehension draws on many different language skills. These include lower-level lexical skills such as word reading efficiency and vocabulary knowledge, sentence-level skills such as knowledge of grammatical structure and higher-level text processing skills such as inference generation and comprehension monitoring (e.g., Hannon & Daneman, 2001; Perfetti & Hart, 2001; Perfetti, Marron, & Foltz, 1996). Efficient lower-level lexical skills facilitate reading comprehension by enabling more resources to be devoted to higher-level processes. However, they are not sufficient to ensure comprehension of what is read. Higher-level skills are related to text comprehension because they enable the reader to make the necessary integrative and inferential links to construct a meaning-based representation of the text (Cain & Oakhill, 2006).

Reading comprehension is a complex process that involves the reader, the contextual setting, and the reader's background knowledge. The literature on

reading proposes several critical processes for adequate reading performance. The most robust predictor of word reading ability is that of phonological processing. Individuals with reading disabilities often have a deficit at the phonological module level, which impedes their ability to discern and manipulate the distinctive sound elements that constitute language (e.g., Mann, 1984; Share & Stanovich, 1995; Stanovich & Siegel, 1994). In addition, word recognition skills must develop to the point where text can be rapidly decoded. The combination of the speed and accuracy of real-word recognition contributes to fluency, which is crucial for effective local text processing (Perfetti, 1985, 1988) and has been shown to have a direct effect on reading comprehension (Blachman, 2000; Kame'enui & Simmons, 2001).

Comprehension difficulties: subtypes

The literature on the reading comprehension of English L1 speakers identifies two types of comprehension difficulties. Most of the research on reading difficulties has focused on poor comprehenders who are also considered poor readers due to deficient basic level processes (e.g., Shankweiler, 1989). This type of reading comprehension difficulty primarily reflects significant word reading problems.

The second type of reading difficulty is considered a specific comprehension problem. These children have developed good word recognition skills but have poor comprehension. When word reading ability and written vocabulary knowledge are controlled, poor comprehenders demonstrate deficits in higher-level skills relative to same-age good comprehenders. Impairments have also been found on measures of working memory (Yuill, Oakhill, & Parkin, 1989). Research has found that such children experience difficulties at the text level rather than the word level. These readers often do not differ significantly from good comprehenders on the accuracy, speed, or automaticity of single-word decoding (e.g., Siegel & Ryan, 1989b; Yuill & Oakhill, 1991). In a review of the research, Yuill and Oakhill (1991) noted that the problems of poor comprehenders arise when low-level processes are intact, but higher-level processes are required including inference making, working memory, and story structure knowledge.

Reading comprehension of ESL students

Few studies have examined the comprehension skills of children who are ESL learners. The findings of the existing studies demonstrate contrasting results: one group of studies indicated that reading comprehension is an area of academic difficulty for ESL students, and that these children perform at significantly lower levels than their monolingual peers on measures of reading comprehension (e.g., Aarts & Verhoeven, 1999; Droop & Verhoeven, 1998, 2003; García, 1991; Low & Siegel, 2005; Verhoeven, 1990, 2000).

Two other studies that examined reading comprehension on a cohort of ESL students demonstrated different results. The ESL students in this cohort received a balanced literacy program in kindergarten and in grade 1 that was created by the

teachers in the district. The students that were identified as being at risk for reading problems in kindergarten received additional phonological awareness training provided by the classroom and resource teachers in small groups and on an individual basis. In addition, the students received a reading program that was also created by the teachers during their elementary grades. Lesaux, Rupp and Siegel (2007) examined the reading comprehension of grade 4 students and found that there were no differences between the ESL and L1 on reading comprehension performance. Although in kindergarten the ESLs performed more poorly than the L1 speakers on several tasks of early literacy, by fourth grade, these differences had generally disappeared. Similarly, the kindergarten predictors of fourth-grade word reading and reading comprehension performance were virtually identical for each of the two groups. Finally, the nonlinear developmental trend in word reading from kindergarten through fourth grade was similar for ESL and L1 speakers. Low and Siegel (2005) also examined the grade 6 cohort and the relative role played by three cognitive processes: phonological processing, verbal working memory and syntactic awareness in understanding the reading comprehension performance among L1 speakers and ESL speakers. The ESL speakers showed comparable performance on word reading, but lower performances on the Oral Cloze task, a measure of syntactic awareness in oral language. In addition, there were no differences between the two language groups on the experimental reading comprehension task that minimized the effects of vocabulary and prior knowledge. There was however differences between the groups on the standardized reading comprehension task and the L1 performed better than the ESL students. The Stanford Diagnostic Reading Comprehension Test (SDRT; Karlsen & Gardner, 1994) mean scores for both groups fell solidly within the average range (mean score of 58th percentile for L1 and mean score of 50th percentile for ESL), suggesting that ESL speakers are not at a disadvantage according to the normative criterion of the test.

Among monolingual populations, oral language competence has been strongly linked to reading comprehension outcomes (Biemiller, 2003). Theorists that study second languages agree that oral proficiency assumes increasing importance as children become more facile decoders and enter into second language text reading that is context reduced and cognitively demanding (Cummins, 1986; Nation, 2001). Therefore, ESL learners may be at a disadvantage when they are required to comprehend a text because they lack background knowledge and/or have deficits in basic cognitive processes because of vocabulary and/or language difficulties.

Cognitive processes, word reading and reading comprehension

A variety of cognitive processes, namely phonological awareness, working memory, syntactic awareness and morphological awareness, have been found to be significant in the development of reading skills of native English speakers and have been found to be problematic in students with reading disabilities (for a review, see Siegel, 1993). Four cognitive processes have been identified as important for ESLs' reading development, at least in the early stages of reading acquisition (e.g., Geva & Siegel, 2000; Limbos & Geva, 2001). In addition, these cognitive variables, accounted for a

significant and similar pattern of variance on L1 and ESL reading comprehension (Low & Siegel, 2005).

