THE INFLUENCE OF CHINESE CHARACTER RECOGNITION SKILLS ON
ENGLISH READING AND SPELLING DEVELOPMENT

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

in
THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES
(Special Education)

THE UNIVERSITY OF BRITISH COLUMBIA
(Vancouver)
April 2018

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Abstract

The present study examined literacy skills in 78 participants who had English as a second language (ESL) in grades 2-4, who had been attending school in English since kindergarten and had a Chinese language as their first language. These participants were tested on word reading, pseudoword reading, spelling, pseudoword spelling, and phonological awareness in English as well as word reading in Chinese. This study found that participants who had ESL were able to become proficient at reading and spelling in English. The participants’ Chinese character identification ability was correlated with their phonological awareness and the spelling of English and pseudowords. However, when including both phonological awareness and Chinese reading ability in the regression equations, Chinese character identification ability was only a significant predictor of pseudoword spelling ability. These results show the importance of understanding the literacy skills of an individual who has ESL in their first language as well as the language in which they are being instructed.
Lay Summary

This study was conducted with participants in grades 2-4 who had English as a second language and a Chinese language as a first language. They had started kindergarten at an English public school with limited exposure to English. It looked at the participants’ ability to read Chinese characters and their ability to read and spell both real and pseudowords in English, and their phonological awareness. Chinese character reading was related to the participants’ phonological awareness, their ability to spell real words and pseudowords as well as their ability to read pseudowords. Once the participants’ awareness of sounds in the English language was accounted for, their ability to read in Chinese was no longer significantly related to their English reading and spelling ability. Phonological awareness is easier to measure in a school setting and accounts for more of a relationship to English literacy skills than Chinese character reading does.
Preface

This thesis is submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Faculty of Graduate Studies, Special Education. It is the original, unpublished, and independent work of K. Garforth. Ms. Garforth was solely responsible for overseeing all aspects of the research project, including but not limited to the recruitment of participants, data collection, scoring, analysis, and interpretation of the data. This study was conducted under the guidance and supervision of her supervisory committee: Dr. Linda Siegel (supervisor), Dr. Laurie Ford (committee member), and Dr. Sterett Mercer (committee member). Prior to commencing data collection, ethical approval for this research was issued by the Behavioural Research Ethics Board at the University of British Columbia (certificate number: H16-00248; “The Influence of Chinese Word Reading on ESL Students’ English Reading and Spelling Development” [dissertation title] and “The Influence of Language Background on Reading and Spelling Development” [BREB-approve project title]).
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<th>Description</th>
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<tbody>
<tr>
<td>CCRMA</td>
<td>Chinese Character Recognition Measure and Assessment Scale</td>
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<td>CCS</td>
<td>Chinese Combined Score</td>
</tr>
<tr>
<td>Chinese</td>
<td>Students who have Mandarin, Cantonese or another Chinese language as their first language</td>
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<tr>
<td>CRL</td>
<td>Chinese Reading Level</td>
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<tr>
<td>CTOPP2</td>
<td>Comprehensive Test of Phonological Processing Second Edition</td>
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<td>ESL</td>
<td>English as a second language</td>
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<td>Letter Word</td>
<td>Letter Word Identification</td>
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<td>RL</td>
<td>Reading Level</td>
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<td>SD</td>
<td>Standard Deviation</td>
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<td>Simplified</td>
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<td>Traditional</td>
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<td>WJ IV</td>
<td>Woodcock-Johnson IV Test of Achievement</td>
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Acknowledgements

I would like to express my deepest thanks to Dr. Linda Siegel for all of the opportunities she has given me throughout my academic career at the University of British Columbia. She has offered support and encouragement throughout my journey as an undergraduate and graduate student.

I would like to thank Drs. Laurie Ford and Sterett Mercer, my committee members, for their support during my course work and advancement through my program.

I would like to thank Dr. Ho, Dr. McBride-Chang, Dr. Chen, Dr. Chung Dr. Chow, Dr. Zhong, Dr. Burgess and Dr. Hayward for allowing me to use the measures they developed in my study.

I would like to thank my research assistants Sonja Saqui and Joanne Ho; I would not have been able to collect my data in a timely manner without their assistance.

Special thanks are owed to my parents, husband, and family who never gave up on helping me fulfill my dreams, regardless of the obstacles I have faced along the way.
Dedication

To my family.
Chapter 1: Introduction

1.1 Introduction

Canada, like many other countries around the world, is a multicultural nation whose population is linguistically and culturally diverse. In the most recent Statistics Canada Census (2016), just under one-fifth of Canadian residents spoke a non-official language as their mother tongue with over two and a half percent of residents identifying a Chinese language as their first language (from here forward, Chinese will refer to Mandarin, Cantonese or another Chinese language such as Shanghainese or Taiwanese). The population having identified a non-official language as their first language increased in British Columbia to over one fifth, and over six percent of British Columbians identified Chinese as their first language. This number increased again when considering Metro Vancouver, where more than fifteen percent of residents reported Chinese as their first language while parts of Richmond and Vancouver had more than sixty percent of residents reporting Chinese as their mother tongue (CensusMapper, 2017).

Classroom composition in Canadian metropolitan schools has changed significantly in the past thirty years with an increase in the number of students who have English as a second language (ESL). In each classroom, you can typically find at least a few students who have ESL. Students are considered to have ESL if their primary home language(s) is not English and they may need specialized language instruction to support academic success (Province of British Columbia, 2018). With an evolving classroom composition, Canadian educators are faced with teaching students who have ESL from diverse language backgrounds and it is very important these educators understand the needs of their students. These students come from diverse language backgrounds and vary in their mastery of the English language at the time they enter school.
There are many students who begin their formal schooling not knowing how to speak or understand English. In many instances, students who have ESL are being spoken to, taught and expected to learn before they have developed adequate linguistic foundations in their second language (Bialystok, Luk, & Kwan, 2005; Koda, 2015). Educational outcomes for students who have ESL can be enhanced if educators have a better understanding of the development of language, literacy skills and how to assess individual while they are learning these new skills; any under development in these areas has the potential to undermine their academic success. Educational research can foster the design of optimal educational environments for students who have ESL (August & Hakuta, 1997; Goldenberg et al., 2008).

In the Lower-Mainland of British Columbia, many classrooms contain students who have Chinese as their first language. Investigating whether there is a relationship between Chinese character identification and various English literacy skills could help provide educators with a better understanding of how an individual’s knowledge about their first language influences the acquisition of the English language and related literacy skills. These findings could provide educators with insight into best practices for teaching and assessing students who have ESL with Chinese as their first language.

Individuals learn the sounds and structure of any spoken language from a very early age (Joseph, 2006). Individuals who experience exposure to languages with different sounds and syllable structures other than English, must develop sensitivities to sounds and syllables they are not used to hearing in their first language. In the case of individuals with Chinese as their first language, they have minimal exposure to syllables with consonant blends because most Chinese syllables do not contain consonant blends (Hashimoto, 1972). An example of the limited syllable structure can be found in Mandarin: it has approximately four hundred syllables with a relatively
simple structure. Nearly 60 percent of the syllables are open and the remaining syllables are closed with one of two final consonants, /n/ or /ŋ/ (Hashimoto, 1972; Wang & Cheng, 2008). Individuals who have a first language background of Chinese are required to learn new phonemes, become familiar with new syllable types and consonant blends in order to have a full understanding of the complexities of the English language.

Literacy skills begin their development from listening to spoken language and typically start emerging long before children enter a formal educational setting. This knowledge is acquired by children increasing their familiarity with concepts of print, becoming proficient in their oral language skills, and gaining an understanding of basic text structures (Lesaux, Geva, Koda, Siegel, & Shanahan, 2008; Nation & Snowling, 2000).

Literacy instruction is extremely important for students who have ESL because reading and writing are required conduits for success in the content subject areas past the primary grades (Fitzgerald & Amendum, 2007). Unfortunately, the majority of students who have ESL are at a disadvantage because, unlike native English speakers, they do not have adequate linguistic foundations in their second language before they begin to learn how to read (Geva & Massey-Garrison, 2013; Koda, 2015). In order for students who have ESL to catch up to their English monolingual peers, they must simultaneously acquire oral language and literacy skills in English at a reasonably fast rate. In the classroom, educators must focus instruction on competencies most relevant for success in literacy for their students (Lesaux et al., 2008).

It is important for educators to understand how an individual’s knowledge from their first language relates to their learning of English and its literacy skills. For example, if a student knows how to read Chinese characters, does it have any relationship to how they approach literacy skills in English? It is important to know if measuring Chinese character identification
amongst students who have ESL provides insight into their literacy skills while they are still gaining proficiency in English. This knowledge could help educators tailor their curriculum to meet any instructional needs of these students.

### 1.2 Bilingualism

Generally speaking, bilingualism is when an individual makes regular use of more than one language in their everyday lives (Grosjean, 2008). However, bilingualism cannot be used as a simple grouping variable because its effects on an individual’s language performance are not homogeneous (Bialystok, Luk et al., 2005). Bilingualism is a term that has many categories attached to it. In any study, it is important to consider and define the type of bilingualism being discussed. Individuals who acquire the second language before the adolescence, which is often considered the ‘critical’ period for learning a new language, are considered early bilinguals and those who acquire the second language after this period are considered late bilinguals (Buchweitz & Prat, 2013). Simultaneous bilinguals are individuals who learn two languages at the concurrently and sequential bilinguals learn and acquire some proficiency in their first language before learning the second language (Gottardo, Koh, Chen, & Jia, 2017). Jia and Aaronson (2003) found young Chinese students who had ESL living in an English immersion environment to have English become their dominant language within three years.

### 1.3 Differences Between Chinese and English

There is a universal nature to reading across all written languages, it is the process of mapping some form of written information onto units of the spoken language (e.g., Perfetti, 2003; Perfetti et al., 2007; Perfetti, Nelson, Liu, Fiez & Tan, 2010). When discussing the process of reading it is important to have a clear understanding of three concepts: writing system, orthography and script. The writing system refers to the principles related to the fundamental
writing-language relationship and not the appearances of the written language. This means an alphabetic writing system, such as English, is rudimentarily different than a morphosyllabic writing system, such as Chinese. Orthography refer to the differences in the implementation within a writing system (e.g., Perfetti, 2003; Perfetti et al., 2007; Perfetti & Liu, 2005). For example, the French and English languages share a writing system but have different orthographies while Chinese and English have different writing systems. The script of a writing system refers to the specific graphic implementation and it makes a difference to how the language is read because it controls the visual input the reader processes. It is the smallest size of the graphic units that map onto language units. For English, the script is the Roman alphabet and for Chinese, the script is the character (e.g., Perfetti & Liu, 2005; Perfetti et al., 2007).

The nature of the writing system, the orthography, and the script have direct implications for how the language is read (Perfetti, 2003; Perfetti & Liu, 2005). No writing system can be read without some form of phonological awareness and the writing system a language uses dictates how the orthography-to-phonology mappings occur (Perfetti, 2003; Perfetti et al., 2005; Tan et al., 1995). The phonological information in Chinese is retrieved once the character has been identified while the phonological information in English is obtained in tandem with the orthographic information (Liu, Dunlap, Fiez & Perfetti, 2007; Perfetti et al., 2005; Tan, Hoosain & Peng, 1995). The Chinese writing system employs a morphosyllabic structure where a character represents both a syllable and a morpheme that carries meaning (Ho & Bryant, 1997; Keung & Ho, 2009; Leong et al., 1987; Leong & Joshi, 1997; Leong & Tamaoka, 1998; McBride-Chang & Ho, 2005; Shu et al., 2000; Tan & Perfetti, 1998; Yeung et al., 2011). Reading Chinese requires a detailed visual-orthographic analysis of the character as opposed to English where readers are required to map graphemes to phonemes that are then assembled into
spoken words (Gottardo, Yan, Siegel, & Wade-Woolley, 2001; Leong, 1997; Mattingly, 1987; Pasquarella, Chen, Gottardo & Geva, 2015; Perfetti et al., 2010; Wang et al., 2003; Yeung et al., 2011). In alphabetic languages, such as English, letters only indicate sound and they do not have any direct relation to meaning (Yeung et al., 2011). The ability to read in English requires an individual to be able to read unfamiliar words, familiar words and even pseudowords. Decoding strategies can be used by individuals to identify unfamiliar words and pseudowords (Ehri, 2013; Perfetti, 2003). The ability to read in Chinese requires the reader to be able to identify familiar characters and the reader must be able to hypothesize the pronunciation and or the meaning of characters they are unfamiliar by using the compositional principles of the writing system. Strictly speaking, in Chinese pseudowords are impossible (Perfetti, 2003).

Two frameworks have been developed to help understand the brain’s response to learning the reading of a language with a different writing system. The assimilation hypothesis suggests that in second language learning, the brain employs procedures from the existing reading network while learning the new writing system. In the accommodation hypothesis, the brain creates new procedures for reading the new language system that are not involved in the first language reading system (e.g., Cao, Tao Liu, Perfetti & Booth, 2013; Perfetti & Liu, 2005). The majority of the functional magnetic resonance imaging research on these hypotheses has been conducted with late Chinese-English bilingual adults with the majority of the results supporting the assimilation hypothesis and some evidence of accommodation (Cao, et al., 2013; Nelson, Liu, Fiez & Perfetti, 2009; Perfetti & Liu, 2005; Tan et al., 2003). It was found that individuals with a higher proficiency of Chinese and English had increased activation in the Chinese network (e.g., Cao et al., 2013; Perfetti et al., 2007).
As noted before, methods of reading depend on the foundational components of the writing system, the orthography and the script and aspects of these components influence the reading instruction methods. In North America, children are often taught to read with some element of decoding and phonics instruction in early reading programs (Pasquarella et al., 2015; Shu & Anderson, 1999). However, this method of reading instructions cannot be used for reading Chinese because the Chinese character maps to a syllable and never a phoneme (Bialystok, McBride-Chang & Luk, 2005; Perfetti et al., 2007; Perfetti et al., 2010). Chinese reading instruction heavily relies on rote memorization of characters (e.g., McBride-Chang, 2004; Wang et al., 2005; Yeung, Siegel & Chan, 2013). Using memory, as a method of Chinese reading instruction, is effective because a high proportion of the characters have a consistent pronunciation in the words they appear in (e.g., Pan et al., 2011). The use of memory as a reading strategy can be applied to English and other languages with an alphabetic writing system (e.g., Perfetti et al., 2010).

There is an increasing amount of evidence suggesting Chinese and English bilinguals who are literate in only one language approach reading differently than those who are able to read in both languages (Gottardo et al., 2017; Wang & Koda, 2013; Wang, Koda & Perfetti, 2003; Wang, Perfetti, & Liu, 2003). This finding is thought to occur because of the interaction between the two languages (Gottardo et al., 2017; Koda, 1996). There have been many studies that have not found an association between reading Chinese and English. This supports Geva & Siegel’s (2000) central processing hypothesis that suggests transference of reading and spelling skills across languages may depend on common cognitive processing skills. In order for word reading accuracy to transfer between two languages, there must be script-specific processes that are similar between the languages (e.g. Gottardo et al, 2001; Wang et al, 2005). Chinese and
English use writing systems that represent different units of speech. Skills used to read morphemes found in Chinese characters cannot be used to sound out the individual phonemes represented by letters in alphabetic languages such as English.
Chapter 2: Review of the Literature & Statement of the Problem

2.1 Students who had ESL

The effects of bilingualism are far from simple and there is no way to easily compare the relationship between bilinguals and monolinguals. Cognition is complex, especially when considering how an individual learns to use a new language (Bialystok, 2008). There are many studies discussing the development of reading in students who had ESL from different language backgrounds and at different stages in their education (e.g., Gottardo et al., 2001; Grant, Gottardo, & Geva, 2011; Lesaux & Siegel, 2003). Second language acquisition is defined as a process involving learning a new language in addition to an already established system (Bialystok, McBride-Chang et al., 2005). Chiappe et al., (2002) found Canadian kindergarten and grade one students who had ESL from various first language backgrounds acquired basic literacy skills at the same rate as their monolingual peers. Bialystok (2007) concluded bilingualism influences children’s literacy acquisition in complex ways. It can be advantageous for some skills, such as concepts of print, but hinder other areas like their oral language competence.

