SPELLING DEVELOPMENT IN BILINGUAL AND MONOLINGUAL CHILDREN IN GRADE ONE

by

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Abstract

This study compared the oral language, phonological awareness, reading, and spelling skills of Tagalog-English bilingual, Chinese-English bilingual, and monolingual English-speaking children in Grade 1. The bilingual children performed more poorly than the monolinguals on measures of oral proficiency in English, but demonstrated equivalent overall performance on phonological awareness, reading, and spelling tasks. However, there were significant differences between the two bilingual groups on several measures: the Tagalog-English bilinguals outperformed the Chinese-English group in terms of phonological awareness, word reading, and pseudoword reading, and the patterns of correlations between these and the spelling measures also differed across groups. More detailed analyses of the children's spelling performance also revealed group differences, as the Chinese-English children demonstrated difficulty spelling certain words, as well as the phoneme /θ/. However, other aspects of the children's spelling performance were more similar across groups: all children showed poorer performance in spelling pseudowords as compared with real words, and in a confrontation pseudoword spelling task, all three groups struggled with orthographically illegitimate as compared with legitimate letter strings. In addition, certain features of English spelling were equally difficult for all children to spell. These results are discussed in terms of language-general vs. language-specific processes in literacy development, as well as possible effects of the children's language and literacy experiences.

Table of Contents

List of Tables

List of Figures

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1 INTRODUCTION

Writing systems are graphic representations of spoken language (DeFrancis, 1989), and literacy development involves learning the association between the printed and oral forms of language (Adams, 1990). In an alphabetic script such as English, the written symbols represent phonemes, while a logographic system like Chinese represents syllabic morphemes (DeFrancis, 1989; Perfetti & Zhang, 1995). Research has shown that the underlying processes in reading and writing also vary across different languages and writing systems (e.g. Goswami, Ziegler, Dalton, & Schneider, 2001; Leong & Tamaoka, 1998; Perfetti, Liu, & Tan, 2005). Several studies of bilingual speakers suggest that some of these skills required for literacy development, such as phonological processing skills, can be transferred from one language to another (e.g. Cisero & Royer, 1995; Durgunoglu, Nagy, & Hancin-Blatt, 1993; Gottardo, Yan, Siegel, & Wade-Woolley, 2001). It has also been shown that readers of orthographically different languages such as Chinese make use of visual-orthographic processing skills developed in their first language (L1) while reading in English, demonstrating transfer of a different type of literacy-related skill (e.g. Wang & Geva, 2003b; Wang, Koda, & Perfetti, 2003). However, relatively few studies to date have directly compared groups of bilingual speakers from different language backgrounds, particularly in the area of spelling development. The present study attempts to address this gap in the literature by examining the spelling and related skills of bilingual children from two different language and writing system backgrounds.

1.1 Spelling development in English

English is generally considered an orthographically deep language, as the relationship between sounds and letters is complex rather than one-to-one. While some words are spelled by assembling phonological units (e.g. /k/, /æ/, /t/ are combined to spell *cat*), other words are

irregular and contain exceptions to this alphabetic principle (e.g. /tʌf/ is spelled *tough* rather than *tuf*). In order to learn to read and write in English, children must therefore draw on knowledge of orthographic and morphological conventions, in addition to phonological knowledge (Bourassa & Treiman, 2001; Treiman, 1993; Treiman & Bourassa, 2000). Charles Read (1971, 1986) was the first to examine preschool children's invented spellings systematically and note that their error patterns over time reflect different strategies and levels of linguistic and orthographic knowledge. Other researchers have similarly studied children's spelling errors and proposed several stage models of spelling development. Henderson (1985) devised a five-stage model outlining the progression from pre-literate writing to knowledge of derivational principles. Similarly, Gentry (1982) identified five stages of spelling (precommunicative, semiphonetic, phonetic, transitional, and correct), and Ehri (1986) described three stages in the development of orthographic knowledge (semiphonetic, phonetic, and morphemic). All of these descriptions suggest that children at different stages are able to make use of different types of information. For example, beginning spellers tend to focus on representing speech sounds, using phonetic strategies such as letter-name or letter-sound correspondences to spell words. Later in development, children begin to recognize patterns in letter sequences and knowledge of orthographic conventions emerges. In the final stages, spellers develop morphological awareness and make the spelling-meaning connection (Templeton, 1983), recognizing that words share bases and roots that have constant meanings and spellings. Although more recent research has suggested that these stages are not necessarily discrete, as even young children have been shown to make use of multiple strategies and implicit orthographic and morphological knowledge (e.g. Treiman & Cassar, 1997; Varnhagen, McCallum, & Burstow, 1997), the use of

stage models as a framework for describing and teaching spelling remains popular in educational settings.