Phonological processing refers to a variety of skills involving the processing of speech sounds. Phonological awareness is the ability to segment speech into smaller units such as syllables and phonemes, and is related to word reading skills (e.g., Share & Stanovich, 1995; Stanovich & Siegel, 1994). Phonological awareness is measured through a variety of techniques, including rhyming, segmenting sounds, blending sounds and deleting sounds (Yopp, 1988). The vast majority of studies have demonstrated that phonological awareness, particularly in the primary grades, has a robust association with word decoding skills (e.g., Perfetti, Beck, Bell, & Hughes, 1987). In a similar manner, for ESL students, phonological awareness is a reliable predictor of word reading skills (e.g., Geva, Yaghoub-Zadeh, & Schuster, 2000; Gottardo, 2002; Muter & Diethelm, 2001). Furthermore, phonological awareness has been found to be an important factor in reading comprehension. When phonological awareness was examined simultaneously with measures of working memory and syntactic processing, it was shown to be a predictor of reading comprehension in monolingual samples (Gottardo, Stanovich, & Siegel, 1996).

Working memory is the ability to hold information over the short-term, while transforming or manipulating it in some way. Working memory is relevant to reading because the reader must decode and/or recognize words while remembering what has already been read, and then retrieve information such as grapheme–phoneme conversion rules (e.g., Baddeley, 1983; Daneman & Carpenter, 1980; Siegel, 1993, 1994). In addition, working memory has limited capacity; when there are more demands on the executive system, less processing space and cognitive energy will be available for the subsidiary systems. Working memory has received increased attention in the monolingual literature for its vital role in reading processing (for a review, see Swanson & Siegel, 2001). Indeed, working memory tasks have been found to be important predictors of word reading performance (e.g., Siegel & Ryan, 1989a; Swanson & Howell, 2001). Studies have demonstrated that ESLs who are typical readers have well-developed working memory skills, but ESLs who are classified as reading disabled show poor working memory skills similar to their monolingual peers (e.g., Da Fontoura & Siegel, 1995; Swanson, Saez, & Gerber, 2006). Gholamain and Geva (1999) found that working memory in first and second languages contributed significantly to single-word recognition and pseudoword reading skills in L1 and second language readers.

The third process, syntactic awareness, is the "ability to reason consciously about the syntactic aspects of language, and to exercise intentional control over the application of grammatical rules" (Gombert, 1992, p. 39). Syntactic awareness is important for reading comprehension because it requires making predictions about the word that should come next in a sequence. Willows and Ryan (1986) reported a predictive relationship between syntactic processing and early reading achievement, even when general cognitive ability and vocabulary levels were controlled. Similarly, Tunmer, Nesdale, and Wright (1987) found that poor readers had a deficit in syntactic awareness even when compared to a sample of reading-matched controls. A group of studies also demonstrated that ESL typical reader students had difficulties in this area compared to their native English speakers peers

(e.g., Da Fontoura & Siegel, 1995; Lesaux & Siegel, 2003). This heavily loaded language based component is of particular interest in the context of ESL students and its contribution to comprehension skills.

Another process that is of interest, especially in the context of reading comprehension, is morphological awareness. Morphological awareness, the sensitivity to the morphemes in words, is another ability that is important for successful word reading and reading comprehension. The ability to segment words into meaning subunits eases the load on working memory, and thus facilitates spelling and even reading comprehension (Arnbak & Elbro, 2000). In addition, the contribution of morphological awareness to reading comprehension has been shown to be higher than that of phonological awareness (Carlisle & Stone, 2005; Siegel, 2008). This morphological awareness test was used as a type of assessment of vocabulary. In this study, we used a measure of understanding of some common prefixes and suffixes in English as a measure of morphological processing.

The existing research and theories of comprehension are based primarily on research conducted with monolingual English speakers. There is limited research of ESL and comprehension and this study will examine comprehension and related skills in order to inform teachers, policy makers and future investigators about the profiles of students with comprehension difficulties in order to provide them with future support.

Hence, especially for middle school and high school students, there is a need to better understand the components that contribute to successful reading comprehension. Of particular interest are the at risk populations such as ESL and LD students.

The present study

The principal objective of the study was to examine the reading comprehension skills of ESL students, as research indicates that reading comprehension is a persistent difficulty for this population. Previous studies that were conducted on this longitudinal sample demonstrated similar trajectories between the ESL and L1 students, but their performance on linguistic and reading comprehension measures differed between the groups in grade 6. The current study was designed as a continuation of the longitudinal study of these students and examined the overall achievement of ESL students compared to English L1 students on measures of reading comprehension in grade 7.

An additional objective of the study was to investigate the overall achievement of ESL students compared to English L1 students on measures of phonological processing, syntactic awareness, morphological awareness of the prefixes and suffixes of English words, and working memory.

The third objective of the study was to specifically examine the profiles of students with reading comprehension difficulties. The students were classified into three groups based on their performance on the Stanford Diagnostic Reading Comprehension Test (SDRT; Karlsen & Gardner, 1994) and the Wide Range Achievement Test reading subtest (WRAT3; Wilkinson, 1993). Two groups of poor comprehenders were examined. The first group was composed of students with poor

word reading and poor comprehension skills, who scored at or below the 25th percentile on the WRAT3 reading subtest and the SDRT and were referred to as Poor Readers (PR). The second group, the Poor Comprehenders (PC), consisted of students with adequate word reading skills, but poor reading comprehension skills. These students scored at or above the 35th percentile on the WRAT3 reading subtest and at or below the 25th percentile on the SDRT. The third group was composed of students with good comprehension and adequate word reading skills who scored at or above the 35th percentile on the WRAT3 reading subtest and on the SDRT and were classified as Good Comprehenders (GC).