2.1.1 Students who Have ESL and Literacy

Evidence suggests that students who had ESL did not require oral language proficiency in the second language for word-reading skills to develop (e.g., Durgunoglu et al., 1993; Geva, Wade-Woolley & Shany, 1993; Gholamain & Geva, 1999). Previous studies have shown that assessing a student who had ESL’s oral language proficiency in their second language is marginally effective for predicting decoding and word recognition ability (e.g., Durgunoglu et al., 1993; Geva & Siegel, 2000; Gholamain & Geva, 1999). There have been mixed results regarding the transference of decoding skills across languages in the early stages of literacy for children who are bilingual. Decoding skills appear to transfer across languages when the writing
systems are similar, but there has been no evidence found for its transference when the languages employ different writing systems (e.g., Geva & Siegel, 2000; Gottardo et al., 2001).

Research has repeatedly shown spelling development for students who had ESL to have a similar trajectory to that of English monolinguals (e.g., Fashola, Drum, Mayer, & Kang, 1996; Limbos & Geva, 2001; Tompkins, Abramson, & Pritchard, 1999; Wade-Woolley & Siegel, 1997). Regardless of the differences and complexities between an individual’s first and second language, their spelling performance had a higher correlation with their reading skills in their second language than to their first language’s characteristics (e.g., Geva et al., 1993; Wade-Woolley & Siegel, 1997).

Phonological awareness has been shown to be a good predictor of word recognition skills among students who had ESL as well as the development of their oral and written language skills in a second language (e.g., Chall, 1996; Snow, Burns & Griffin, 1998). Research has shown skills relating to phonological awareness can transfer across languages for bilingual students and that these skills can be used to predict word recognition and spelling development in their first and second languages (e.g., Durgunoglu et al., 1993; Geva & Wade-Woolley, 1998; Wade-Woolley & Siegel, 1997). In a meta-analysis of neuroimaging studies of the correlates for Chinese and alphabetic reading and Tan et al, (2005) found phonological processing in these languages to share three common areas of brain function.

2.1.2 Chinese Students who Have ESL

Before examining research involving Chinese-speaking students who had ESL, it is important to consider the nature of the sample. In order for a fair comparison of conclusions from previous research, the samples must be from similar situations. When examining research, it is essential to remember that different countries and education systems employ different
approaches to teaching. In addition, it is important to consider the societal language(s) spoken in the sample’s environment.

In research from China, Taiwan, and Hong Kong, the individuals in the sample were living in an environment where Chinese was the societal language. These individuals were exposed to Chinese at home, in school, in the community, and through media exposure. In these countries, Chinese and English reading instruction typically begins around age four or five. The Chinese characters are usually introduced as holistic visual patterns. English reading instruction is taught using rote memorization and the sound symbol relationship is not explicitly taught to the students (e.g., Cheung, Chan & Chong, 2007). These individuals attended school in Chinese and learned English as a subject as part of their formal schooling (e.g. Keung & Ho, 2009; Pasquarella et al., 2015; Shu & Anderson, 1999).

The exposure to the Chinese language is very different for students who had ESL in North America because English is a societal language. French is also spoken in certain areas of Canada, but in British Columbia, English is the predominant language. There are some areas in North America where there is a strong Chinese community, but individuals have nowhere near the same Chinese exposure as they would if they lived in a Chinese speaking Asian country. In research conducted in North America, Chinese students who had ESL typically attend an English-speaking school and any additional reading instruction for Chinese is done either at home with their parents or at an after-school Chinese heritage language program. North American reading instruction typically employs at least some elements of phonics and decoding instruction during early reading programs (e.g., Keung & Ho, 2009; Pasquarella et al., 2015; Shu & Anderson, 1999).
2.1.2.1 Research From Asia

Tong & McBride-Chang (2009) found visual-orthographic skills to be a consistent factor in both Chinese and English word reading for second and fifth grade students in Hong Kong. There are conflicting findings within the research as to whether phonological awareness plays a role in Chinese reading. Phonological awareness, as measured by a rhyme detection subtest, did not account for any independent contributions to Chinese character reading amongst first grade students in Hong Kong (Yeung et al., 2011). Tong and McBride-Chang (2009) investigated phonological awareness as measured by a syllable and phoneme deletion task they created and did not find it to be uniquely associated with reading in Chinese for second and fifth grade students. However, Keung & Ho (2009) found there was strong evidence that English phonological awareness measured by rhyme detection, and especially phonemic awareness measured by initial phoneme deletion, played a unique role in the Chinese reading development of second grade students in Hong Kong. In a longitudinal study, phonological awareness as measured by Chinese syllable deletion was found to be a significant predictor of word reading abilities among kindergarten students from Hong Kong (Chow et al., 2005). In Hong Kong, a cross-sectional study with children aged 7- to 12-years old, found phonological processing played a significant part in Chinese character recognition (Chan & Siegel, 2001).

In a five-year longitudinal study conducted in Beijing, Pan et al. (2011) found Chinese character recognition was an important predictor of all subsequent reading skills assessed, including English word recognition. A two-year longitudinal study conducted in Hong Kong found that both universal and language specific skills needed in the development of Chinese character recognition and English word reading among young students who had ESL (McBride-Chang & Ho, 2005). In Hong Kong, a study involving Chinese individuals aged 9 to 11 who had
ESL, found a cross-linguistic transfer of visual-orthographic knowledge, phonological awareness, morphological awareness and rapid naming between Chinese and English. (Chung & Ho, 2010).

In research conducted in Singapore comparing 6-year-old students from three different first language backgrounds who all had ESL, Chinese students employed a visual approach to reading conventional high frequency words in English. The Chinese individuals in this research had poorer phonological processing skills when compared to the students who had Malay and Tamil as their first language (Dixon, Zhao, & Joshi, 2010).

2.1.2.2 Research Employing Comparisons Across Countries

There have been several studies conducted comparing students who had ESL while residing in different countries. Bialystok, McBride-Chang, & Luk (2005) examined the reading of three groups of 5- and 6-year olds. They were English monolinguals residing in Canada, Chinese and English speaking individuals residing in Canada and Chinese and English speaking individuals residing in Hong Kong. This research found that decoding skills need to be built up separately for languages employing different writing systems. They concluded that the abilities supporting English reading cannot be recruited for Chinese reading.

When comparing the English spelling performance of students from the United States, Norway, India, and China, researchers found Chinese students employ a visual approach when spelling English words (Joshi, Hoien, Feng, Chengappa, and Boulware-Goeden, 2006). When the Chinese students were asked to spell pseudowords, they would either skip the word if they were unsure how to spell it or spell a real word as a substitute for the pseudoword.
2.1.2.3 Research From North America

Pasquarella et al. (2015) conducted a 2-year longitudinal study on Spanish and Chinese students who were ESL to compare the cross-language transfer patterns found between two different first languages. The students were assessed on measures of phonological processing, rapid automatized naming for digits, word reading accuracy and fluency in English as well as measure of word reading fluency and accuracy in their first language. There was no association found between English and Chinese character reading accuracy for second grade students who had ESL. There was evidence of a cross-language transfer of word reading fluency for the Chinese students who had ESL.

Wang & Geva (2003 a, b) conducted a longitudinal spelling development study on Canadian Cantonese speaking students who had ESL and monolingual English students from first to the second grade. In one study, they compared the developmental trajectories of novel English phonemes between students who had ESL and English monolingual students. Originally it was found that young Chinese students who had ESL, had spelling errors reflecting a difficulty in representing phonemes absent in Cantonese phonology. They improved over time and were performing similarly to the English monolinguals by the end of the second grade (Wang & Geva, 2003a). The second study examined real word, pseudoword and confrontational pseudoword spelling, vocabulary and nonverbal visual matrix measures with English monolingual students and Cantonese students who had ESL. There was a greater difference between the real word and pseudoword spelling for the students who had ESL than the monolingual students (Wang & Geva, 2003b). Overall, the students who had ESL spelled words lexically as it was easier to spell English words than pseudowords because the students had
difficulty mapping phonemes to graphemes when spelling pseudowords (Wang & Geva, 2003a, b).

Marinova-Todd & Hall (2013) conducted research on Canadian English monolinguals, Tagalog-English and Cantonese-English grade one students who were ESL with measures of oral language, phonological awareness, reading and spelling. Phonological awareness was a weaker predictor for pseudoword spelling for the Cantonese students who had ESL, than the Tagalog students who had ESL. Cantonese students who had ESL relied on processing skills rather than phonological awareness for spelling pseudowords.

A Canadian study of Cantonese students who had ESL in grades 1 - 8 used parallel measure of orthographic processing, phonological processing, and oral language in both Cantonese and English. Chinese rime detection was associated with English word reading and significantly associated with English phonological processing. However other measures of Cantonese oral language and reading performance did not have strong associations with English reading performance (Gottardo et al., 2001).

A study among Canadian Cantonese students who had ESL in the first through the eighth grade examined the relationship between phoneme categorization, phonological processing and reading performance in both Cantonese and English. This study found Cantonese ESL children’s English phonological processing to be related to their English word and pseudoword reading (Gottardo et al., 2006). This relationship is the same as is seen in native English speakers (Rack, Hulme, Snowling, & Wightman, 1994; Siegel & Ryan, 1988; Stanovich & Siegel, 1994; Wagner & Torgesen, 1987).

A study from the United States of America, of second and third grade Mandarin speaking students who had ESL focused on phonological and orthographic processing, English word and
pseudoword reading, Chinese character recognition, and reading in Pinyin. There was a certain level of phonological transfer between English and Mandarin. Mandarin tone awareness was associated with English pseudoword reading. Mandarin orthographic skills did not have any predictive value for English reading skills. Wang et al., (2005) concluded that Mandarin-English bilingual reading acquisition is a joint function between orthographic specific processes for each language and shared phonological processes between the languages.

2.2 Summary

A common process in reading any language involves the ability to translate forms of visual information into meaningful units of language. The commonality of this process suggests the likelihood of a correlation among reading constructs across languages (Perfetti et al., 2007). Reading in a second language is a complex task where there is interaction between the individual’s first and second language. Research has found constructs related to reading can transfer across languages (e.g., Chung & Ho, 2010; Pan et al., 2011; Tan et al., 2003; Wang et al., 2005).

Chinese has become one of the largest non-official mother tongues in both Canada and the United States of America (Li, 2006). Classrooms in the Lower Mainland of British Columbia have continued to see and increasing number of students who have ESL with Chinese as their first language. Many students who have ESL enter formal school before they have gained sufficient knowledge of the English language (Koda, 2015). It is very important for educators to understand how these students simultaneously learn the English language, while being educated in it. One aspect of this involves educators having the ability to assess the development of their students who have ESL’s English literacy skills and predict their future success in them. This
understanding may allow educators to adjust their practices to facilitate the process of learning in a language the individual is not yet proficient in.

The acquisition of bilingual reading is a joint function of orthographic skills and phonological processes (Wang et al., 2005). There has been a limited amount of educational research focused on if and how an individual’s ability to read in Chinese has any relationship with English reading and spelling abilities. Previous research has provided several reasons to believe that an individual’s ability to read in Chinese may be related to their success in learning different English literacy skills. Chinese character recognition was an important predictor of literacy skills, including English word recognition (Pan et al., 2011). Studies using functional magnetic resonance imaging have shown a partial overlap of regions in the brain for reading in Chinese and reading in English (Chee et al., 2000; Perfetti et al., 2010; Tan et al., 2000, Tan et al., 2001). The evidence from these studies has shown that the procedures used in reading Chinese can be used when reading alphabetic languages, such as English, but that alphabetic reading procedures cannot be recruited to read Chinese (Perfetti et al., 2007; Perfetti et al., 2010). There have been studies that have shown that Chinese individuals who had ESL appear to use whole word strategies when reading English words (e.g., Haynes & Carr, 1990; Joshi et al., 2006; Marinova-Todd & Hall, 2013; Tan et al., 2003; Wang & Geva, 2003b). Tan et al. (2003) suggest this is because Chinese does not have letter-to-sound conversion rules that are used to analyze words by English monolinguals. McBride-Chang & Kail (2002), found early reading development of Chinese and English to be remarkably similar to each other.

Numerous studies have demonstrated how phonological awareness uniquely explains children’s reading ability better than general intelligence or other linguistic variables (e.g., Adams, 1990; Comeau, Cormier, Grandmaison, & Lacroix, 1999; Manis & Freedman, 2001;
There is also evidence that phonological awareness is uniquely associated with reading for students who had ESL from different language backgrounds (e.g., Chiappe, Siegel, & Wade-Woolley, 2002; Durgunoglu, Nagy, & Hancin-Bhatt, 1993; Gottardo et al., 2001; Lesaux & Siegel, 2003). Similar associations have been found between phonological awareness and reading Chinese (e.g., Ho & Bryant, 1997; Hu & Catts, 1998; McBride-Chang & Kail, 2002; So & Siegel, 1997; Wang & Geva, 2003a). English is an alphabetic writing system that has a segmental structure where individual letters represent phonemes that do not carry meaning on their own (Leong, 1997; Mattingly, 1987; Perfetti et al., 2005). Reading English requires phonemic awareness which is a higher level of phonological awareness than needed when reading Chinese (e.g., Gottardo et al., 2001; Keung & Ho, 2009; McBride-Chang & Ho, 2005; Pasquarella et al., 2014). Research has shown there to be a level of phonological transfer even when languages are based in two different writing systems like English and Chinese (Bialystok, McBride-Chang et al., 2005; Chow, McBride-Chang, & Burgess, 2005; Gottardo, Yan, Siegel, & Wade-Woolley, 2001; Keung & Ho, 2009; Lindsey, Manis, & Bailey, 2003; McBride-Chang & Ho, 2000; Saiegh-Haddad & Geva, 2007; Wang et al., 2005).

There is also evidence in current research that suggest an individual’s Chinese reading ability would not be able to predict their English reading ability because of the differences in the writing systems. Skilled Chinese reading may be influenced by different processes than skilled English reading (Nagy & Anderson, 1995). Chinese is a morphosyllabic writing system where both the sound and meaning are portrayed in the character (Leong, 1997; Mattingly, 1987; Perfetti et al., 2005). When reading Chinese characters, the reader must map orthographic patterns to sound meaning. Chinese does not have the same sound-symbol correspondence found
in alphabetic languages so there is limited use of phonological recoding, which in turn de-emphasizes the role of phonological awareness in Chinese character reading (Bialystok, Luk et al., 2005; McBride-Chang & Ho, 2005; Pasquarella et al., 2014; Perfetti & Tan, 1998; Read, Zhang, Nie & Ding, 1986). The grapheme-morpheme linkage for Chinese characters requires use of visual-orthographic processing and there are a large number of characters that must be memorized (Koda, 2015). Morphological awareness and visual-orthographic processing have shown to be some of the strongest predictors of Chinese character reading (Keung & Ho, 2009; Leong, Tse, Loh & Hau, 2008; McBride-Chang et al., 2005; McBride-Chang, Shu, Zhou, Wat & Wagner, 2003; McBride-Chang, Wagner, Muse, Chow & Shu, 2005; Tan & Perfetti, 1998; Tolchinsky, Levin, Aram, & McBride-Chang, 2012).