1.2 Component skills for literacy development across languages

As these stage models suggest, English speakers must develop skills and awareness in the areas of phonology, orthography, and morphology in order to learn to read and spell accurately. Of these various sources of knowledge for English literacy development, phonology has received the most attention in the literature. A large body of research has found phonological awareness, or the ability to attend to the sound structure of words, to be strongly associated with reading and spelling development in English speakers (e.g. Adams, 1990; Bradley & Bryant, 1983; Bruck & Treiman, 1990; Share & Stanovich, 1995; Stuart & Masterson, 1992; Wagner & Torgesen, 1987). Phonological awareness has also been shown to influence reading ability in speakers of other languages with alphabetic scripts, such as French, Danish, and Spanish (e.g. Ben-Dror, Bentin, & Frost, 1995; Caravolas, Volin, & Hulme, 2006; Carillo, 1994; Casalis & Louis-Alexandre, 2000; Jimenez-Gonzalez, 1997; Lafrance & Gottardo, 2005; Lundberg, Frost, & Petersen, 1988; Nikolopoulos, Goulandris, Hulme, & Snowling, 2006). However, despite these cross-linguistic similarities, the orthographic depth hypothesis (Frost, 1994; Katz & Frost, 1992) suggests that the reading process is different for alphabetic languages differing in the consistency of grapheme-phoneme correspondences (i.e. 'shallow' vs. 'deep' orthographies), and several studies have provided support for this claim (e.g. Cossu, Shankweiler, Liberman, & Katz, 1988; Geva & Siegel, 2000; Goswami et al., 2001, 2003; Juul & Sigurdsson, 2005). For example, Goswami et al. (2003) found that learners of a shallow language like German rely on grapheme-phoneme correspondences in learning to read, while deep orthographies like English encourage readers to use both large-unit (rime- and word-level) and small-unit (grapheme-phoneme level)

strategies. Juul and Sigurdsson's (2005) study further suggests that learners of a deep orthography such as Danish acquire phonemic encoding skills more slowly than learners of a transparent orthography such as Icelandic.

Although the orthographic depth hypothesis pertains to alphabetic scripts, it has also been suggested that non-alphabetic orthographies such as Chinese similarly rely on different cognitive processing skills for reading and writing (e.g. Leong & Tamaoka, 1998). Chinese has been referred to as a morphosyllabic writing system (e.g. DeFrancis, 1989; Perfetti & Zhang, 1995), as the basic unit of writing, the character, represents a monosyllabic morpheme. Because of this feature of Chinese orthography, researchers have questioned whether or not phonological processing skills play the same important role in Chinese literacy development as in alphabetic scripts, and this remains a controversial issue in the literature. Several studies have shown that phonological processing skills such as rhyme and tone awareness are associated with word reading ability in Chinese children (e.g. Chow, McBride-Chang, & Burgess, 2005; Ho & Bryant, 1997; Hu & Catts, 1998; McBride-Chang & Ho, 2000). However, it has also been proposed that phonological information in Chinese is encoded at the syllable level, rather than at the phonemic level, and current models of Chinese reading suggest that phonological and semantic information are only activated after a graphemic representation is accessed (e.g. Perfetti et al., 2005). In addition, the logographic nature of the Chinese orthography also influences the cognitive skills required for literacy development, as several studies have shown that visual processing skills play a critical role in Chinese reading (e.g. Ho & Bryant, 1997; Huang & Hanley, 1997; Leck, Weekes, & Chen, 1995; Siok & Fletcher, 2001). In Siok and Fletcher's (2001) study, for example, visual skills were predictive of reading ability in the lower grades, while phonological and orthographic skills were better predictors of reading success in the higher grades. Taken

together, all of these studies suggest that a language's orthographic system has implications for the component skills required for reading and writing: certain phonological skills may be important in different languages and/or at different times, and visual processing skills may be uniquely relevant to reading and writing a logographic language.

1.3 Research with bilingual populations

Given these differences across languages, several studies have investigated the possibility that bilingual speakers might make use of literacy abilities developed in one language when reading in the other. Many researchers have focused on the phonological awareness skills of bilinguals and learners of English as a second language (ESL) and found evidence of transfer of these abilities across languages (e.g. Durgunoglu et al., 1993; Cisero & Royer, 1995; Gottardo et al., 2001; Wang, Perfetti, & Liu, 2005; Wang, Park, & Lee, 2006). For example, Durgunoglu et al. (1993) found that phonological awareness and reading skills in ESL-learning children's first language (L1) of Spanish predicted their ability to read unfamiliar words in their second language (L2). For the Chinese-speaking ESL children in Gottardo et al.'s (2001) study, rhyme detection skill in Chinese was correlated with and contributed a unique variance to English reading performance. Similarly, Wang et al. (2005) found that tone processing skill in Chinese was predictive of English pseudoword reading in ESL learners, providing further evidence of the transfer of phonological processing skills even across orthographically different languages.