Method

Students in grade seven, from the eighth wave of a longitudinal study, participated in this study. The students were from 30 different schools within one school district in Canada. Children were classified as ESL if they spoke a language other than English at home with their parents, siblings, and others who lived at home with them, such as grandparents; this information was obtained through school records. Most of the ESL speakers were born in Canada although some immigrated to Canada at an early age. In order to examine the first and second objectives, the entire longitudinal population of 674 students (572 L1 and 102 ESL) was included. In order to examine the third objective, the students were classified into three reader groups on the basis of their word reading and reading comprehension abilities.

The ESL children came from a variety of linguistic backgrounds, as the full sample included a total of 33 languages. The predominant native languages for the ESL children were Cantonese, Mandarin, Korean, Farsi and Spanish.

The largest linguistic subgroups included Chinese (Cantonese and Mandarin, 28 students), Farsi (12 students), followed by Korean and Spanish (7 and 6 students from each of the two groups). Of the 102 children with ESL, 32 were born outside of Canada, and 70 were born in Canada. Most of the children had some experience with reading and writing in their first language. For the purpose of these analyses, the entire longitudinal population of 674 students (572 L1 and 102 ESL) was included. Within the monolingual group, there were 300 females and 272 males and their mean age in months was 153.16 ($SD = 6.95$). Within the ESL group, there were 54 females and 48 males, and their mean age in months was 153.01 ($SD = 3.37$).

The sample included all schools in one school district in Canada and represented a wide range of socioeconomic backgrounds in the province of British Columbia. Therefore, having a diverse socioeconomic status (SES) group reduced the possibility that the performance of the ESL children as a group was related to a specific SES status. In addition, D'Angiulli, Siegel and Maggi (2004) investigated whether the relationship between socioeconomic conditions and the development of word-reading achievement is similar among the ESL and L1 children in this cohort from kindergarten to grade 5. They found that as early as kindergarten there were differences in word-reading achievement associated with SES, but the performance of ESL and L1 students became similar as they progressed through grade 5.

The important implication of these findings was that the similarities in the word-reading development of ESL and L1 students were associated with the role of instruction (D'Angiulli et al. 2004). As well, the correlation of reading skills and SES declined significantly from kindergarten to grade 3, indicating a positive influence of good schooling in this sample (for further discussion about the SES and reading ability in this district, see D'Angiulli & Siegel, 2004).

District wide reading programs

The School District has its own published kindergarten early literacy curriculum (Firm Foundations, 2001) and a reading curriculum for elementary grades that was first published in 1999 and was revised in 2004 (Reading 44, 2004). The Firm Foundations program was a classroom-based program for both L1 and ESL students. The students that were identified as being at risk for reading problems in kindergarten received additional phonological awareness training provided by the classroom and resource teachers in small groups and on an individual basis. In addition, the Firm Foundations program consisted of early literacy skills development, letter–sound relationship, and language development. For instance, small groups and individuals were provided with different activities in a play format such as rhymes, sound–symbol, early writing activity (journals), and letter identification activities (baking letter-shaped cookies). Overall, the intervention was provided three to four times a week for 20 min. The intervention occurred in the context of developing a language and literacy rich environment with story reading and retelling, journals, and the reading of children's books of different levels.

Reading 44 program is a classroom program that was developed by a team of teachers in the district. The core of the framework was developed by the team from several research documents, their own knowledge of the reading process and their knowledge of appropriate teaching practices. The program is for all students and is based on the belief that all teachers are teachers of reading. The purpose of the Reading 44 framework is to help teachers use the knowledge available about the teaching of reading in their everyday classroom practice. Three main features of this document are: twelve reading strategies, the components of a balanced reading program and a selection of instructional activities.

In the elementary schools of the district, children with ESL backgrounds, despite very limited oral proficiency, received the same early classroom instruction in English as their non-ESL peers.

Measures

The students in grade 7 were administered standardized and experimental measures of reading, comprehension, working memory, phonological awareness, morphological awareness, and syntactic awareness. Trained graduate students conducted the assessments in the schools. Each child was individually assessed in a quiet room. The reading comprehension tasks were administered in group settings in classrooms.

Grade 7 measures

Word reading

WRAT-3 reading subtest, blue form (Wilkinson, 1993): Children were asked to read as many words as possible from a list containing words of increasing difficulty (e.g., in, cat, stretch, and triumph). The task administration was discontinued when 10 consecutive words were read incorrectly.

Woodcock Reading Mastery Test—Revised: Word attack, Form G (Woodcock, 1987): This subtest is made up of a list of pseudowords of increasing difficulty (e.g., dee, ap, straced) to measure decoding skills. Children were required to decode as many pseudowords as possible from the list. The task administration was discontinued when all items in a given level were failed.

The Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999): The TOWRE is composed of two timed sub-tests: Sight Word Efficiency (SWE), which assesses the ability to read real words aloud, and Phonemic Decoding Efficiency (PDE), which assesses the ability to read pronounceable printed non-words aloud. Each subtest consists of a list of graded words printed on a single page. In each subtest the student was given 45 s to read as many items as possible.

Reading comprehension

The Stanford Diagnostic Reading Test (Karlsen & Gardner, 1994) is a standardized reading comprehension test whereby the children were asked to read short passages from a booklet and respond to multiple-choice questions about each passage within a time limit.