2.3 Problem Statement

Canadian educators teach students with diverse language backgrounds and it is important for educators to understand how literacy skills in the student’s first language can have an impact their learning of English literacy skills. A large number of students who have ESL in the Lower Mainland have Chinese as their first language and have had at least some exposure to Chinese characters. Previous research has shown that assessing an ESL student’s oral language proficiency in English is only marginally effective at predicting their English word decoding (Durgunoglu et al., 1993; Geva & Siegel, 2000; Gholamain & Geva, 1999; Gottardo et al., 2001). Given this, it is important for educators to find efficient ways to easily measure current and future reading skills. In the literature, there is evidence both supporting and refuting whether an individual’s ability to read in Chinese has any relationship with their ability to read in English. Previous research in this area on individuals who live in an environment where English is the societal language and they begin formal schooling in English, is limited (Wang & Geva, 2003 a,
b; Wang, Perfetti & Liu, 2005). It would be valuable for educators to know if there is a
significant independent relationship between a student’s ability to read in Chinese and their
ability to read and spell in English.

However, there is limited previous research on early sequential Chinese-Canadian
individuals who had ESL and addressing whether their ability to read in Chinese correlates to
their literacy skills in English. Previous research has not addressed whether their Chinese reading
ability has any unique correlation to English word reading, pseudoword reading, spelling and
pseudoword spelling after the correlation to the skills of English phonological awareness has
been accounted for.

2.4 Research Questions & Hypotheses

The following research questions were investigated by this study:

Research Question # 1: For an individual who has ESL, does their Chinese reading ability
relate to their English phonological awareness, their ability to read and spell in English, and their
ability to read and spell pseudowords?

It is expected that there will be evidence for a correlation between Chinese character
identification and English literacy skills because of the evidence found for the assimilation
hypothesis amongst Chinese-English bilingual adults from a number of functional magnetic
resonance imaging studies (Cao et al., 2013; Nelson et al., 2009; Perfetti & Liu, 2005; Tan et al.,
2003). Pan et al. (2011) found Chinese character recognition to be an important predictor of
English word identification.

Even though Chinese characters cannot be decoded like words from an alphabetic
language can be, the use of the holistic visual strategies such as rote memorization can be used to
read English words instead of decoding them (e.g. Cheung et al., 2007; Perfetti et al., 2010).
Research has shown Chinese individuals who had ESL to employ visual strategies for reading and spelling English words (Dixon et al., 2010; Joshi et al., 2006).

**Research Question #2:** For an individual who has ESL, does their Chinese reading ability account for any unique correlation in reading and spelling abilities once the correlation explained by English phonological awareness has been removed?

Orthographic phonological mapping is a commonality found in all writing systems (Perfetti, 2003; Perfetti et al., 2005; Tan et al., 1995). Previous research has established that there are both universal and language specific skills required for Chinese character and English word reading (Chung & Ho, 2005; McBride-Chang & Ho, 2005). Phonological awareness has been shown to be a good predictor of word reading as well as oral and written language skills in an individual’s second language (e.g. Chall et al., 1996; Snow et al., 1998). Numerous studies have shown there to be a cross language transfer of phonological processes, even if the languages had different writing systems (e.g., Bialystok, McBride-Chang et al., 2005; Chow et al., 2005; Lindsey et al., 2003; Saiegh-Haddad & Geva, 2007). English phonological awareness has been found to have a unique role in Chinese reading development (Keung & Ho, 2009).

Research using neuroimaging found phonological processing skills in English and Chinese to share common areas of brain function (Tan et al., 2005). It is expected that English phonological awareness and Chinese character identification will be correlated with each other because of previous research showing how skills relating to phonological awareness can transfer across languages (e.g. Chan & Siegel, 2001; Durgunoglu et al., 1993; Geva & Wade-Woolley, 1998; Wade-Woolley & Siegel, 1997). However, it is not clear as to whether the Chinese character identification will account for any unique variance among English literacy skills after accounting for its correlative relationship with English phonological awareness.
2.5 Rationale for Measures

In the current study the researcher looked at English phonological awareness, single word reading of real words and pseudowords, spelling of real words and pseudowords and Chinese reading ability. These measures were selected in order to look for relationships between Chinese character identification and English reading and spelling skills in participants. Conducting measures of pseudoword reading and spelling can provide insight into decoding strategies a participant uses.

Decoding is a skill required for the reading of any alphabetic language. It requires an individual to analyze graphemes and extract phonological and morphological information. The individual must simultaneously access lexical and sub-lexical knowledge, while making use of this information to extract and integrate the visually presented information from the printed word (Koda, 2015). Decoding requires the individual to connect print representations to appropriate meanings and pronunciations of words; this skill is associated with phonological awareness (Everatt et al., 2013). Since the decoding and word identification sub skills for each language vary, they must be built up separately for each language and its writing system (Bialystok, McBride-Chang et al., 2005; Koda, 2015).

Spelling development parallels the process of learning to read and it is the application of the sound-symbol relationship in a written format (Lesaux et al., 2008). Spelling provides students with a concrete experience to practice mapping phonemes to the appropriate letter(s) (Graham & Hebert, 2010; Shahar-Yames & Share, 2008). Bruck and Waters (1988) postulated that spelling involves two important processes. One process involves phonological awareness, specifically the relationship between the sounds and letters in the English language. The second involves individuals using their visual memory skills to learn how to spell words from memory.
Phonological awareness was selected as a control in this study because it plays an important role in the development of both reading and spelling (Bryant, Maclean, Bradley, & Crossland, 1990; Hogan, Catts, & Little, 2005; Stanovich, 1988; Vandervelden & Siegel, 1995; Wagner, Torgesen, & Rashotte, 1994). Phonological awareness is the identification and manipulation of oral language. It involves skills including the retrieval, representation, and analysis of phonological information (Share, Jorm, Maclean, & Matthews, 1984). Unlike speaking and listening to English, reading requires explicit awareness of phonological segments and this awareness is difficult considering the embedded nature of phonemes and syllables in the English language (Brady, 1991). Phonological awareness at the phoneme level has consistently shown to be a key factor in learning to read English for both native and ESL speakers (e.g., Chiappe & Siegel, 1999; Cormier & Kelson, 2000; Hulme et al., 2002; Muter et al., 1998; Stuart, 1999; Yeung & Chan, 2013). Teachers can be trained to administer measures of phonological awareness and can use these measures within their classrooms.

Measures of Chinese character recognition were used to assess the participants’ ability to read in Chinese. These measures can be challenging to use in a classroom setting to assess reading ability, because the educator would need to able to speak and read in Chinese in order to administer them. Although some educators in North America may be able to do this, it is not a skill that all educators have and so classroom administration of Chinese reading measures to the appropriate students would be difficult in a school setting.
Chapter 3: Methodology

3.1 Participants

When conducting research of any sort, it is important to consider the heterogeneity of the sample, this is especially true when considering research conducted among students who have ESL. To be eligible to participate in this study, individuals had to be considered to have had ESL by the school and had attended school in English since kindergarten. All public elementary schools within a school district in the Lower Mainland were sent an invitation to participate in the current study. Teachers from three schools in this district agreed to participate. The ESL teachers from each of these schools consulted the enrolment records and only those who met the inclusionary criteria for the study had consent forms sent home with them. These individuals were all early sequential bilinguals.

The consent form was made available in both English (Appendix A) and jiàntǐzì (Simplified Chinese;\(^1\) Appendix B) to the families. At the first school, the consent forms were originally sent home in jiàntǐzì but a number of the parents requested English forms instead. It contained a section with optional questions for the parents to answer in order to gain more information about each student’s background and language uses at home. There were 121 students who had consent forms distributed to them with 92 students returning their forms for a return rate of 76%. However, in one of the grade four classrooms, the teacher stated if the students did not want to participate in the study they did not have to return the forms to school. Had the teacher not given the students this option there may have been a higher return rate for

\(^1\) Simplified Chinese characters or what is colloquially referred to as jiàntǐzì are used in mainland China. They are the characters prescribed in the Table of General Standard Chinese Characters have existed for thousands of years and refers to a simpler form of the character’s structure (Wikipedia, 2017).
the consent forms. This would not change the number of students who participated in the study but it might have increase the percentage of consent forms returned. Of the 78 students who gave consent to participate in the study, 32 of the forms were returned in English and 46 were returned in jiăntīzì. The majority of the consent forms (76 of 78) had some or all of the optional questions answered. The socio-economic status of those who responded was estimated by the parents’ self-reports of their educational attainment. The responses were compared with the educational attainment of adults age 25-65 in Metro Vancouver (National Household Survey, 2011c). The responses had a similar number of individuals who did not complete high school, but more individuals who had completed a university degree (see Table 3.1).

In the sample, 46 students were Mandarin speaking, 23 were Cantonese speaking and nine spoke both Mandarin and Cantonese in their homes. One of the Mandarin speaking students also spoke Urdu at home. Fifty-one of the students were enrolled in Chinese school (16 Cantonese speaking, 30 Mandarin speaking, 5 spoke both). Some of the Cantonese speaking students were enrolled in Mandarin Chinese school. Some of the students in the study knew Hanyu Pinyin, an alphabetic script sometimes used in Mandarin.

3.2 Procedures

After ethics approval from the University of British Columbia Behavioural Research Ethics Board, and permission from the approached school district, the schools and teachers within the district were contacted to participate in the study. There were three schools that expressed interest in the study and a total of 14 classrooms took part. The schools’ ESL teachers identified the students in each classroom who met the inclusionary criteria for the study. The classroom teachers sent the study information and consent forms home to the parents (Appendix A & B). All of the students who returned a consent form were entered in a draw for an
educational book, regardless of whether consent was given to participate in the study. After participating in the testing sessions, students were offered stickers as a thank you.

The data was collected over two testing sessions at the end of the school year. The testing sessions were completed by the primary researcher and trained graduate students in a quiet setting within the schools. Before the English testing sessions, each participant was asked to provide verbal assent and sign an assent form to participate in the study using a semi-structured procedure (Appendix C). The English testing session consisted of five measures and a brief informal interview (Appendix D). The measures were selected to assess reading, spelling and phonological awareness. The informal interview was used as a way for the researchers to gather information regarding each participant’s language use in their home(s), neighbourhood(s) and at school. The Chinese testing session was conducted by one individual to ensure consistency. At the beginning of the Chinese testing, the research assistant briefly talked to each participant in Cantonese or Mandarin to estimate the participant’s proficiency in the language before asking them to read the appropriate Chinese reading measures.
Table 3.1 Demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (78)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>36</td>
<td>46.15%</td>
</tr>
<tr>
<td>Female</td>
<td>42</td>
<td>53.85%</td>
</tr>
<tr>
<td><strong>Country of Birth</strong></td>
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<td></td>
</tr>
<tr>
<td>Canada</td>
<td>51</td>
<td>65.38%</td>
</tr>
<tr>
<td>China</td>
<td>15</td>
<td>19.23%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>8</td>
<td>10.26%</td>
</tr>
<tr>
<td>USA</td>
<td>3</td>
<td>3.85%</td>
</tr>
<tr>
<td>Not Answered</td>
<td>1</td>
<td>1.28%</td>
</tr>
<tr>
<td><strong>Language Spoken</strong></td>
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<td></td>
</tr>
<tr>
<td>Cantonese</td>
<td>16</td>
<td>20.51%</td>
</tr>
<tr>
<td>Mandarin</td>
<td>42**</td>
<td>53.85%</td>
</tr>
<tr>
<td>Cantonese and Mandarin</td>
<td>20</td>
<td>25.64%</td>
</tr>
<tr>
<td><strong>Before Elementary School Care</strong></td>
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<td></td>
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<tr>
<td>Daycare in English</td>
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<td>34.62%</td>
</tr>
<tr>
<td>Daycare in a language other than English</td>
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<td>8.97%</td>
</tr>
<tr>
<td>Preschool in English</td>
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<td>32.05%</td>
</tr>
<tr>
<td>Preschool in a language other than English</td>
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<td>2.56%</td>
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<tr>
<td>Both</td>
<td>7</td>
<td>8.97%</td>
</tr>
<tr>
<td>Both in a language other than English</td>
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<td>1.28%</td>
</tr>
<tr>
<td>Not specified</td>
<td>7</td>
<td>8.97%</td>
</tr>
<tr>
<td><strong>Paternal Education</strong></td>
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<td></td>
</tr>
<tr>
<td>Less than high school diploma</td>
<td>7</td>
<td>8.97%</td>
</tr>
<tr>
<td>High school diploma/equivalent</td>
<td>7</td>
<td>8.97%</td>
</tr>
<tr>
<td>Some college/trade/university</td>
<td>11</td>
<td>14.10%</td>
</tr>
<tr>
<td>Diploma/apprenticeship/trades certification</td>
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<td>11.54%</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>21</td>
<td>26.92%</td>
</tr>
<tr>
<td>More than a bachelor's degree</td>
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<td>14.10%</td>
</tr>
<tr>
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<td>12.82%</td>
</tr>
<tr>
<td><strong>Maternal Education</strong></td>
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<td></td>
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<tr>
<td>Less than high school diploma</td>
<td>6</td>
<td>7.69%</td>
</tr>
<tr>
<td>High school diploma/equivalent</td>
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<td>7.69%</td>
</tr>
<tr>
<td>Some college/trade/university</td>
<td>17</td>
<td>21.79%</td>
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<tr>
<td>Diploma/apprenticeship/trades certification</td>
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<td>6.41%</td>
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<tr>
<td>Bachelor's degree</td>
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<td>32.05%</td>
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<tr>
<td>More than a bachelor's degree</td>
<td>12</td>
<td>15.38%</td>
</tr>
<tr>
<td>Not reported</td>
<td>7</td>
<td>8.97%</td>
</tr>
</tbody>
</table>

* Note: Percentages do not add up to 100 because of rounding

**One of the participants spoke Mandarin and Urdu at home
3.3 English Measures

There were five tests selected from two commercially available standardized measures for the English portion of the testing.

3.3.1 Woodcock-Johnson IV Tests of Achievement

The Woodcock-Johnson IV Tests of Achievement (WJ IV) is an individually administered standardized test that has measures designed to test participants in the areas of reading, writing, and mathematics (Schrank, Mather, & McGrew, 2014).

3.3.1.1 Letter Word Identification

The Letter Word Identification (Letter Word) test measures the participants’ word identification skill. The initial questions require a participant to correctly identify letters and then to correctly read aloud words that become increasingly difficult. When used for participants between the ages 5-19 there is a median reliability of .92 (Mather & Wendling, 2014).

3.3.1.2 Word Attack

The Word Attack test measures the participants’ ability to pronounce English pseudo- or low-frequency words using English phonics and structural analysis. The test begins with a participant producing sounds for individual letters, followed by letter combinations, and then words. When used for participants between the ages of 5-19 there is a median reliability of .90 (Mather & Wendling, 2014).