Planet Filk and Greb, the experimental reading comprehension task, is composed of short stories containing novel and made-up information. For this task, each child was asked to read two short stories and respond to multiple-choice questions about the stories. The maximum score on Planet Filk was 10 and the maximum score on Greb was 4. The Planet Filk and Greb tasks were was designed to reduce the effects of vocabulary and prior knowledge on reading comprehension. Such a task is valuable to the study of ESL reading since the current debate in the assessment of ESL children not only surrounds the issue of oral language proficiency, but also that many tasks require some criterion degree of vocabulary and culturally-based knowledge. With the use of novel and counterfactual information, the children are required to rely more heavily on the information explicitly provided within the cognitive processes underlying the reading comprehension text, as well as information inferred from the text. The information needed to make the inferences is included in the text. Furthermore, Planet Filk and Greb is composed of text that is easily readable by children at the upper-elementary grades, and thereby better equating the accessibility of the text for readers with a range of vocabulary. The stories with the related questions are presented in Appendix 1.

Working memory

In the Working Memory for Words task (Siegel & Ryan, 1989a), children were presented with sets of sentences in which the final word was missing (e.g., "Snow is white, grass is ___.") and each sentence was read aloud by the examiner. Children were asked to provide the missing word of each sentence and then repeat all the missing words from each set of sentences for a total of three trials within each set of sentences. The number of sentences in each set increased, beginning with two sentences in the first set and then increasing by an additional sentence up to a possible five sentences. To minimize word-finding problems, the sentences were chosen so that the word was virtually predetermined, which was reflected in the responses, because the children did not experience any difficulty in supplying the missing words. The task administration was discontinued when a child failed all the items in a given level. The raw score was computed as the number of correct responses ($\alpha = .84$).

Phonological processing

Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999). The Elision subtest, a phonological awareness test, was administered to each participant. An increasingly difficult series of words were presented verbally and students were asked to delete syllables and phonemes and deleting smaller units as the items became more difficult (e.g., say blend without saying /l/). Woodcock Johnson III Spelling of Sounds: The task requires the written spelling of nonwords according to English spelling rules.

Syntactic awareness

Syntactic awareness*:* The Oral Cloze task was used to assess syntactic awareness (Siegel & Ryan, 1989a; Willows & Ryan, 1981). In this task, twenty sentences were read to each student, and the students were asked to provide the missing word in each sentence. The missing words included nouns, verbs, prepositions, adverbs, auxiliary verbs and conjunctions. In order for the response to be considered correct, the addition of the word must form a semantically and syntactically correct sentence. Sample sentences include: *"Betty ___ a hole with her shovel", "It was a sunny day with a pretty ___ sky"* and *"The children put on their boots ___ it snows"*. This task had a Cronbach's alpha of .84, based on data collected from the test's development. The items are shown in Appendix 2.

Morphological awareness

Prefix/Suffix knowledge: In this task, students were presented with 17 English prefixes/suffixes (e.g., un, ful, dis) and required to provide the meaning. Students were also asked to give an example that included the specific prefixes/suffixes. This experimental paper and pencil task was group administered and untimed. For example, the word part "tri" means "three" and it is found in the word "triangle." The maximum score was 17. The full task is presented in Appendix 3.

Results

The first objective of this study was to compare the reading comprehension skills of ESL and L1 students in grade seven. Group comparisons between L1 and ESL speakers were conducted using a series of *t*-tests. To minimize the chance of a Type I Error, the α level was set at .01. Cohen's *d* was used as a measure of effect size, with .20 being small, .50 being medium and .80 being large (Cohen, 1992).

Table 1 summarizes the scores for both language groups on the battery of reading comprehension tasks. There were no significant differences on the standardized and experimental reading comprehension tasks. Specifically, there were no significant differences between the ESL and the L1 students on the STRD, $t(673) = .34$, $p = .73$, *ns,* the Greb task, $t(673) = 1.16$, $p = .24$, *ns,* and the Filk task, $t(673) = .31$, $p = .75$, *ns*.

The second objective of this study was to examine the overall achievement of ESL students compared to English L1 students on measures of phonological processing, syntactic awareness, morphological awareness and working memory. Table 2 summarizes the scores for both language groups on these factors. There were no significant differences between the groups on phonological awareness measures and morphological awareness task. There were significant differences between the L1 and ESL students on two measures. The L1 group performed better than the ESL group on the measures that assessed Working Memory for Words, $t(673) = 2.45$, $p = .014$, $d = .26$ and on the measure that assessed syntactic awareness, Oral Cloze, $t(673) = 2.70$, $p = .006$, $d = .18$.

The third objective of the study was to examine the profiles of students with reading comprehension difficulties. Good comprehension skill was defined as performance at or above the 35th percentile on the SDRT and poor reading comprehension skills was defined as at or below the 25th performance on the SDRT. Good word reading skills was defined as a performance at or above the 35th percentile on the measure of word accuracy, WRAT3 reading subtest, and poor word reading skill was defined as a performance at or below the 25th percentile on the WRAT3 reading subtest. The students in this study were classified into three reader groups by their word reading and reading comprehension abilities: eight grade seven students (7 L1 speakers and 1 ESL-speaker) scored at or below the 25th percentile on

Table 1 Performance on reading comprehension tasks by language group

Measure	ESL ($n = 102$)	L1 ($n = 576$)
*SDRT comprehension percentile		
M	63.38	64.29
SD	24.65	25.37
Filk raw score (max 10)		
M	7.19	7.24
SD	1.34	1.55
Greb raw score (max 4)		
M	3.15	3.04
SD	.82	.87

SDRT stanford diagnostic reading test

Table 2 Cognitive processes underlying reading comprehension by language groups

Measure	ESL ($n = 102$)	L1 ($n = 576$)
Word Attack percentile		
M	74.18	75.24
SD	24.69	24.53
CTOPP Elision percentile		
M	61.36	62.31
SD	18.75	18.31
WJ-III Spelling of sounds percentile		
M	67.35	70.30
SD	22.46	22.04
TOWRE Pseudowords percentile		
M	74.27	71.46
SD	22.63	23.43
Oral Cloze raw score (max 20)		
M	15.13	15.79*
SD	2.48	2.48
Prefix/Suffix knowledge raw score (max 17)		
M	5.30	4.72
SD	3.25	3.07
Working Memory raw score		
M	9.33	9.42*
SD	1.72	1.89

*p < .01

the WRAT3 reading subtest *and* on the SDRT and were classified as PR. Fifty-six students (50 L1 speakers and 6 ESL speakers) scored at or above the 35th percentile on the WRAT3 reading subtest *and* at or below the 25th percentile on the SDRT and were classified as PC. GC were defined as students who scored at or above the 35th percentile on both WRAT3 reading subtest and SDRT. Initially, there were 553 students (85 ESL and 468 L1) who scored above the 35th percentile on both tests and were classified as good comprehenders. In order to match this group on accuracy measures of reading word level to the PC group, a randomized selection by the SPSS was conducted based on the mean score on the WRAT3 reading subtest. In the final matched group of the GC there were 279 grade seven students (38 ESL and 241 L1).

Overall, approximately 88% of the students in the L1 and 85% of the students in the ESL group were classified as good comprehenders. Almost 10% of the L1 students and about 13% of the ESL students were classified as poor comprehenders. For both groups, about 2% of the students were classified as poor readers. Table 3 contains the classification of the three groups based on the WRAT3 reading subtest and the SDRT comprehension test. Cross tabulation analysis was conducted and there were no differences between the ESL and the L1 on the prevalence of the GC, PC and PR ($\chi^2 = .37$, $df = 2$, $p = 8.28$).

The next goal was to examine the profiles of the three language groups. Since there were only six students in the ESL PC group and 1 ESL student in PR group, there was a need to combine the two language groups into one. In addition, there

Table 3 Group characteristics of poor readers, poor comprehenders, and good comprehenders

Measure	Good comprehenders		Poor comprehenders		Poor readers	
	L1 ($n = 241$)	ESL ($n = 34$)	L1 ($n = 50$)	ESL ($n = 6$)	L1 ($n = 8$)	ESL ($n = 1$)
WRAT 3 reading percentile						
M	63.99	65.61	61.94	64.16	16.25	23.00
SD	11.26	8.78	16.27	24.26	5.54	
SDRT comprehension percentile						
M	69.71	63.97	17.58	14.00	12.12	17.00
SD	17.94	18.72	6.76	6.03	8.83	

were only 10 students in the poor reader group, and as a result, statistical analyses were not conducted.

The performance of the poor and good comprehenders was compared on measures of word reading, reading comprehension, phonological awareness, syntactic awareness, morphological awareness and working memory. Table 4 presents means and standard deviations by reader group on all of those factors. There were no significant differences between the comprehension groups on the WRAT3 reading measure, $t(334) = 1.75$, $p = .080$, *ns.* There was a significant difference between the poor and the good comprehends on the fluency measure, TOWRE word reading, $t(334) = 6.19$, $p < .001$, $d = .9$. Reading comprehension was assessed using a standardized measure, SDRT, and experimental measures,

Table 4 Means and standard deviations by reader group on word reading, comprehension and cognitive measures

Measure	Poor Comprehenders ($n = 56$)	Good Comprehenders ($n = 265$)
WRAT3 reading percentile		
M	62.17	66.36
SD	17.03	14.28
TOWRE Words percentile		
M	50.75	69.81*
SD	23.53	20.92
CTOPP Elision percentile		
M	53.55	60.06*
SD	20.03	18.66
WJ-III Spelling of sounds percentile		
M	55.29	70.43*
SD	24.15	19.69
TOWRE Pseudowords percentile		
M	55.29	70.63*
SD	25.33	20.94
Word Attack percentile		
M	62.52	70.29*
SD	27.71	23.64

Table 4 continued

Measure	Poor Comprehenders ($n = 56$)	Good Comprehenders ($n = 265$)
SDRT percentile		
M	17.49	69.62*
SD	6.42	18.04
Greb raw score (4 max)		
M	2.33	3.13*
SD	.90	.80
Filk raw score (10 max)		
M	5.71	7.27*
SD	1.75	1.27
Oral Cloze raw score (max 20)		
M	13.53	15.64*
SD	2.61	2.15
Prefix/Suffix knowledge raw score (max 17)		
M	2.08	4.61*
SD	2.05	2.82
Working Memory Words raw score (Max 12)		
M	5.50	6.42*
SD	1.92	1.83

*p < .01

Greb and Filk tasks. By definition, the good comprehenders performed better than the poor comprehenders on the SDRT, $t(334) = 21.06$, $p < .001$, $d = 3.09$. In addition, the good comprehenders performed significantly better than the poor comprehenders on the two experimental tasks: Greb, $t(334) = 6.51$, $p < .001$, $d = .96$ and Filk, $t(334) = 7.84$, $p < .001$, $d = 1.16$.

The good comprehenders performed better than the poor comprehenders on all the phonological tasks that aimed to assess the cognitive processes that underlie reading. The good comprehenders performed better than the poor comprehenders on the Word attack, $t(334) = 2.34$, $p = .02$, $d = .34$; the CTOPP Elision task, $t(334) = 2.50$, $p = .01$, $d = .37$, the pseudoword fluency measure, TOWRE, $t(334) = 4.58$, $p < .001$, $d = .67$ and the WJ spelling of sound test, $t(334) = 4.64$, $p < .001$, $d = .68$. The good comprehenders group performed significantly better than the poor comprehenders group on the Oral Cloze task, $t(334) = 6.56$, $p < .001$, $d = .96$; and on the prefix/suffix knowledge task, $t(334) = 5.54$, $p < .001$, $d = .87$.