3.3.1.3 Spelling

The Spelling test measures the participants’ prewriting skill and spelling ability. The prewriting skill involves drawing lines and tracing letters followed by asking for the production of upper and lower case letters. Words are presented orally for a participant to spell and the
words increase in difficulty as the measure progresses. When used for participants between the ages of 5-19 there is a median reliability of .91 (Mather & Wendling, 2014).

3.3.1.4 Spelling of Sounds

The Spelling of Sounds test measures the participants’ ability to use their phonological and orthographic coding skills to spell pseudowords and low frequency words that follow regular English spelling patterns. The test begins with a participant writing single letters representing one sound before moving onto the words. A recording is used for dictation of the pseudowords. When used for participants between the ages 5-19 median reliability of .88 (Mather & Wendling, 2014).

3.3.2 Comprehensive Test of Phonological Processing Second Edition

The Comprehensive Test of Phonological Processing, Second Edition (CTOPP2) is an assessment designed to measure different phonological processing skills with ten core subtests and two supplemental subtests (Wagner, Torgesen, Rashotte, & Pearson, 2013).

3.3.2.1 Elision

The Elision subtest from the CTOPP2 is done orally with the participant to assess their ability to isolate and manipulate sound segments of words. At first, the participant is asked to repeat a compound word and then asked to remove part of the word from the stimulus. For example, the participant might be asked to say the word ‘laptop’ and then asked to say it without saying ‘lap’. The measure increases in complexity as it progresses, starting with removing syllables to asking the participant to remove individual phonemes from the word. The measure is discontinued once the participant had made three consecutive errors (Wagner et al., 2013).
3.4 Chinese Measures

Three Chinese character reading measures were used in this study. In these measures, the participant was asked to name as many of the Chinese characters as they could from the stimulus sheets. The characters increased in complexity as the measure continued. The first, Chinese Character Recognition Measure and Assessment Scale (CCRMA), is a widely-used standardized test to measure character recognition for Mandarin-speaking participants (Wang & Tao, 1993). The second two measures have been used with Cantonese-speaking participants and consisted of 100 single Chinese characters selected from Chinese primary school textbooks. One of the tasks is in simplified Chinese (Simplified) and the other is in traditional Chinese (Traditional; Liu, Chen, & Chung, 2015; Liu, & McBride-Chang, 2010; McBride-Chang et al., 2003). If the participants were Cantonese-speaking, they were asked to read both the Simplified and the Traditional measures. If the participants were Mandarin-speaking, they were asked to read the CCRMA and if they were able to read some of the items on this measure they were also asked to read the Simplified measure. When the participants spoke both languages, they were asked to read all three measures.

3.5 Interview

An informal interview (Appendix D) was conducted for researchers to get a better understanding about what language(s) the participants spoke out of school, and with whom, in order to get a better understanding of the type of bilingualism the participants were experiencing.
Chapter 4: Results

All of the data analyses were conducted using the raw scores from the measures. This is in accordance with previous research conducted on participants who had ESL, since none of the measures were standardized on ESL populations (e.g., Geva & Yaghoub Zadeh, 2006; Harrison et al., 2016; Jean & Geva, 2009). The samples used to create the norms for the standardized measures used in this study are not representative of the current sample so it would be inappropriate to conduct the analyses using these scores.

The data was analyzed using R (Version 3.4.0; R Core Team, 2013), specifically the lavaan package (Rosseel, 2012). Two different approaches were taken for analyzing the data because the number of the Chinese reading measures read by each participant varied. In one approach, an ordinal variable was created to rank the Chinese reading ability of the participants based on the number of words they read on the Chinese reading measures they completed. This rank was used in regression equations to address the research questions. The second approach employed structural equation modeling where a latent variable was created and employed missing data handling to create one score for the Chinese reading measures.

4.1 Differences Between Language Groupings

4.1.1 English Measures

Analyses were conducted where the participants at each grade level were split into subsamples of the Chinese language(s) that the participants spoke at home, in order to see if there were differences between the language groups. There were normal distributions among the groups, but examining the scores within the groups at each grade level revealed some differences between the language groups. Since there was no English monolingual control group in this study, the raw scores were converted to percentile ranks in order to compare the participants with...
English speaking individuals from the norming sample of the standardized tests. In the second grade, the differences between the language groups can likely be attributed to the uneven sample sizes between the language groupings (Table 4.1). When looking at the percentile ranks of the tests scores for the students, it can be seen that the participants in the grade two sample performed within the average range of the normative sample for the tests (Table 4.2).

For the third-grade participants, those who spoke Mandarin or both Mandarin and Cantonese at home achieved better scores on Spelling, Word Attack, and Elision when compared to their Cantonese-speaking peers (Table 4.3). Overall, the participants in grade three performed at or above the average range of the normative sample for the tests. The participants who spoke both Mandarin and Cantonese at home had an average one standard deviation above the mean of the normative sample on the Letter Identification tests (Table 4.4).

For the fourth-grade participants, those who spoke Mandarin performed better on Spelling, Spelling of Sounds, and Elision when compared to their peers (Table 4.5). Overall, the participants in the fourth grade performed at or above the range of the normative sample on the standardized tests (Table 4.6).

When considering the whole sample, those who spoke Cantonese at home did not perform as well in Letter Word (Tables 4.1, 4.3 and 4.5) when compared to the Mandarin speaking students.
### Table 4.1 Grade 2 Raw Scores From English Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>Whole</th>
<th>Mandarin</th>
<th>Cantonese</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Letter Word</td>
<td>48.25</td>
<td>6.43</td>
<td>47.65</td>
<td>6.96</td>
</tr>
<tr>
<td>Spelling</td>
<td>26.33</td>
<td>7.06</td>
<td>26.47</td>
<td>7.18</td>
</tr>
<tr>
<td>Word Attack</td>
<td>17.17</td>
<td>5.44</td>
<td>16.71</td>
<td>5.64</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>12.17</td>
<td>4.52</td>
<td>12.76</td>
<td>4.97</td>
</tr>
<tr>
<td>Elision</td>
<td>20.08</td>
<td>6.23</td>
<td>19.76</td>
<td>6.68</td>
</tr>
</tbody>
</table>

n=24  n=17  n=4  n=3

### Table 4.2 Grade 2 Percentile Rank From English Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>Whole</th>
<th>Mandarin</th>
<th>Cantonese</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Letter Word</td>
<td>56.79</td>
<td>19.36</td>
<td>53.18</td>
<td>20.54</td>
</tr>
<tr>
<td>Spelling</td>
<td>64.25</td>
<td>26.66</td>
<td>63.47</td>
<td>27.12</td>
</tr>
<tr>
<td>Word Attack</td>
<td>52.00</td>
<td>30.99</td>
<td>48.18</td>
<td>32.67</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>44.33</td>
<td>25.71</td>
<td>47.12</td>
<td>28.45</td>
</tr>
<tr>
<td>Elision</td>
<td>38.83</td>
<td>24.38</td>
<td>39.18</td>
<td>27.31</td>
</tr>
</tbody>
</table>

n=24  n=17  n=4  n=3

### Table 4.3 Grade 3 Raw Scores From English Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>Whole</th>
<th>Mandarin</th>
<th>Cantonese</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Letter Word</td>
<td>54.79</td>
<td>8.04</td>
<td>55.07</td>
<td>7.37</td>
</tr>
<tr>
<td>Spelling</td>
<td>33.28</td>
<td>6.3</td>
<td>34.4</td>
<td>6.22</td>
</tr>
<tr>
<td>Word Attack</td>
<td>21.86</td>
<td>5.84</td>
<td>22.33</td>
<td>5.67</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>15.17</td>
<td>4.13</td>
<td>15.87</td>
<td>3.71</td>
</tr>
<tr>
<td>Elision</td>
<td>23.69</td>
<td>5.83</td>
<td>25.47</td>
<td>5.66</td>
</tr>
</tbody>
</table>

n=30  n=15  n=8  n=7
Table 4.4 Grade 3 Percentile Rank From English Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>Whole</th>
<th>Mandarin</th>
<th>Cantonese</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Letter Word</td>
<td>58.07</td>
<td>28.11</td>
<td>60.00</td>
<td>26.59</td>
</tr>
<tr>
<td>Spelling</td>
<td>74.23</td>
<td>22.69</td>
<td>77.60</td>
<td>21.56</td>
</tr>
<tr>
<td>Word Attack</td>
<td>64.78</td>
<td>33.80</td>
<td>67.17</td>
<td>31.95</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>49.33</td>
<td>26.12</td>
<td>53.07</td>
<td>24.46</td>
</tr>
<tr>
<td>Elision</td>
<td>45.23</td>
<td>30.27</td>
<td>53.73</td>
<td>30.00</td>
</tr>
</tbody>
</table>

n=30 n=15 n=8 n=7

Table 4.5 Grade 4 Raw Scores From English Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>Whole</th>
<th>Mandarin</th>
<th>Cantonese</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Letter Word</td>
<td>60.67</td>
<td>5.81</td>
<td>62.3</td>
<td>4.81</td>
</tr>
<tr>
<td>Spelling</td>
<td>36.42</td>
<td>4.56</td>
<td>38.6</td>
<td>3.44</td>
</tr>
<tr>
<td>Word Attack</td>
<td>24.38</td>
<td>4.04</td>
<td>24.7</td>
<td>3.8</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>17.58</td>
<td>4.62</td>
<td>19.8</td>
<td>2.74</td>
</tr>
<tr>
<td>Elision</td>
<td>25.54</td>
<td>5.48</td>
<td>28.8</td>
<td>3.7</td>
</tr>
</tbody>
</table>

n=24 n=10 n=6 n=8

Table 4.6 Grade 4 Percentile Rank From English Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>Whole</th>
<th>Mandarin</th>
<th>Cantonese</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Letter Word</td>
<td>67.75</td>
<td>22.70</td>
<td>72.70</td>
<td>20.03</td>
</tr>
<tr>
<td>Spelling</td>
<td>72.13</td>
<td>18.02</td>
<td>78.00</td>
<td>13.89</td>
</tr>
<tr>
<td>Word Attack</td>
<td>70.50</td>
<td>24.37</td>
<td>69.10</td>
<td>24.60</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>51.96</td>
<td>26.27</td>
<td>63.00</td>
<td>17.98</td>
</tr>
<tr>
<td>Elision</td>
<td>45.92</td>
<td>26.92</td>
<td>61.10</td>
<td>27.21</td>
</tr>
</tbody>
</table>

n=24 n=10 n=6 n=8

4.1.2 Chinese Measures

For the second-grade participants, 20 read the CCRMA and there was a median score of 8.5 with an interquartile range of 5 – 15.5 (Table 4.7). All participants read the Simplified measure and there was a median score of 7.5 with an interquartile range of 3.25 – 13.75. Twelve
participants read the Traditional measure and there was a median score of 1.5 with an interquartile range of .25 – 6.25.

For the third-grade participants, 26 read the CCRMA and there was a median score of 12 with an interquartile range of 5 – 21.75. All participants read the Simplified measure and there was a median score of 12.5 with an interquartile range of 5.5 - 20.75. Eleven participants read from the Traditional word list and there was a median score of two with an interquartile range of 0 – 2.

For the fourth-grade participants, 19 read the CCRMA and there was a median score of 13 with an interquartile range of 10 – 32. Twenty-three participants read the Simplified measure and there was a median score of 16 with an interquartile range of 10 – 34. Fifteen participants read the Traditional measure and there was a median score of five with an interquartile range of 2 – 9.

This data shows that the sample contained participants with a wide range of Chinese reading abilities.

**Table 4.7 Chinese Measures: Median and Interquartile Range**

<table>
<thead>
<tr>
<th>Grade 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Range</td>
<td>Median</td>
<td>Interquartile Range</td>
</tr>
<tr>
<td>CCRMA</td>
<td>20</td>
<td>0 - 85</td>
<td>8.5</td>
<td>5 - 15.5</td>
</tr>
<tr>
<td>Simplified</td>
<td>24</td>
<td>1 - 77</td>
<td>7.5</td>
<td>3.25 - 13.75</td>
</tr>
<tr>
<td>Traditional</td>
<td>12</td>
<td>0 - 13</td>
<td>1.5</td>
<td>.25 - 6.25</td>
</tr>
<tr>
<td>Grade 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCRMA</td>
<td>26</td>
<td>0 - 63</td>
<td>12</td>
<td>5 - 21.75</td>
</tr>
<tr>
<td>Simplified</td>
<td>30</td>
<td>0 - 57</td>
<td>12.5</td>
<td>5.5 - 20.75</td>
</tr>
<tr>
<td>Traditional</td>
<td>11</td>
<td>0 - 10</td>
<td>2</td>
<td>0 - 2</td>
</tr>
<tr>
<td>Grade 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCRMA</td>
<td>19</td>
<td>0 - 64</td>
<td>13</td>
<td>10 - 32</td>
</tr>
<tr>
<td>Simplified</td>
<td>23</td>
<td>0 - 62</td>
<td>16</td>
<td>10 - 34</td>
</tr>
<tr>
<td>Traditional</td>
<td>15</td>
<td>0 - 23</td>
<td>5</td>
<td>2 - 9</td>
</tr>
</tbody>
</table>
4.2 Regression Analyses

An ordinal variable, the Chinese Reading Level (CRL), was created in order to allow for comparison of the participants based on their ability to read in Chinese established from the number of words they read and on how many of measures they read from. Participants were assigned to one of four values. Participants who were not able to read any of the characters or only identified a few of the characters correctly were assigned a value of zero. Participants who were able to read some of the characters, but not likely to read a beginning level text, were assigned a value of one. Participants who were able to read a number of characters and would likely be able to read a beginning level text were assigned a value of two. Participants who read several characters and would be able to fluently read a text at or above their grade level were assigned a value of three.

4.2.1 English Measures Regressed on the CRL

A simple linear regression was calculated to predict the raw score on the English measures based on the ordinal variable CRL (Figure 4.1). There were significant correlations found among the English measures in this analysis (Table 4.8).

First, a regression model was conducted to evaluate the predictive effects of the ordinal variable CRL on the English reading and spelling measures (Table 4.9). Significant regression equations were found for four of the five English measures. The ordinal variable CRL was a significant predictor of the Spelling score ($\beta = 0.3$, $p < 0.01$) and accounted for 9% of the variance explained. The ordinal variable CRL was a significant predictor of the Word Attack score ($\beta = 0.23$, $p < 0.05$) and accounted for 5% of the variance explained. The ordinal variable CRL was a significant predictor of the Spelling of Sounds score ($\beta = 0.34$, $p < 0.01$) and accounted for 11% of the variance explained. The ordinal variable CRL was a significant
predictor of the Elision score ($\beta = 0.29$, $p < 0.01$) and accounted for 9% of the variance. The ordinal variable CRL was not a significant predictor for the Letter Word measure ($p > 0.1$).