The good comprehenders performed significantly better than the poor comprehenders on the working memory tasks: $t(334) = 3.57$, $p < .001$, $d = .53$.

In summary, there were significant differences between the good and poor comprehenders on the phonological, working memory, syntactic awareness and morphological tasks. In addition, the good comprehenders performed better than the poor comprehenders on word fluency, although the performance of the two groups was similar in terms of accuracy. The good comprehenders also performed better than the poor comprehenders on the two experimental reading comprehension measures.

Discussion

The first objective of this study was to examine the differences and similarities in the reading comprehension performance between ESL and English L1 grade 7 students. When the two groups were compared, there were no significant differences on any of the reading comprehension tests. In grade 7 the ESL students in this district were able to perform in a similar manner to the L1 students on reading comprehension tests. In grade 6, the ESL speakers showed comparable performance on word reading, but lower performances on reading comprehension and the Oral Cloze task. In addition, there were no differences between the two language groups on the experimental reading comprehension task that minimized the effects of vocabulary and prior knowledge. There was however differences between the groups on the standardized reading comprehension task and the L1 performed better than the ESL students (Low & Siegel, 2005). There can be several explanations for the differences between the performances in grade 6 and grade 7. First, the ESL students in grade 6 performed in a similar way to their L1 English peers on the experimental tasks that were untimed and required significantly less background and vocabulary knowledge. It may be the case that in grade 6 one of those components (time, background knowledge or vocabulary) or the combination of those components contributed to the lower performance of the ESL students on the SDRT standardized test. Second, perhaps the ESL students needed more practice and exposure to text in English in order to perform in a similar way to their peers and therefore required an additional year in order to improve and perform equally to their L1 peers. In the grade 6 study there were a number of ESL students who had entered the district in the previous year so it appeared to take these students more time to catch up to the L1 students. It is important to note that the ESL students were supported by phonological awareness and reading comprehension instructional programs during their elementary schooling. With appropriate instruction, it is possible that ESL students may perform in a manner similar to native speakers. This study demonstrated that ESL students who receive good word reading and reading comprehension instruction are capable of developing word reading and reading comprehension skills that are as strong as their L1 peers after 8 years of schooling in English.

The second objective of the study was to examine the processes that underlie reading comprehension. In grade 7, there were no significant differences between the ESL and English L1 groups on the cognitive measures that underlie reading comprehension, except on the oral cloze and working memory for words tasks. ESL students' knowledge of English syntax still lagged behind that of their L1 peers. This finding is consistent with previous studies that were conducted on ESL students at a younger age (Da Fontoura & Siegel, 1995; Lesaux & Siegel, 2003). The syntactic awareness tasks required the student to listen to the examiner and provide a word that created a semantically and syntactically well-formed sentence. The class of the missing words varied, including nouns, adjectives, prepositions, and verbs. The working memory for words is another task that is sensitive to language level, as it required the students to provide a word and remember the content of a sentence. Both the working memory and the syntactic tasks are open-ended and demand that the students provide a missing word. In addition, exposure to language may play an

important role on those tasks. The ESL students had lower scores than the L1 students on the syntactic awareness and the working memory for words tasks, although the effect size was small.

The third research question explored differences according to reading comprehension performance. Three groups were examined: children with poor comprehension in the absence of word reading difficulties, (2) children with poor word reading and poor comprehension, and (3) children with both good word reading and comprehension abilities. Approximately 80% of the children in the L1 group were classified as GC, and just under 18% were classified as PC. In a similar manner, of the ESL speakers, 85% were classified as GC and 12.5% were classified as PC. Within both the ESL and L1 groups, approximately 2% of children were classified as PR. Similar to previous findings, the analyses demonstrated that these slight differences in proportions were not significant, thus the percentage of the three reader groups identified in each of the language groups was similar (Lesaux, Lipka, & Siegel, 2006). Therefore, the proportion of children with reading comprehension difficulties is quite similar in the ESL and L1 groups.

There are several implications of these results. First, ESL and L1 students had similar proportions of reader groups with good comprehension skills. In addition, a very small proportion of students were identified as experiencing reading challenges associated with difficulties with word skills and reading comprehension. Furthermore, a group of grade 7 students (12–17%) were found to have difficulties with reading comprehension skills, despite adequate word reading skills.

This study also examined the profiles of the three reading groups. Since the poor reader group contained only 8 students, statistical analyses were not conducted with this group and the comparison was made only between the good and poor comprehenders. Although these two groups were equivalent on their word reading level, there were significant differences between these two groups on all the cognitive measures, demonstrating the contribution of these cognitive processes to reading comprehension, even with an absence of any word reading difficulties.

The PC performed significantly lower than the GC on measures of reading fluency, reading comprehension, phonological awareness, syntactic awareness, working memory and morphological awareness. Those processes contribute to successful reading comprehension skills. Fluency is now receiving substantial attention due to the Report of the National Reading Panel that discusses it as one of only five critical components of the reading process (National Reading Panel, 2000). The National Reading Panel report defines reading fluency as "…the ability to read text quickly, accurately, and with proper expression" (p. 3–5). Stanovich (1986) indicated that there is a reciprocal relationship between fluency and the amount of reading in which a reader engages. Readers who have achieved some fluency are more likely to engage in more extensive amounts of reading than readers who lack fluency. One of the foundations of fluency is phonological awareness. In her discussion of how students build sight recognition for words during their first few years of reading, Ehri (1998) lists three prerequisite "graphophonic" capabilities: (1) letter familiarity; (2) phonemic awareness; and (3) knowledge of how graphemes typically represents phonemes in words. Theories such as Ehri's indicate that in order to achieve fluency, there is a need to master phonological processing. Indeed, the PC in this study also demonstrated poor

phonological processing skills although they had good word recognition skills. In addition, phonological awareness was shown to be a predictor of reading comprehension in monolingual samples (Gottardo et al., 1996). Therefore, phonological awareness plays an important role in facilitating reading comprehension skills.