Figure 4.1 Regression: CRL

Table 4.8 Correlation Matrix: CRL

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Letter Word</td>
<td>—</td>
<td>0.85***</td>
<td>0.80***</td>
<td>0.78***</td>
<td>0.70***</td>
</tr>
<tr>
<td>2. Spelling</td>
<td>0.85***</td>
<td>—</td>
<td>0.87***</td>
<td>0.79***</td>
<td>0.71***</td>
</tr>
<tr>
<td>3. Word Attack</td>
<td>0.80***</td>
<td>0.87***</td>
<td>—</td>
<td>0.79***</td>
<td>0.70***</td>
</tr>
<tr>
<td>4. Spelling of Sounds</td>
<td>0.78***</td>
<td>0.79***</td>
<td>0.79***</td>
<td>—</td>
<td>0.68***</td>
</tr>
<tr>
<td>5. Elision</td>
<td>0.70***</td>
<td>0.71***</td>
<td>0.70***</td>
<td>0.68***</td>
<td>—</td>
</tr>
</tbody>
</table>

*** $p < 0.001$
4.2.2 English Measure Regressed on the CRL and Elision

Second, a multiple regression was conducted to evaluate the predictive effects of both the ordinal variable CRL and the Elision on the English reading and spelling measures (Figure 4.2). There was a significant correlation found between the ordinal variable CRL and the Elision ($r(10) = 0.25, p < 0.05$). However, upon further investigation, it was found that although the ordinal variable CRL only acted as a small and often insignificant predictor for the English measures but the Elision was consistently a predictor with a beta with $p$ value of less than 0.001. There was significant correlation found between the English reading and spelling measures (Table 4.10). When Elision was included in the regression equations, the ordinal variable CRL no longer accounted for a significant source of correlation for the dependent variables (Table 4.11). When the multiple regression was conducted, the Letter Word score was correlated with the ordinal variable CRL and Elision, the Elision was a significant predictor, and the ordinal variable CRL was not ($\text{Elision } \beta = 0.72, p < 0.001; \text{ CRL } \beta = -0.06, p = .64$). This relationship accounted for 50% of the variance explained between the Letter Word score the ordinal variable CRL and the Elision score. When the Spelling score was correlated with the ordinal variable CRL and Elision, the Elision was a significant predictor, and the ordinal variable CRL was not ($\text{Elision } \beta = 0.83, p < 0.001; \text{ CRL } \beta = 0.58, p = 0.26$). This relationship accounted for 55% of the variance explained between the Spelling of Sounds score, the ordinal variable CRL and the

### Table 4.9 Regression: CRL

<table>
<thead>
<tr>
<th></th>
<th>Intercept</th>
<th>CRL $\beta$</th>
<th>CRL $p$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Word</td>
<td>53.19</td>
<td>0.17</td>
<td>0.13</td>
<td>0.03</td>
</tr>
<tr>
<td>Spelling</td>
<td>29.96</td>
<td>0.3</td>
<td>0.01</td>
<td>0.09</td>
</tr>
<tr>
<td>Word Attack</td>
<td>19.87</td>
<td>0.23</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>13.36</td>
<td>0.34</td>
<td>0.001</td>
<td>0.11</td>
</tr>
<tr>
<td>Elision</td>
<td>21.39</td>
<td>0.29</td>
<td>0.001</td>
<td>0.09</td>
</tr>
</tbody>
</table>
Elision score. When the Word Attack score was correlated with the ordinal variable CRL and Elision, the Elision was a significant predictor, and the ordinal variable CRL was not (Elision $\beta = 0.71$, $p < 0.001$; CRL $\beta = 0.03$, $p = 0.76$). This relationship accounted for 51% of the variance explained between the Word Attack score, the ordinal variable CRL and the Elision score. When the Spelling of Sounds score was correlated with the ordinal variable CRL and Elision, the Elision was a significant predictor, and the ordinal variable CRL was not (Elision $\beta = 0.66$, $p < 0.001$; CRL $\beta = 0.14$, $p = 0.09$). This relationship accounted for 51% of the variance explained between the Spelling of Sounds score, the ordinal variable CRL and the Elision score.

Figure 4.2 Multiple Regression CRL and Elision

Table 4.10 Correlation Matrix: CRL and Elision

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Letter Word</td>
<td>—</td>
<td>0.68***</td>
<td>0.61***</td>
<td>0.56***</td>
</tr>
<tr>
<td>2. Spelling</td>
<td>0.68***</td>
<td>—</td>
<td>0.73***</td>
<td>0.61***</td>
</tr>
<tr>
<td>3. Word Attack</td>
<td>0.61***</td>
<td>0.73***</td>
<td>—</td>
<td>0.60***</td>
</tr>
<tr>
<td>4. Spelling of Sounds</td>
<td>0.56***</td>
<td>0.61***</td>
<td>0.60***</td>
<td>—</td>
</tr>
</tbody>
</table>

* $p < 0.05$; **$p < 0.001$
Table 4.11 Multiple Regression: CRL and Elision

<table>
<thead>
<tr>
<th></th>
<th>Intercept</th>
<th>CRL $\beta$</th>
<th>CRL $p$</th>
<th>Elision $\beta$</th>
<th>Elision $p$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Word</td>
<td>34.59</td>
<td>-0.04</td>
<td>0.64</td>
<td>0.72</td>
<td>0.001</td>
<td>0.50</td>
</tr>
<tr>
<td>Spelling</td>
<td>23.54</td>
<td>0.58</td>
<td>0.26</td>
<td>0.83</td>
<td>0.001</td>
<td>0.55</td>
</tr>
<tr>
<td>Word Attack</td>
<td>17.19</td>
<td>0.03</td>
<td>0.76</td>
<td>0.71</td>
<td>0.001</td>
<td>0.51</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>11.29</td>
<td>0.14</td>
<td>0.09</td>
<td>0.66</td>
<td>0.001</td>
<td>0.51</td>
</tr>
</tbody>
</table>

4.3 Structural Equation Model

A structural equation model was created using R with the Lavaan package (Version 3.4.0; R Core Team, 2013; Rosseel, 2012). The model consists of one latent variable, Reading Level (RL), created from the three Chinese reading measures and used a full information maximum likelihood strategy to handle missing data among the variables. The model examined how latent variable RL and Elision correlated the four remaining English measures. The model fit the data well ($\chi^2 (10) = 10.93, p = 0.36$).

4.3.1 English Measures Regressed on the Reading Level

Next, a regression was conducted to evaluate the predictive effects of the latent variable RL on phonological awareness, the English reading and spelling measures (Figure 4.3). There were significant correlations among the English measures in this analysis (Table 4.12). The latent variable RL was a significant predictor for three of the five measures (Table 4.13). The latent variable RL was a significant predictor for the Spelling score ($\beta = 0.31, p < 0.01$) and accounted for 9% of the variance explained. The latent variable RL was a significant predictor for the Spelling of Sounds score ($\beta = 0.36, p < 0.001$) and accounted for 13% of the variance explained. The latent variable RL was a significant predictor for the Elision score ($\beta = 0.24, p < 0.05$) and accounted for 6% of the variance explained. The latent variable RL was not a
significant predictor for the Letter Word measure (p > 0.1) nor the Word Attack measure (p > 0.5).

![Diagram of relationships between Mandarin, Traditional, Simplified, and measures]

**Figure 4.3 Regression: RL**

**Table 4.12 Correlation Matrix: RL**

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Letter Word</td>
<td>—</td>
<td>0.85***</td>
<td>0.8***</td>
<td>0.77***</td>
<td>0.70***</td>
</tr>
<tr>
<td>2. Spelling</td>
<td>0.85***</td>
<td>—</td>
<td>0.87***</td>
<td>0.79***</td>
<td>0.71***</td>
</tr>
<tr>
<td>3. Word Attack</td>
<td>0.8***</td>
<td>0.87***</td>
<td>—</td>
<td>0.78***</td>
<td>0.69***</td>
</tr>
<tr>
<td>4. Spelling of Sounds</td>
<td>0.77***</td>
<td>0.79***</td>
<td>0.78***</td>
<td>—</td>
<td>0.67***</td>
</tr>
<tr>
<td>5. Elision</td>
<td>0.70***</td>
<td>0.71***</td>
<td>0.69***</td>
<td>0.67***</td>
<td>—</td>
</tr>
</tbody>
</table>

*** p < 0.001

**Table 4.13 Regression: RL**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Intercept</th>
<th>RL $\beta$</th>
<th>RL p</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Word</td>
<td>54.7</td>
<td>0.15</td>
<td>0.19</td>
<td>0.02</td>
</tr>
<tr>
<td>Spelling</td>
<td>32.19</td>
<td>0.31</td>
<td>0.01</td>
<td>0.1</td>
</tr>
<tr>
<td>Word Attack</td>
<td>21.3</td>
<td>0.2</td>
<td>0.09</td>
<td>0.04</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>15.04</td>
<td>0.36</td>
<td>0.001</td>
<td>0.13</td>
</tr>
<tr>
<td>Elision</td>
<td>23.26</td>
<td>0.25</td>
<td>0.03</td>
<td>0.06</td>
</tr>
</tbody>
</table>
4.3.2 English Measures Regressed on the RL and Elision

Finally, a multiple regression was conducted to analyze the correlation of both the latent variable RL and the Elision on the English reading and spelling measures (Figure 4.4). There was a significant correlation between the latent variable RL and the Elision $r(76) = 0.25$, $p < 0.05$. However, upon further investigation, the latent variable RL only predicted a small and often-insignificant amount of correlation and the Elision consistently predicted a beta with $p$ value of less than 0.001. There were significant correlations found between the remaining English measures (Table 4.14). There were significant correlations between the Elision and the other English measures but the latent variable RL was only a significant predictor for the Spelling of Sounds measure (Table 4.15). When the Letter Word score was correlated with latent variable RL and Elision, the Elision was a significant predictor and latent variable RL was not (Elision $\beta = 0.72$, $p < 0.001$; RL $\beta = -0.03$, $p = 0.72$). The relationship between the Letter Word score, the latent variable RL and the Elision score accounted for 50% of the variance explained. When the Spelling score was correlated with latent variable RL and Elision, the Elision was a significant predictor and the latent variable RL was not (Elision $\beta = 0.70$, $p < 0.001$, RL $\beta = 0.14$, $p = 0.7$). The relationship between the Spelling score, the latent variable RL and the Elision score accounted for 56% of the variance explained. When the Word Attack score was correlated with RL and Elision, the Elision was a significant predictor and the latent variable RL was not (Elision $\beta = 0.71$, $p < 0.001$; RL $\beta = 0.14$, $p = 0.7$). The relationship between the Word Attack score, the latent variable RL and the Elision score accounted for 51% of the variance explained. When the Spelling of Sounds score was correlated with RL and Elision, both the RL and the Elision were significant predictors (Elision $\beta = 0.19$, $p < 0.001$; RL $\beta = 0.19$, $p < 0.01$). The
relationship between the Spelling of Sounds score, the latent variable RL and the Elision score accounted for 53% of the variance explained.

![Diagram showing the relationship between different measures and RL and Elision](image)

**Figure 4.4 Multiple Regression: RL and Elision**

**Table 4.14 Correlation Matrix: RL and Elision**

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Letter Word</td>
<td>—</td>
<td>0.69***</td>
<td>0.60***</td>
<td>0.57***</td>
</tr>
<tr>
<td>2. Spelling</td>
<td>0.69***</td>
<td>—</td>
<td>0.60***</td>
<td>0.60***</td>
</tr>
<tr>
<td>3. Word Attack</td>
<td>0.60***</td>
<td>0.74***</td>
<td>—</td>
<td>0.59*</td>
</tr>
<tr>
<td>4. Spelling of Sounds</td>
<td>0.57***</td>
<td>0.60***</td>
<td>0.59*</td>
<td>—</td>
</tr>
</tbody>
</table>

* p < 0.05; *** p < 0.001

**Table 4.15 Multiple Regression: RL and Elision**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Intercept</th>
<th>RL β</th>
<th>RL p</th>
<th>Elision β</th>
<th>Elision p</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Word</td>
<td>32.16</td>
<td>-0.03</td>
<td>0.72</td>
<td>0.17</td>
<td>0.001</td>
<td>0.50</td>
</tr>
<tr>
<td>Spelling</td>
<td>13.07</td>
<td>0.14</td>
<td>0.09</td>
<td>0.70</td>
<td>0.001</td>
<td>0.51</td>
</tr>
<tr>
<td>Word Attack</td>
<td>5.52</td>
<td>0.02</td>
<td>0.82</td>
<td>0.71</td>
<td>0.001</td>
<td>0.51</td>
</tr>
<tr>
<td>Spelling of Sounds</td>
<td>3.19</td>
<td>0.19</td>
<td>0.02</td>
<td>0.65</td>
<td>0.001</td>
<td>0.53</td>
</tr>
</tbody>
</table>
4.4 Key Findings for Specific Research Questions

Research question #1. For an individual who had ESL, does their Chinese reading ability relate to their English phonological awareness, their ability to read and spell in English, and their ability to read and spell pseudowords?

A participant’s ability to read in Chinese did account for some of the correlation on the English measures used in this study. Two analyses were done using an ordinal variable and a latent variable derived from the performance on the three Chinese reading measures. The variable CRL was created by the researcher assigning an ordinal value based on the number of items the participant read on the measures administered. The ordinal variable CRL was a significant predictor for the English spelling measure, the measures of pseudoword reading and spelling as well as the measure of phonological awareness. The latent variable RL was created using the lavaan package for R and it used the full information maximum likelihood to handle the missing data from the three Chinese measures (Version 3.4.0; R Core Team, 2013; Rosseel, 2012). The latent variable RL was a significant predictor for both measures of spelling and the measure of phonological awareness.

If the results of the analyses of both the ordinal variable CRL and the latent variable RL are combined, there are consistencies amongst the findings for four of the five measures. For the sample in this study, Chinese character identification did not correlate with the participants’ ability to read words in English. A participant’s Chinese character identification did correlate with their ability to spell both English words and pseudowords as well as their phonological awareness. It was unclear whether a participant’s ability to read in Chinese correlated with their ability to read pseudowords.
Research Question #2. For an individual who had ESL, does their Chinese reading ability account for any unique correlation in reading and spelling abilities once the correlation explained by English phonological awareness has been removed?

Once the correlation accounted for by phonological awareness on the English measures was removed, the correlation of Chinese character identification was not significant for all but one of the analyses. When using the latent variable RL and the Elision scores as predictors for the Spelling of Sounds measure, both had significant values.

4.5 Interview

During the English sessions with the participants, the researcher asked them questions in an effort to gain insight into their comfort with the English language as well as their language use outside of the school environment (Table 4.16). First, the participants were asked which language(s) they were most comfortable speaking and thinking in. Then the researcher asked the participants about who lived in their home with them, before inquiring about what language they spoke with each of the individuals in their home. Next, the participants were asked what language(s) they used during after school activities and when they were with their friends. Finally, the participants were asked if they had any additional Chinese instruction.

Based on the information gathered in this study, the greater part of the sample was more comfortable speaking English than Chinese. A few of the participants were no longer comfortable speaking in Chinese and although they could understand what the examiner was saying in Chinese they chose to respond in English. There were only a few of the participants who were able to converse and read in Chinese at a level that would be expected for their age.

The majority of the participants reported being comfortable speaking and thinking in English, with 17 percent being comfortable only speaking in English, and nine percent being
more comfortable thinking in Cantonese or Mandarin. Although 47 percent of the participants spoke exclusively to their parents in Cantonese and or Mandarin, only 20 percent of the participants with siblings spoke to their siblings exclusively in their first language(s). The majority of the participants with grandparents living in their home spoke strictly Chinese with their grandparents. Two out of the five participants who had additional extended family such as cousins, aunts, or uncles sharing their home spoke exclusively in Chinese to their family members.

The majority of the participants spoke both English and Chinese outside of school with only 19 percent of the participants reporting they only spoke English and one student reportedly only spoke Cantonese. The majority of the participants attended Chinese school and some of the Cantonese speaking participants were enrolled in Mandarin Chinese school because their parents wanted them to know both languages.
Table 4.16 Interview Results

<table>
<thead>
<tr>
<th>Situation</th>
<th>Language(s)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language most comfortable speaking</td>
<td>Cantonese</td>
<td>6.41%</td>
</tr>
<tr>
<td></td>
<td>Mandarin</td>
<td>8.97%</td>
</tr>
<tr>
<td></td>
<td>Cantonese &amp; English</td>
<td>11.54%</td>
</tr>
<tr>
<td></td>
<td>Mandarin &amp; English</td>
<td>17.95%</td>
</tr>
<tr>
<td></td>
<td>Cantonese, Mandarin &amp; English</td>
<td>5.13%</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>50%</td>
</tr>
<tr>
<td>Language most comfortable thinking</td>
<td>Cantonese</td>
<td>6.41%</td>
</tr>
<tr>
<td></td>
<td>Mandarin</td>
<td>2.56%</td>
</tr>
<tr>
<td></td>
<td>Cantonese &amp; English</td>
<td>8.97%</td>
</tr>
<tr>
<td></td>
<td>Mandarin &amp; English</td>
<td>24.36%</td>
</tr>
<tr>
<td></td>
<td>Cantonese, Mandarin &amp; English</td>
<td>3.85%</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>30.77%</td>
</tr>
<tr>
<td>Language spoken with Parents</td>
<td>Cantonese</td>
<td>19.23%</td>
</tr>
<tr>
<td></td>
<td>Mandarin</td>
<td>25.64%</td>
</tr>
<tr>
<td></td>
<td>Cantonese &amp; Mandarin</td>
<td>2.56%</td>
</tr>
<tr>
<td></td>
<td>Cantonese &amp; English</td>
<td>11.54%</td>
</tr>
<tr>
<td></td>
<td>Mandarin &amp; English</td>
<td>32.05%*</td>
</tr>
<tr>
<td></td>
<td>Cantonese, Mandarin &amp; English</td>
<td>6.41%</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>2.56%</td>
</tr>
<tr>
<td>Language spoken with Siblings</td>
<td>Cantonese</td>
<td>2.56%</td>
</tr>
<tr>
<td></td>
<td>Mandarin</td>
<td>8.97%</td>
</tr>
<tr>
<td></td>
<td>Cantonese &amp; Mandarin</td>
<td>1.28%</td>
</tr>
<tr>
<td></td>
<td>Cantonese &amp; English</td>
<td>11.54%</td>
</tr>
<tr>
<td></td>
<td>Mandarin &amp; English</td>
<td>14.10%</td>
</tr>
<tr>
<td></td>
<td>Cantonese, Mandarin &amp; English</td>
<td>2.56%</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>24.36%</td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
<td>34.62%</td>
</tr>
<tr>
<td>Language spoken with Grandparents</td>
<td>Cantonese</td>
<td>5.13%</td>
</tr>
<tr>
<td></td>
<td>Mandarin</td>
<td>12.82</td>
</tr>
<tr>
<td></td>
<td>Cantonese &amp; English</td>
<td>2.56%</td>
</tr>
<tr>
<td></td>
<td>Mandarin &amp; English</td>
<td>1.28%</td>
</tr>
<tr>
<td></td>
<td>Not Applicable</td>
<td>78.82%</td>
</tr>
<tr>
<td>Language spoken with Extended Family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Cantonese</td>
<td>1.28%</td>
<td></td>
</tr>
<tr>
<td>Cantonese &amp; Mandarin</td>
<td>1.28%</td>
<td></td>
</tr>
<tr>
<td>Mandarin &amp; English</td>
<td>2.56%</td>
<td></td>
</tr>
<tr>
<td>Mandarin, Urdu &amp; English</td>
<td>1.28%</td>
<td></td>
</tr>
<tr>
<td>Not Applicable</td>
<td>93.59%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Language spoken outside of school</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantonese</td>
<td>1.28%</td>
</tr>
<tr>
<td>Cantonese &amp; English</td>
<td>15.38%</td>
</tr>
<tr>
<td>Mandarin &amp; English</td>
<td>43.59%</td>
</tr>
<tr>
<td>Cantonese, Mandarin &amp; English</td>
<td>20.51%</td>
</tr>
<tr>
<td>English</td>
<td>19.23%</td>
</tr>
</tbody>
</table>

* One student spoke Mandarin, Urdu and English with parents

### 4.6 Common Reading & Spelling Errors

During the data collection with the participants, researchers noted that some of them made similar errors on the different English measures. After reviewing all the responses the participants made, there were several misreadings or misspellings that were repeated by different participants. For an error to be considered a common error, it had to be made by at least five of the participants. Some of the errors included omitting a sound or syllable from a word or changing the target word to another word with a similar spelling.

The Chinese Combined Score (CCS) was a latent variable created to group the participants together based on how many Chinese characters they correctly read on the Chinese measures. The CCS scores were categorized into three ranges, 0-30 correct, 31-60 correct and over 60 correct. Participants who read between 0-60 Chinese characters correctly would commonly misspell or misread word on three of the five measures. However, there were no commonalities found exclusively to the participants who had read over 60 words correct on the CCS. Although these participants made some of the common errors made by the those who read
fewer Chinese characters correctly, there were several unique errors. None of the common errors were exclusively made by the participants belonging to a specific language background.

For the Letter Word Identification test (Table 4.17), the participants with a CCS score between 0-60 commonly misread: often (offen), brought (bought), cologne (college) and echelon (ekelon). These errors are all involve the pronunciation of consonant digraphs. On this measure, some of the unique errors made by those who read more than 60 words on the CCS included: over it (overwhelm), hairlistic (heuristic), signgracy (idiosyncrasy) and milleryou (millieu). Examination of the types of errors made when the participants were reading English words shows that they typically made errors involving the sound of the vowel and when the words involve a consonant blend. More specifically, they omitted the second sound in the blend when they would pronounce library as ‘libary’ or brought as ‘bought’. The participants made errors in a two syllable word where the final consonant sound in the first syllable was different than the intial consonant sound in the second syllable. For example, the participants would say ‘offen’ instead of often.

On the Word Attack test (Table 4.18), the common errors made were done so by the participants with a variety of Chinese reading abilities and were not exclusive to one language group. Many of the common errors occurred when the participants attempted to change the target pseudoword to an English word or syllable they knew, for example when the target pseudoword ‘leck’ was pronounced as ‘leek’ or when the target word ‘quade’ was pronounced as ‘quad’. In the cases where the participants made unique errors of the target pseudowords, their pronunciation typically included a phoneme that was not in the original word or mispronouncing the vowel sound. On this measure, some of the unique errors made by those with a CCS score of more than 60 included: phelltober (phintober), serthy (cythe) and zast
(saist). In these mispronunciations, the participants changed the vowel sound and added a consonant sound that was not in the target word.

Overall, on the Spelling test, many of the errors were from when participants made vowel substitutions or occurred when words contained consonant clusters. On the Spelling test (Table 4.19), participants who misspelled “comb” as “com” scored between 0-30 on the CCS. This error suggest the students were not aware of the silent ‘b’ at the end of the word. The participants who had a CCS score between 0-60 commonly misspelled: already (alredy), laugh (lagh), juice (juce), comb (come), manager (manger, maneger), important (in - > im), calorie (calery). All but one of these errors are associated with the vowels in the word. The first three errors suggest the participants were not familiar with the vowel diagraphs found in these words. The final three errors suggest the participants were not hearing each individual phoneme in the word clearly because they made substitutions with inappropriate letters. On this measure, some of the unique errors made by those participants who had a CCS score of more than 60 included: leachic (electric), supskipation (subscription) and esuiastic (enthusiastic). These errors suggest the participant was not able to identify all the consonants in the consonant blends.

On the Spelling of Sounds test (Table 4.20), the participants who had a CCS score between 0-60 commonly misspelled: ift (ist), ushes (ushis, is->es), quib (qib), cridge (crige), autopotricious (is -> ous). Consistant with the errors on the Spelling test, many of the errors on the Spelling of Sounds test were vowel substitutions or invovled consonant clusters. There were several instances when common affixes were mispelled such as ‘ous’ being spelled as ‘is’ or ‘us and when the suffix‘es’ was spelled as ‘is’. On this measure, some of the unique errors made by those participants who had as CCS score of more than 60 included: zhang (jang), quitch (cridge) and aldomerous (automerous).
### Table 4.17 Common Errors for Letter Word

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Word Read</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>library</td>
<td>libary</td>
<td>6/8</td>
</tr>
<tr>
<td>often</td>
<td>offen</td>
<td>7/11</td>
</tr>
<tr>
<td>brought</td>
<td>bought</td>
<td>5/7</td>
</tr>
<tr>
<td>signal</td>
<td>single</td>
<td>5/21</td>
</tr>
<tr>
<td>knead</td>
<td>ned</td>
<td>15/29</td>
</tr>
<tr>
<td>sphere</td>
<td>spear</td>
<td>14/24</td>
</tr>
<tr>
<td>contrary</td>
<td>country</td>
<td>2/5</td>
</tr>
<tr>
<td>cologne</td>
<td>college</td>
<td>5/62</td>
</tr>
<tr>
<td>stamina</td>
<td>stamia</td>
<td>5/38</td>
</tr>
<tr>
<td>thoroughfare</td>
<td>throughfare</td>
<td>17/34</td>
</tr>
<tr>
<td>staunchest</td>
<td>stunchest</td>
<td>5/22</td>
</tr>
<tr>
<td>scepter</td>
<td>skepter</td>
<td>22/29</td>
</tr>
<tr>
<td>echelon</td>
<td>ekelon</td>
<td>5/30</td>
</tr>
</tbody>
</table>

### Table 4.18 Common Errors for Word Attack

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Word Read</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>leck</td>
<td>leek</td>
<td>8/20</td>
</tr>
<tr>
<td>bine</td>
<td>bin</td>
<td>14/24</td>
</tr>
<tr>
<td>blighten</td>
<td>blitten</td>
<td>8/35</td>
</tr>
<tr>
<td>quade</td>
<td>quad</td>
<td>15/35</td>
</tr>
<tr>
<td>centizen</td>
<td>citizen</td>
<td>9/40</td>
</tr>
<tr>
<td>saist</td>
<td>sist</td>
<td>5/31</td>
</tr>
<tr>
<td>saist</td>
<td>sast</td>
<td>5/31</td>
</tr>
<tr>
<td>hudned</td>
<td>hudded</td>
<td>4/21</td>
</tr>
<tr>
<td>fleighted</td>
<td>flighted</td>
<td>14/50</td>
</tr>
<tr>
<td>coge</td>
<td>cog</td>
<td>19/39</td>
</tr>
<tr>
<td>Target Word</td>
<td>Misspelling</td>
<td>Occurrence</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>cooked</td>
<td>cook</td>
<td>5/13</td>
</tr>
<tr>
<td>already</td>
<td>already</td>
<td>6/25</td>
</tr>
<tr>
<td>juice</td>
<td>juce</td>
<td>2/21</td>
</tr>
<tr>
<td>comb</td>
<td>com</td>
<td>7/27</td>
</tr>
<tr>
<td>comb</td>
<td>come</td>
<td>8/27</td>
</tr>
<tr>
<td>important</td>
<td>in-&gt;im</td>
<td>15/17</td>
</tr>
<tr>
<td>manager</td>
<td>manger</td>
<td>5/28</td>
</tr>
<tr>
<td>electric</td>
<td>electrick</td>
<td>5/29</td>
</tr>
<tr>
<td>electric</td>
<td>ick-&gt;ic</td>
<td>6/29</td>
</tr>
<tr>
<td>clothes</td>
<td>cloths</td>
<td>5/25</td>
</tr>
<tr>
<td>sword</td>
<td>sord</td>
<td>7/22</td>
</tr>
<tr>
<td>calorie</td>
<td>calery</td>
<td>7/43</td>
</tr>
<tr>
<td>calorie</td>
<td>calory</td>
<td>7/43</td>
</tr>
<tr>
<td>calorie</td>
<td>calary</td>
<td>6/43</td>
</tr>
<tr>
<td>calorie</td>
<td>y-&gt;ie</td>
<td>26/43</td>
</tr>
<tr>
<td>subscription</td>
<td>sus-&gt;sub</td>
<td>5/36</td>
</tr>
<tr>
<td>league</td>
<td>leag</td>
<td>7/36</td>
</tr>
<tr>
<td>skiing</td>
<td>skiing</td>
<td>18/25</td>
</tr>
<tr>
<td>enthusiastic</td>
<td>in-&gt;en</td>
<td>20/37</td>
</tr>
<tr>
<td>cocoa</td>
<td>coco</td>
<td>31/38</td>
</tr>
<tr>
<td>calendar</td>
<td>calender</td>
<td>30/37</td>
</tr>
<tr>
<td>calendar</td>
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<td>5/37</td>
</tr>
<tr>
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<tr>
<td>lacquer</td>
<td>lacker</td>
<td>7/15</td>
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</table>
Table 4.20 Common Errors for Spelling of Sounds

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Misspelling</th>
<th>Occurrence</th>
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<tbody>
<tr>
<td>ift</td>
<td>ist</td>
<td>18/29</td>
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<tr>
<td>ushes</td>
<td>ushis</td>
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<td>ushes</td>
<td>is-&gt;es</td>
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<td>jang</td>
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<td>grunches</td>
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Chapter 5: Conclusion

5.1 Overview

The present study aimed to investigate if there was any correlation between the Chinese reading abilities of second, third, and fourth grade Chinese participants who had ESL, and their English phonological awareness, word reading and spelling ability. There was a wide range of Chinese reading abilities within this sample. The majority of the current research available on Chinese students who had ESL, has come from countries where English is not the societal language and formal schooling occurs in Chinese with some English language instruction. This study took place in Canada, in a community where English was the predominant societal language and the primary language of instruction in public schools used in this study. However, within the school district where the study occurred and the surrounding community, there was high percentage of Chinese speaking individuals and the Chinese culture spoken and written language was prevalent. In this community, there were several after-school Chinese programs available for participants to attend. All of the participants in this study had limited exposure to English in their home before entering kindergarten. The sample contained participants who had received formal reading instruction in Chinese from an after-school program and those who had not. The participants’ language usage outside of school ranged from those who would speak Chinese exclusively outside of school, to those who spoke a mixture of Chinese and English, and those who spoke predominantly in English. The sample is thought to be representative of the Chinese ESL population in Metro Vancouver.

The findings from the present study demonstrated that the Chinese participants, who had ESL and had limited exposure to English before entering formal schooling in kindergarten, were able to become proficient at reading and spelling in English. This is similar to Lesaux & Siegel’s
(2003) finding that individuals’ reading development was not predetermined by lack of proficiency in English before entering school. It also adds evidence to Chiappe et al., (2002) finding that students who had ESL were able to acquire basic literacy skills at the same rate as their English monolingual peers.

The present study found that Chinese character identification was correlated with the English spelling, pseudoword spelling, and phonological awareness measures. This is consistent with Pan et al., (2011) finding of Chinese character recognition predicting English word recognition. However, in this study, phonological awareness was the strongest correlate for English word reading, pseudoword reading and spelling ability. When Chinese character identification and phonological awareness were analyzed together on the remaining measures, the Chinese character identification only accounted for a significant amount of correlation on the pseudoword spelling measure.