Consistent with previous studies, we found that the poor comprehenders had a deficit in syntactic awareness (e.g., Tunmer et al., 1987) that probably contribute to poor reading comprehension. The syntactic awareness task (Oral Cloze) measures a child's understanding of the underlying structure of a language. For fast and efficient reading, the brain must make predictions about what words come next in the text. A good grasp of the structure of the language is, therefore, important for reading comprehension. Furthermore, the PC group performed significantly lower than the GC on morphological awareness task. In a previous study, Siegel (2008) found that morphological awareness contributed significant independent variance to reading comprehension over and above phonological awareness and syntactic awareness. Understanding the morphological structure of English words may help with recognizing the meaning of unfamiliar words and help enhance reading comprehension.

The good and poor comprehenders differed on working memory skills. A reader must process incoming information (the text he or she is reading), while retrieving the pronunciation and the meaning of words. Recall of the previous information on a sentence and paragraph level is also important for reading comprehension. Therefore, this study demonstrated the importance of verbal working memory skills for reading comprehension.

There are several educational implications of these findings. First, reading comprehension is probably a skill that needs to be taught directly and be implemented in the curriculum. Having an adequate word reading ability is not a guarantee for good reading comprehension ability. Between 12 and 17% of the students in grade 7 had an average or above average word reading ability, but struggled with reading comprehension. In addition, this skill needs to be monitored over the years across all students in order to identify the ones that are having difficulties in this area. Those will be the students that will have challenges "reading to learn" as opposed to learning to read. In terms of support, the study demonstrated that the performance of the students who were PC was significantly low on all of the underlying processes examined. The implications of this result are twofold: first, instruction and interventions that target reading comprehension skills should include reading comprehension strategies as well as phonological awareness, working memory, syntactic awareness, and morphological awareness components. Second, students can be identified as having difficulties with reading comprehension by assessing those underlying processes.

There are several limitations to this study. First, the entire district was exposed to these interventions and reading programs and the study did not compare the sample with students that were not exposed to the intervention. However, the fact remains that ESL students can achieve average and above average reading comprehension skills with the appropriate instruction. Second, the study grouped together all the ESL students. Future research could examine reading comprehension in relation to specific language backgrounds. The study was limited to assessing reading comprehension and underlying processes. Future studies should examine reading

strategies, different text levels and different types of questions and the aspects that contribute to motivation.

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Appendix 1

Planet filk

The silver spaceship, Starview, glided to a gentle stop on the planet Filk. Just as the landing wheels touched down, Pat and Kim, the passengers, both age 12, felt the spaceship bump.

They peered out the window. Pat screamed, "Look at the lake, look at the lake! It's purple!"

Kim said, "That is because it is made out of grape juice."

"You're kidding me. Lakes are not made out of grape juice."

"Yes, they are. They are on Filk."

"Really? Are you fooling me?"

"They are made out of grape juice. Let's go taste what is in the lake. Then you'll believe me."

While strolling along the path to the lake, they heard a rustling in the bushes. "What's that, Pat?". Pat looked scared, "I don't know". All of a sudden a big bear with blue fur appeared in front of a bush just a short distance away. The bear stared at them. What should they do? They tried to remember what to do when you meet a bear. Run? Climb a tree? Make noise?

"What should we do?" asked Kim.

Just then the bear started to come toward them. They were scared. Suddenly, the bear turned and ran away into the bushes. "Wow, that was close. I hope we don't meet any more bears."

They dashed to the lake and scooped up the purple liquid with their hands. "Yum! This tastes good, Pat. I wish the lakes on Earth were made of grape juice."

In the distance they spotted a large tree with different coloured flowers on it: red, green, yellow, white, orange, brown. The flowers were round and very smooth. What strange looking flowers, they thought. When they reached the tree they saw they were not flowers; they were Smarties. Pat reached up and grabbed one. So did Kim. The Smarties tasted good. In the distance they saw a person. It must be someone who lives on Filk. People who live on Filk are called Filkians. Pat whispered, "Look! The Filkian has three heads! Wow, they must be very smart."

"Having three big brains does not always mean that you are smart. Elephants have big brains and they're not very smart", said Kim.

"The Filkian has no ears!" Kim exclaimed. Pat pointed to the large antenna on each of the Filkian's three heads. "Maybe that's what they use to hear."

"I bet that you're right."

The Filkian had only one mouth in the middle of his head.

"Ellohay, Earth eoplepay." A Filkian walked slowly toward them.

"What did the Filkian say?" asked Pat.

"I don't understand." Kim replied. "It sounds like Martian. I guess he's speaking Filkian."

Pat and Kim spoke to the Filkian, "We don't understand. We speak English. Do you speak English?"

"Onay. I ouldway ikelay ota earnlay. Illway ouya eachtay emay?"

"Okay. When we meet people we say 'hello'."

Pat and Kim both said, "Hello."

Pointing and smiling, Pat said, "My name is Pat." Pointing to Kim, Pat said, "My friend's name is Kim." Pat pointed to the Filkian. "What is your name?"

"89213."

"Do you have numbers instead of names?"

"Esyay."

The Filkian waved and said "Oodgay ayday."

Pat and Kim said "Goodbye."

They looked ahead of them.

Large and beautiful mountains rose majestically in the distance. They were brown with white tops.

"Let's go visit the mountains."

"How will we get there?"

Pat looked ahead and saw a sign 'TRAIN TO THE MOUNTAINS. 200 KM FROM HERE TO THE MOUNTAINS. NEXT TRAIN 12 NOON. TRAIN ARRIVES 1400 (2 PM). RETURN TRAIN AT 1600 (4PM). FARE: FREE ONLY FOR EARTH PEOPLE. FARE FOR FILKIANS: 27 PABBERS.

"Let's go!"

"Do we have time?"

"Yes. The spaceship leaves at 1900 (7 pm). We can catch the train at 1600 and be at the spaceship in plenty of time."

Pat and Kim took the train to the mountains. They threw snowballs at each other on the top of the mountains. They had a good time and returned to the spaceship.

Questions

1. If Kim and Pat saw a Filkian wearing a fur coat made of bearskin, the coat would be

   a. Brown
   b. Blue
   c. White
   d. Black

2. Which of the following could be a word in Filkian language?

   a. Latcay
   b. Otnak

c. Onpat
d. Ogday

3. Majestic means

a. Very big and beautiful
b. Very little and beautiful
c. Average size and beautiful
d. No way to know

4. How fast does the train to the mountains travel?

a. 200 km per hour
b. 100 km per hour
c. 50 km per hour
d. 150 km per hour

5. Will Pat and Kim return to the spaceship on time?

a. Yes
b. Maybe
c. No
d. If they hurry

6. If Pat and Kim were thirsty and decided to drink from the lake, what would they drink?

a. Water
b. Grape juice
c. Milk
d. Hot chocolate

7. Who said, "Yes they are on Filk."

a. Kim
b. Pat
c. Neither Kim nor Pat
d. Both Kim and Pat

8. Were Pat and Kim boys or girls?

a. They were both boys.
b. Pat was a girl and Kim was a boy.
c. Kim was a girl and Pat was a boy.
d. The story does not tell us.

9. What time will the train return from the mountains?

a. 1600
b. 1800
c. 1900
d. 1400

10. The Filkian money is called

    a. Filkers
    b. Pabbers
    c. Dollars
    d. Cents

Greb

The spaceship, Starview, drifted silently down from the clouds to the Planet Greb. The passengers, Leslie and Cory, age 11 years old, peered out the large round window and saw a grassy meadow.

"Look at the turquoise coloured leaves on the trees!" shouted Leslie.

"All the trees have turquoise leaves, Leslie," Cory said.

They started off down the path. A large creature stepped in front of them.

"Greb to Welcome! Stay your enjoy you hope I." The creature grinned at them with a mouthful of teeth.

"What did the creature say?"

"I don't know; it must speak the Grebian language."

The creature yelled at them: "Me understand you don't?"

"No, I'm sorry; we only speak English."

"You understand don't I." the creature said and waved goodbye.

"Look at its hand! It has 12 fingers on it, neatly arranged in three rows of four fingers!" The other hand has 12 also, in three rows.

"Don't stare. He probably thinks that we are funny looking."

Leslie and Cory ran off to the spaceship.

Questions

1. Leslie kicked a pile of leaves. What colour were the leaves?

    a. Green
    b. Red
    c. Yellow
    d. Turquoise

2. Which one of these sentences should be correct in the Grebian language?

    a. Strange and scary very is large planet this.
    b. Strange and scary very is planet large this.
    c. Strange and scary planet is very large.
    d. Strange and scary larger very this planet.

3. What is one advantage of having 24 fingers, 12 on each hand, arranged in three rows?

    a. You could play the piano very easily.
    b. You could type on a computer very easily.

c. You could knit more easily than someone with only 5 fingers on each hand.
d. You could pick your nose more easily than someone with 5 fingers on each hand.

4. Which is correct?

a. Cory and Leslie are both boys.
b. Cory is a boy and Leslie is a girl.
c. Cory and Leslie are both girls.
d. There is not enough information to judge from the story.

Appendix 2

Oral cloze—grade 7

Instructions: I will read something to you and there will be a word missing. Where the word is missing, I will say "blank." I want you to think of a word that would sound right in the blank. For example, I might say, "The moon shines bright in the 'blank'" (pause and repeat) and I want you to say "sky" or "night." "The moon shines bright in the sky." O.k. let's try another one. I'll say, "The children 'blank' with the toys." (pause and repeat). What's the word missing? (If the child fails to respond, say "How about play? The children play with the toys.") Let's try another one. "The little puppy wags its ___" (pause and repeat). "Good!"

1. The ___ little pigs ate corn.
2. Fred put the big turkey ___ the oven.
3. The ___ put his dairy cows in the barn.
4. Jane ___ her sister ran up the hill.
5. It was a sunny day with a pretty ___ sky.
6. Betty ___ a hole with her shovel.
7. we should have____that yesterday.
8. With a piece ___ chalk, he sketched her face.
9. The girl ___ is tall plays basketball well.
10. The boy had big brown eyes and a pleasant ___.
11. Because of the rain yesterday, the children ___ inside the house.
12. Nancy knocked ___ before entering the house.
13. The children put on their boots ___ it snows.
14. I want to play with a toy ___ is fun.
15. ___ is Susan going to the doctor today?
16. Jeffrey wanted to go ___ the roller coaster.
17. When we go ___ the building, we must be quiet.
18. Dad ___ Bobby a letter several weeks ago.
19. After her broken leg had healed, Laura found it hard to walk ___.
20. Paul's mother picked up the toys ___ books

Appendix 3

Prefixes/suffixes knowledge—grade 7

You will see a list of parts of words. Try to guess what they mean. Think of a word that has that part in it and write it on the line. Some of them are at the beginning of words and some are at the end. Some of these are hard but try your best. This is not a test. Your teacher will not see your answers.

Example

Tri three triangle

un _____

re_____

anti_____

phil_____

geo_____

dis_____

ism_____

pre_____

ful_____

psych_____

centric_____

ology_____

penta_____

tele_____

socio_____

bi_____

quadr_____

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