There is a significant amount of evidence of phonological skills being related to Chinese reading (Hu & Catts, 1998; McBride-Chang & Ho, 2005; Perfetti & Tan, 1998; Perfetti & Zhang, 1991, 1995; Shu et al., 2000; Tan & Perfetti 1997, 1998). Previous research has demonstrated the same relationships exist among Chinese students who had ESL as English monolinguals on measures of reading and phonological processing (Chall, 1996; Gottardo, Yan et al., 2001; Gottardo, Chiappe, et al., 2006; Rack et al., 1994; Snow et al., 1998). The current study had the same finding.

Previous research on Chinese students who had ESL found them to spell words and pseudowords using visual, whole word strategies and that they did not employ phonological awareness strategies when spelling pseudowords (Haynes & Carr, 1990; Joshi et al., 2006; Marinova-Todd & Hall, 2013; Tan et al., 2003; Wang & Geva, 2003b).
The present study found that although participants had similar common error patterns in their spelling, the participants who were better at reading Chinese characters had more errors where they did not appear to use a phonological strategy when spelling unfamiliar words and pseudowords. For example, spelling ‘sword’ as ‘stoes’ on the Spelling test or spelling the target word of ‘hoke’ as ‘cork’. Marinova-Todd & Hall (2013) had a similar finding where the Chinese ESL in their study relied on their processing skills rather than phonological awareness for spelling pseudowords. This is similar to Tan et al. (2003) suggestion Chinese individuals who had ESL tended to employ a holistic approach with English because their first language does not have a set of letter-to-sound conversion rules.

There were several instances in this study where the participants substituted a like sounding real word for pseudowords they were asked to spell. It was common in the Spelling of Sounds test for individuals to change the pseudoword to a real word, such as changing ‘toping’ to ‘topping’ or spelling ‘ashes’ instead of the target word ‘ushes’. In the Word Attack test individuals also substituted real words in the place of pseudowords such as saying ‘leek’ when the target word was ‘leck’ or saying ‘citizen’ for the target word ‘centizen’. In addition, there were several cases where the participants left the space for a pseudoword blank if they were unsure of its spelling. This was particularly prevalent among the participants who were proficient at reading in Chinese. This is similar to what Joshi et al., (2006) found when Chinese students who had ESL skipped spelling a pseudoword or spelled a real word as a substitute for the pseudoword.

Grant et al., (2011) studied Spanish and Portuguese speaking students who ESL and they found these students to be performing within the average range based on the norms of native English language speakers. The present study found the sample performed at or above the mean
of the English norming sample from the standardized measures on the Letter Word
Identification, the Spelling, and the Word Attack measures. For the Spelling of Sounds measure,
the participants in the fourth grade performed within one standard deviation of the mean of the
norming sample, but the participant from the younger grades did not perform in a comparable
way to the mean of the norm. The participants in the present study did not perform within one
standard deviation of the mean on the Elision. The results from this study demonstrated, although
the Chinese participants who had ESL may have performed within the one standard deviation of
the mean on some of the standardized measures, they did not perform within this range on all the
measures.

5.1.1 High Scoring on English Measures

Overall, participants in this study performed very well on several of the English
measures. Since this study did not contain a sample of monolingual English control participants,
the scores were converted to the tests percentile rank to allow a comparison with the age based
norms from these measures. These results show the current sample performed at a similar level
or higher than the normative sample. Initially this may seem surprising but it is a finding that has
been replicated in previous research among populations who had ESL from various first
language backgrounds.

There have been several studies where the participants who were ESL from various
language backgrounds performed better than the monolingual participants on measures of
English words reading and spelling (e.g., Abu Rabia & Siegel, 2002; Lesaux et al., 2006; Lipka,
2003; Lipka & Siegel, 2007; Uchikoshi & Marinova-Todd, 2012; Zhao, Quiroz, Dixon, & Joshi,
2016). Additionally, research has found students who had ESL from numerous heritage
languages to outperform their monolingual peers on measures of pseudoword spelling (e.g.,
D’Angiulli, Siegel, & Serra, 2001; Da Fontoura & Siegel, 1995). Students who had ESL have also been found to perform similar to their monolingual peers on measures of phonological awareness (e.g., Harrison et al., 2016). However, when accessing measures of reading comprehension, researchers have found students who had ESL to perform at lower levels than their monolingual peers (e.g., Snow, 2014). Mancilla-Martinez & Lesaux (2011) suggested this may be due to the fact that reading comprehension is a more complex process than skills such as word reading and spelling.

5.2 Key Findings for Research Questions

Research question #1. For an individual who has ESL, does their Chinese reading ability relate to their English phonological awareness, their ability to read and spell in English, and their ability to read and spell pseudowords?

Research using functional magnetic resonance imaging has found evidence Chinese English bilinguals have neural networks that partly assimilates English word reading into a Chinese reading system (Perfetti et al., 2007). Given this, it makes sense that the answer to whether Chinese character identification is related to English word reading ability has conflicting results. Some studies, like Keung & Ho (2009), have found a significant correlation between Chinese and English word reading. Chung & Ho (2010) also found Chinese reading related cognitive skills such as visual-orthographic knowledge, phonological awareness and rapid naming, to be related to English word reading. Although, others have found no significant correlation between word reading skills in English and Chinese (Gottardo, Yan, Siegel & Wade-Woolley, 2001; Wang et al., 2005). The current study found the participants’ ability to read in Chinese had no significant relation on their ability to read in English. This is similar to Bialystok,
McBride-Chang et al.’s (2005) finding that the abilities required to support reading in English cannot be recruited for word reading in Chinese.

However, the participants’ Chinese character identification did account for a small amount of correlation in their English word spelling ability. Some research has found Chinese students who had ESL to use visual, whole-word strategies for spelling English words (e.g. Dixon, Zhao, & Joshi, 2010; Joshi et al., 2006). The Chinese character identification also accounted for a small amount of correlation in their spelling of pseudowords. This may be explained by Marinova-Todd & Hall (2013) finding that Chinese ESL student used their processing skills rather than phonological awareness for spelling pseudowords.

In this study, there was a significant correlation between Chinese reading ability of the participants and their phonological awareness. This was to be expected given the highly general role of phonology across writing systems and that previous research has shown there to be a level of phonological transfer across languages even if they have two different writing systems (Perfetti et al., 2007; Wang et al., 2005). This finding adds to the argument previous research has suggested phonological awareness is used by individuals reading Chinese characters (e.g., Hu & Catts, 1998; McBride-Chang & Kail, 2002; McBride-Chang et al., 2003; Shu et al., 2000).

Research Question # 2. For an individual who has ESL, does their Chinese reading ability account for any unique correlation in reading and spelling abilities once the correlation explained by English phonological awareness has been removed?

As noted before there was a significant correlation between Chinese character reading and phonological awareness, however after further analysis, it was discovered that once the correlation explained by phonological awareness had been accounted for, participants’ Chinese
reading ability no longer accounted for any unique correlation in their reading of English words, reading of pseudowords and spelling of English words.

Similar to previous research, the current study found phonological awareness to be a significant predictor for a participant’s English word reading and spelling ability (e.g., Gottardo et al., 2001; Gottardo et al., 2006; Hogan et al., 2005; Rack et al., 1994). The only measure where both the participants’ phonological awareness and their Chinese character identification accounted for significant amount of correlation, was when they were asked to spell pseudowords. Previous research has found Chinese students who had ESL to rely on their processing skills rather than phonological awareness when spelling pseudowords (Marinova-Todd & Hall, 2013). This could be explained by the participants trying to use their visual memory for a similar real word and adapting it to fit the pseudoword by using their phonological awareness skills.

5.3 Implications for Practice

Examining the errors the participants made during the spelling and reading tests provided insights that may prove useful to those working with Chinese students who had ESL. Firstly, several of the participants had difficulty identifying some of the consonant blends when spelling, particularly the pseudowords. This suggests the participants are having problems distinguishing some of the consonant blends in the English language and could benefit from working on their phonological awareness, especially with sounds in the coda position of a syllable. This difficulty is not surprising given in some Chinese languages there are only two possible consonant sounds available for the closing syllable position (Hashimoto, 1972; Wang & Cheng, 2008).

There is a growing body of research providing evidence that phonological awareness instruction has a positive effect on reading for children who had ESL from various language backgrounds (e.g., Ganschow & Sparks, 1995, Lesaux & Siegel, 2003). Educators could embed
phonological awareness instruction in other instructional activities. Yeung et al., (2013) found students who had received phonological awareness instruction, embedded in their vocabulary instruction, to perform better on English word reading, spelling and phonological awareness than the students in the control group who had just received vocabulary instruction. An additional way to increase phonological sensitivity is by using one of the several computer programs available with activities specifically for developing phonological skills, such as ABRACADABRA (2008). Guided use with a program such as this may help students improve their auditory acuity to phonemes that they are not exposed to in Chinese, but they would have gained naturally if they had exposure to English as a young child. Secondly, reviewing common affixes and discussing their significance in the reading and spelling of words, may assist the students in spelling words containing them.

When examining the errors, it seemed that there was a split as to which of the two spelling processes postulated by Bruck and Waters (1988), the participants relied on more for spelling. Those who had limited ability to read in Chinese tended to manipulate the sounds of the English language to read and spell unfamiliar words. This is consistent with how reading and spelling are typically taught in North America. Meanwhile, the researchers noted that the participants who were more adept at reading Chinese relied more on their memory for reading and spelling English words. They preferred to avoid reading or spelling a word they were not familiar with. This result suggests one of two outcomes. Either, participants did not want to risk getting the word wrong or they relied more on memory for reading and spelling than using their knowledge of English letters and sounds, or that participants prefer to use memory for word recognition as they would use when reading Chinese.
Based on the results from this study, it does not seem necessary to measure participants’ Chinese reading ability if a measure of English phonological awareness is employed. This has significant implications for educational settings, because it can be difficult to find people who are able to read in both Cantonese and Mandarin in addition to having the ability to read traditional and simplified texts. As demonstrated by the current sample, there were many participants who would read in both Cantonese and Mandarin without realizing it.

5.4 Strengths, Limitations, and Implications for Future Research

This study made novel contributions to the current literature about elementary Chinese students who had ESL being educated where English is both the societal language and the language of instruction. This study was unique because even with the prominence of English in the society, there was a noticeable Chinese culture with the spoken and written language easily found within the community. The participants were comprised of a diverse sample with a wide range of Chinese reading abilities. This study reported information regarding the participants’ language experience before entering school, whether they attended Chinese school, their use of language at home and outside of school. This allows for a more thorough understanding of the composition of the sample.

Previous research on students who had ESL, from any language background, often did not have the strict requirements to the amount of exposure to the English language they have had at the time of the study. The present study had strict inclusion requirements to ensure the participants had similar exposure to the English language before entering formal schooling at kindergarten. Teachers reviewed students’ school records and only sent consent forms home to students who met this criterion.
Over 50 percent of the correlation in the participants’ reading and spelling abilities of both real and English pseudowords in the present study, could be explained by assessing their phonological awareness and ability to read in Chinese. Although, phonological awareness was still the single most significant predictor for the participants reading and spelling abilities, the amount of correlation explained, increased with the addition of the number of words a participant read in Chinese.

This study only reported correlational data as all the tasks were administered during one time period. This meant there was no way to test the directionality of the relationships between the variables. A longitudinal study with a similar sample would provide a deeper understanding of the relationship between Chinese character identification of participants who have ESL on English phonological awareness, reading and spelling abilities.

This study had a narrow focus by only looking at the participants’ ability to identify Chinese characters and comparing it with a few of English literacy skills. It would be advantageous for future research to address if and how different of Chinese reading related abilities, like morphological awareness, affect various constructs of English literacy skills, such as word reading fluency and reading comprehension. Additionally, it would be beneficial to know if there was an interaction effect between Chinese morphological awareness and English phonological awareness when examining different English word reading and spelling results.

The results from this study would have been more comprehensive if there were additional measure of the participants’ Chinese language abilities. Measures that examined their language proficiency would allow the participants to be classified according to their speaking and reading proficiency in Chinese. This study would have benefited from additional information regarding
how Chinese is used in the participants’ homes and what type of Chinese reading instruction they had received.

Further research on populations such as this, is warranted in order to better explain how skills learned from Chinese students who are ESL’s first language influences their literacy skills in English. Ideally, they would be longitudinal in nature and track individuals from kindergarten and follow the first five years of schooling. This would allow for a more thorough understanding of the changes in the nature of predictors, as the individuals increase their language exposure and experiences with written language.

Future investigations should include measures assessing participants’ vocabulary in both languages. It should involve measures of morphological awareness in English and measures of morphological and phonological awareness in Chinese. As with the present study, parameters should be set in place to control the participants’ exposure to the English language and efforts to gather information about their language use outside of school and any additional language instruction they have received.

The addition of vocabulary measures in each language would allow researchers a better understanding of the samples’ abilities in each language. The sample could then be subdivided into three different groups, those who have a stronger English vocabulary, those who have a stronger Chinese vocabulary and those who have similar vocabularies in both languages. The ability to divide the sample into these subsets would allow for more meaningful analysis of the differing language abilities in the ESL sample, especially when examining relationships between the different measures.

Since the morpheme is the most basic unit of speech in Chinese, the addition of morphological awareness tasks in each language would allow researchers to explore whether
their importance of this skill in their first language continues to have the same importance in their second language. The addition of a Chinese phonological awareness activity would allow for comparisons between the correlation explained by English phonological awareness and Chinese phonological awareness. It would be interesting to see if when the groups were divided into the subsets describe above, based on vocabulary, there are any differences in the predictability of both morphological and phonological awareness for reading abilities.

5.5 Summary and Conclusion

Chinese is one of the most commonly spoken first languages in Canada and in the United States of America (Li, 2006). This means that schools are seeing an increase in the number of students who are enrolling who have ESL and Chinese as their first language. It is important for educators to appreciate how their students’ experiences in their first language have an impact their learning of and education in English. The present study found participants character identification correlated with their English phonological awareness, spelling, and spelling of pseudowords. English phonological awareness was a significant correlate of both English real and pseudoword reading and spelling. This taken with findings from previous research suggest that measuring Chinese students who have ESL’s phonological awareness, has more value for relating and predicting their English literacy skills than measuring their Chinese character identification.
References:


Tan, L. H., Spinks, J. A., Feng, C. M., Siok, W. T., Perfetti, C. A. Xiong, J., … & Gao, J.


Appendices

Appendix A

THE UNIVERSITY OF BRITISH COLUMBIA
Department of Educational & Counseling Psychology & Special Education
Faculty of Education
2123 Main Mall
Vancouver, B. C. Canada V6T 1Z4

The Influence of Language Background on Reading & Spelling Development
A UBC Research Study

Information for Parents and Consent
May 30, 2016

Principal Investigator: Linda Siegel, Ph.D. (Phone: XXX-XXX-XXX; Email: X@X.ca)
Co-Investigators: Kathryn Garforth, Ph.D. Candidate (Phone: XXX-XXX-XXX; Email: X@X.ca)
University of British Columbia, Faculty of Education
Department of Educational and Counseling Psychology & Special Education
XXXX Main Mall, Vancouver, BC, XXX YYY

Dear Parent(s),
We are writing to ask your permission for your child to take part in a UBC research study.

What is the study about?
In this project, we want to find out how a student's language background influences their reading development. This study has two parts described below. The results will be used as a part of Ms. Garforth's doctoral dissertation research, titled "The Influence of Language Background on Reading and Spelling Development".

Who is being asked to take part?
Children in grades two, three and four at your child’s school will be invited to take part in the study. However, only children who have written parent/guardian permission can take part in the study. Students must be between ages 7 and 10 years old during the study, and have English as their first language or have been speaking English at school since kindergarten. Taking part in the study is voluntary and your child will be given the chance to stop at any time if they wish. All children who return consent forms (both those who take part and those who do not) will be entered in a draw for a prize. There will be one prize per classroom.

What is involved?
First, we verbally will ask your child if they want to take part, and if they understand what they will be asked to do. We will do the study at school in a location agreed upon by your child’s teacher and principal. All members of our team are approved to work in schools. We will not rush your child. We will be positive, give them stickers as they work, give breaks, and stop the activities when needed.
What is Involved (continued)?

- **Activities**
  The tasks usually will be done in a 30-35 minute sessions and a 5-minute session. They will include activities related to reading and spelling.
  On the consent form, we ask you a set of optional questions to get a better understanding about your child’s background.

How will your Privacy be Respected?

- All information about your child and your family on the consent form will be private.
- All of your child’s work is private and only seen by the researchers.
- All information will be stored with a code, and not your child’s name, in a locked file cabinet location at UBC.

What are the Benefits & Risks if your Child takes part?

We hope that results from this study will help inform educators about how a student’s language background affects their reading and spelling development. We believe the risks in this study are minimal, and not unlike what children experience in their day-to-day life. Most children find the Individual Activities fun and game-like. Your child may stop taking part at any time. If they want to stop, that is okay. If your child does not take part, then your child will take part in normal classroom activities. Taking part or not does not affect any services that your child receives.

Who do you contact if you have questions?

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSIL@ors.ubc.ca or call toll free 1-877-822-8598. If you have any questions about this study, please call or email Ms. Garforth, as listed at the top of this letter. If you have any questions about your child’s treatment or rights as a research participant, please contact the Director of Research Services at the University of British Columbia at (604) 822-8598.

How do I give my consent?

We hope your child takes part in this study, but it is your choice. If you give consent for your child to take part in our project, please:

1. Complete the consent form on the next page. You may keep this letter for your records.
2. Have your child return the consent form to their teacher by **Friday June 3, 2016**.
3. **If you do not want your child to take part, please return the form so we know that you got our letter.**

Thank-You

Linda Siegel  
Kathryn Garforth
PARENT/GUARDIAN CONSENT FORM

THE INFLUENCE OF LANGUAGE BACKGROUND ON READING & SPELLING DEVELOPMENT

Investigators: Linda Siegel, and Kathryn Garforth University of British Columbia

1. Consent: I have read and understand the information about the project, "Language Background and its Affect on Reading and Spelling Development." I understand that their taking part in the project is voluntary. My child may stop at any time, even after the consent form is signed.

   2. Please check one:

   - [ ] NO, I do not consent to my son/daughter's taking part in this study.
   - [ ] YES, I consent to my son/daughter's taking part in this study.

   3. Please fill out the following and sign below:

   - Your Son/Daughter's Name - PRINT
   - Birthdate* (dd/mm/yyyy)
   - Parent/Guardian Name - PRINT
   - Parent/Guardian Signature (date)

4. If you consent for your child to take part, please let us know some or all of the following information only if you are willing:

   **Your Child's Background**
   - What country was your child born in?
   - What was your child's first language?
   - Can your child read in their first language? [ ] Yes  [ ] No
   - What is the main language you child speaks?
   - What is the main language(s) your family speaks at home?
   - What other languages does your family speak at home?

   **Outside of School**
   - Does your child receive any additional reading instruction outside of school? [ ] No  [ ] Yes  [ ] Language other than English
   - Before Kindergarten, did your child regularly attend any of the following? [ ] Daycare  [ ] Language other than English  [ ] Preschool  [ ] Language other than English

   **Other Children Living In Your Home**
   - [ ] My child is the only child living in my/on our home.
   - [ ] Other children live at home with my child (such as full, half, or step-siblings).

   **Family Background** (of Family Living with Child)
   - Caregiver 1 (circle: mother father other):
     - [ ] High School Diploma or Equivalent
     - [ ] Some College/Trades/University
     - [ ] Apprenticeship/Trade Certificate
     - [ ] Bachelor's Degree
     - [ ] More than Bachelors
   - Caregiver 1 (circle: mother father other):
     - [ ] High School Diploma or Equivalent
     - [ ] Some College/Trades/University
     - [ ] Apprenticeship/Trade Certificate
     - [ ] Bachelor's Degree
     - [ ] More than Bachelors
亲爱的家长，
我们书面征求您的同意，让您孩子参与一项 UBC 的学习研究。

这是一项关于什么的研究？
在这一研究中，我们希望找出学生的语言背景对他们的阅读能力发展的影响。这项研究主要分成两个步骤，以下会有详细解释。研究所得之结论将被应用于 Ms. Garforth 的博士论文研究，题目为“语言背景对阅读与拼写能力发展的影响”。

谁会被邀请参与此项目？
所有在此学校就读的二年级、三年级及四年级学生将会被邀请参与这个项目研究。然而，这仅限于已经表达家长或监护人同意信的学生。参与此研究的学生必须是年龄介于 7 岁至 10 岁之间，并且英语是他们第一与第二语言，或是从其他地方在本校接受英语。这次的研究是自愿参与，您的孩子有权利在任何时候停止参与此研究。所有的递交同意书的学生（包括自愿参加以及不愿意参加的学生）都有机会参与抽奖，每个班级将设立一个获奖名额。

如何参与此项目？
首先，我们将口头征询您的孩子是否愿意参加此研究，以及孩子是否愿意参与研究的步骤。然后，将会进行两个部分的研究：1）拼写活动，2）个体活动。

> 第一部分：拼写活动
如果您跟您的孩子双方都同意，您的孩子将参与一项拼写活动，类似于拼写测试，但结果将不会影响您的孩子学科成绩。

在进行第二部分活动之前，我们将征询您孩子个人意愿，是否愿意参与个体活动，我们将会在老师以及家长指定的地方进行此项目研究。我们研究组的所有成员都得到学校的允许参与此项目，我们不会强迫您的孩子。我们会以正面的态度，给予证书作为奖励，给予休息时间，以及在任何时间都可提出暂停的要求。

Page 1 of 3
如何参与此项目（续）？

- 第二部分：个体活动
  这项活动将由教师在学生和教师双方同意的时间及地点进行，此活动通常可在30至35分钟内完成，将包括阅读以及拼写的内容。
  在同意信中，您将有机会提出问题，以便我们更好的了解您的孩子。

您的隐私是否被保护？

- 在同意信中所有关于您孩子以及家庭的资料将受到隐私保护。
- 您孩子所参与的活动将受到隐私保护，并有研究人员允许参与。
- 所有的信息将加密存储，不是您孩子的姓名，并存储于UBC的档案室内。

您孩子参与此项目的益处及风险？

我们希望此研究可以提供教育者们一些关于学生的学习背景如何影响到他们阅读与拼写能力发展的信息。

我们相信此项研究存在的风险非常低，而且不同于孩子们每天所经历的。大部分孩子会认为个体活动非常有趣，跟做游戏一样。如果他们想要暂停，完全可以的。如果您的孩子不参与，您的孩子将如常参与班级活动。参与此研究，您的孩子及其他活动将不会受到影响。

如果您有疑问应该联系何人？

作为参与者，在此研究的过程中，如果您有任何关于您权利或经历的疑虑与抱怨，请联系UBC研究中心参与者投诉专线：604-822-8598，或如果您是长途，请使用电子邮件：RSIL@ors.ubc.ca，或拨打免费长途：1-877-822-8598。

如果您对此研究有任何疑问，请致电或电邮Ms. Garforth，她的联系方式见于此信上方。如果您对您的孩子参与此研究的方式与权利有任何疑虑，请联系UBC研究中心总管（604）822-8598。

如何递交同意书？

我们希望您的孩子能够参与此项研究，但这是您的选择。如果您同意您的孩子参与我们的研究项目，请
1. 填写下一页的同意书，您可以保存这份信件作为凭证。
2. 让您的孩子在这周五前将此同意书递交给老师。
3. 如果您愿意让您的孩子参与，请交给此表格，这样我们才知道您已经收到此信件。

感谢

Linda Siegel
Kathryn Garforth
家长/监护人同意书

请将此页送达学校

语言背景对于阅读与拼写能力发展的影响

研究人员：Linda Siegel, and Kathryn Garforth University of British Columbia

1. 同意：我已经阅读并明白关于此项研究的内容，“语言背景对于阅读与拼写能力发展的影响”。我知道这项研究是以自愿形式参与的。在我签署这份同意书后，我的孩子仍可以在任何时候终止参与这项研究。

2. 请在其中一项内选一：

□ 不，我不同意我儿子/女儿参与此项研究。
□ 是，我同意我儿子/女儿参与此项研究。

3. 请填写并签名：

儿子/女儿姓名 - 拼写生日（年/月/日）

家长/监护人姓名 - 拼写

家长/监护人签名（日期）

4. 如果您同意您孩子参与，在您愿意的情况下，请让我们了解以下信息。

<table>
<thead>
<tr>
<th>家庭背景</th>
<th>与孩子共同生活的家庭成员情况</th>
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<tr>
<td>□ 监护人 1 (填项：母亲 父亲 其他)：</td>
<td>□ 监护人 1 (填项：母亲 父亲 其他)：</td>
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<td>□ 高中文凭或同等</td>
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</table>

□ 其他语言（非英语）

□ 全日制幼儿园 □ 非英语环境

□ 半日制幼儿园 □ 非英语环境

□ 我的孩子是独生子女。

□ 我家里还有其他小孩（包括亲生的，或继生的）
Appendix C

THE UNIVERSITY OF BRITISH COLUMBIA

Department of Educational & Counseling Psychology & Special Education
Faculty of Education
2125 Main Mall
Vancouver, B.C. Canada V6T 1Z4

Reading & Spelling Development
A UBC Research Study

Information for Students

Principal Investigator: Linda Siegel, Ph.D. (Phone: XXX-XXX-XXXX; Email: X@X.ca)
Co-Investigators: Kathryn Garforth, Ph.D. Candidate (Phone: XXX-XXX-XXXX; Email: X@X.ca)
University of British Columbia, Faculty of Education
Department of Educational and Counseling Psychology & Special Education
X Main Mall, Vancouver, BC, XXX YYYY

(This is to be read to the classroom before distributing the parent consent forms. This will be reviewed again individually with each student prior to beginning Part Two: Individual Activities.)

"We are researchers from the University of British Columbia. We study kids at school. We are asking if you would like to be in a study, about reading and spelling.

What is This Study About?
We're doing a research study about how the language or languages you speak affects how you read and spell.

Who Are We Asking for Help? Do You Have to Do This?
We are asking kids in grade three and four if they would like to take part in this study. You have to be between 8 and 10 years old. You also have to speak and understand English to be in this study.

Whether or not you do the study is up to your parents, and up to you. If your parents decide that it's ok for you to do the study, then they have to sign the study permission form. You have to give the signed form back to your teacher.

We hope that you will want to do the activities with us, but no one has to do anything that they don't want to do, even after their parents have said it is okay. If you don't want to be in the study, it's ok.

Are Your Answers Private?
It's ok for you to tell others about what you do in the study. You can tell others what you think about the study.

However, anything you do for the study will only be seen by the researchers. We will not tell your teachers about what you did in the study.

When we talk to other people about the study, we never tell them your name, if you did the study, or how anyone did on the activities.

What Happens If You Do the Study?
> PART ONE: Spelling Activity
You and the other students in your class who have decided to take part of the study will do a spelling activity, similar to a spelling test but it doesn’t count for marks.

PART TWO: Individual Activities
We will then come back later and ask some of the students who did the Spelling Activity to do some other activities with us one on one. It’s your choice if you want to do them. We will do the activities with you here at your school. We will work with you a couple of times.

These activities will include: spelling some made up words, reading, word games, number games, & answering some questions. When we do the activities, we can take breaks if you get tired. If you don’t feel like doing the activities or want to stop, it’s ok.

Why Might You Want to Do The Study?
It would be great if you can help and take part in this research study. We want to better understand how kids who speak different languages learn how to read.

For your class, everybody who returns the parent form will have their names entered into a draw for a prize. Even if you and your parents don’t want to do the study, please bring the form back. Everybody, even the people who say no, get to enter the draw for a prize.

Most kids find the individual activities to be fun.

Who Can I Talk to About the Study?
If you have questions, you can ask me, Ms. Garforth, your teacher, or your parents, who have my phone number and email.
INDIVIDUAL STUDENT ASSENT FORM

THINKING SKILLS & CHILDREN’S SOCIAL BEHAVIOR

Investigators: Linda Siegel, and Kathryn Garforth, University of British Columbia

(to be done with each student after parental consent has been received, but prior to Part A/B)

RESEARCH ASSISTANT:

1.A. In developmentally appropriate language, verbally explain and review each of the following aspects of informed assent with the potential participant.

1.B. Check off each item after it has been explained to the student.

1. C. Answer any questions that the potential participant may have.
   - Who you are (researcher with UBC)
   - What is a study and purpose of this study (to understand how students who speak different languages learn how to read and spell)?
   - Parental Consent (that their parents have said that it is ok, but it’s ok for them to say no)
   - Child Assent (that it is their choice, and nothing bad will happen if they say no)
   - Study Child Requirements (communicate spelling activity and individual activities)
   - Study Risks and Benefits (boredom/frustration, stickers)
   - Privacy / Confidentiality (all answers to be secret, don’t use any names of children)
   - Voluntary Participation (they can take breaks or stop at any time)

RESEARCH ASSISTANT:

2.A. Ask the below questions to evaluate if assent is truly informed and voluntary.

2.B. If the student provides an appropriate response (that indicates understanding of the related aspect of informed assent), tick the related box.

2.C. If the student does not provide a response that is appropriate, re-explain the related concept and then re-ask the question. If an appropriate response cannot be obtained for each question, assent is not informed. Make relevant notes, and confer with study coordinator before commencing any further study activities.
   - Do you understand what a study is?
   - Who gets to decide whether kids take part in the study?
   - Does anything happen to the kids who say no to the study?
   - For kids in the study, what are they asked to do?
   - For kids in the study, what are some good and bad things that might happen when they do the study?
   - Does it mean that your answers are “private”?
   - If you take part, can you change your mind or stop at any time?

RESEARCH ASSISTANT & STUDENT

3. Ask student to make a checkmark in one of the two boxes. Tell them that we will ask them again later, whether they want to be in the study (in case they change their mind).

☐ NO, I do not want to be in the study  ☐ YES - I want to be in the study.

☐ YES - I want to do the Spelling Activity

☐ YES - I want to do the Individual activities

Child’s Name: ____________________________  Child’s Signature: ____________________________

Date: ____________________________
Interview

I am going to ask you some questions about yourself so I can get to know you better.

1. What language are you most comfortable speaking?
   Chinese __________  English __________

2. What language do you think in?
   Chinese __________  English __________

3. Who lives with you at your house and what languages do you speak with each of them?
   __________________________________________________________________________
   __________________________________________________________________________

4. What languages do you family members use when speaking to each other at home?
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

5. Does anyone read to you in at home?
   Chinese __________  English __________

6. What do you do after school? What language do you speak when you do that?
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
   Chinese __________  English __________

7. When you are with your friends outside of school, what language do you speak?
   Chinese __________  English __________

8. Do you go to Chinese school or do you have a Chinese tutor?
   School: Yes  No  Tutor: Yes  No

9. What languages are spoken in your neighbourhood?
   __________________________________________________________________________
   __________________________________________________________________________