Although these studies have demonstrated similarities in transfer effects across a range of languages, other research suggests that bilingual learners from different language backgrounds exhibit different types of transfer of reading skills. Bialystok, Majumder, and Martin (2003) compared the English phonological awareness skills of Spanish-English bilinguals, Chinese-English bilinguals, and native English-speaking children and found that the Spanish-English

group outperformed the others on a phoneme segmentation task, while the Chinese-English group obtained the lowest scores. The authors hypothesized that the similar phonological and orthographic systems of Spanish and English may have given the Spanish-speaking children an advantage over the Chinese bilinguals in this phonological awareness task. At the same time, the differences in this task did not correspond to differences in reading performance for the three groups, suggesting that other factors or skills may also play a role in their reading development. Wang, Koda, and Perfetti (2003), on the other hand, found that adult ESL learners with a logographic home language (Chinese) performed more poorly on English reading tasks than those from an alphabetic language background (Korean). In addition, the Chinese speakers relied more on visual-orthographic processing in word reading, while the Korean ESL learners made more use of phonological information, indicating that alphabetic and non-alphabetic literacy experiences result in different types of transfer to the L2. Other studies with adult ESL learners from non-alphabetic L1 backgrounds similarly suggest that these readers rely on different skills when reading English (e.g. Akamatsu, 1999; Haynes & Carr, 1990; Holm & Dodd, 1996; Koda, 1989; Wade-Woolley, 1999). In Haynes and Carr's (1990) study, Chinese learners of English were found to benefit more from lexical familiarity (i.e. real words vs. pseudowords) than from phonological accessibility (i.e. pseudowords vs. letter strings) when their performance on visual efficiency tasks was compared with that of English speakers. These results are consistent with the notion that Chinese readers make more use of visual, whole-word strategies than phonological processing when reading in English. Similarly, Wade-Woolley (1999) compared Japanese and Russian ESL learners and found that the Japanese speakers relied more on their sensitivity to orthographic patterns than on phonological awareness skills when decoding unfamiliar pseudowords.

Most of the aforementioned studies examined phonological processing and word reading skills in native English speakers and bilingual speakers. Although spelling tasks are often included in studies of bilingual and ESL speakers as an additional measure of literacy, more detailed analyses of spelling characteristics and predictors in these populations have been conducted relatively rarely. In one of the few spelling studies with ESL learners, Wade-Woolley and Siegel (1997) found that ESL children spelled as accurately as native English-speaking children despite poorer phonological awareness skills. Only poor readers from both language groups demonstrated significant spelling difficulties, and both ESL and English-speaking children appeared to rely on similar underlying processes in spelling, namely pseudoword decoding and phoneme deletion. However, the ESL participants in this study were from diverse language backgrounds, and given the language-specific transfer effects seen in the reading studies described previously, it might be expected that English learners with different home languages would also show differences in spelling performance. In fact, some studies have provided converging evidence of these language-specific effects. For example, Fashola, Drum, Mayer, & Kang (1996) studied Spanish-speaking children learning ESL and found that their spelling errors in English were largely consistent with the application of Spanish phonological and orthographic rules (e.g. substituting *j* for *h*), reflecting negative transfer from the L1. Similarly, Wang and Geva's (2003a) study revealed that Chinese ESL learners have difficulty spelling English phonemes that are absent in Chinese, such as /θ/ and /ʃ/. Other studies of ESL learners from non-alphabetic L1 backgrounds have demonstrated similar patterns in English spelling as in reading; for example, Holm and Dodd (1996) found that adult ESL learners from Hong Kong performed more poorly on phonological awareness as well as pseudoword reading and spelling tasks than those with an alphabetic L1, in spite of equivalent performance on real

word tasks. Wang and Geva (2003b) studied Cantonese-speaking children learning ESL and found the same effect of lexicality in spelling (i.e. more difficulty with pseudowords that do not have a lexical entry in the mental dictionary than with familiar real words), while also providing evidence of positive transfer of visual-orthographic processing skills when spelling unpronounceable words. Consistent with Haynes and Carr's (1990) findings in their reading study, these results suggest that Chinese readers make use of visual, whole-word strategies rather than phonological assembly when spelling English words. However, while these results are suggestive of language-specific transfer effects, Wang and Geva (2003b) also propose that future research should control for possible confounding factors by comparing the spelling skills of bilingual groups from two different language backgrounds. Very few studies to date have carried out such a comparison, making it difficult to directly assess the effects of exposure to particular phonological and orthographic systems on English spelling development.

Although phonological and other processing skills have been the focus of a large volume of literacy research to date, the issue of oral language proficiency is also important to consider in studies of bilingual populations. Research with monolingual children has shown that language comprehension and production abilities are correlated with later success in reading (e.g. Snow, Burns, & Griffith, 1998), and children with language impairments have been found to be at a high risk for developing reading disabilities (Catts, Fey, Tomblin, & Zhang, 2002). The same relationship might be expected among bilingual or ESL learners with limited oral proficiency in English; however, the literature to date provides only partial support for this hypothesis. On the one hand, studies such as Gottardo's (2002) investigation of Spanish-speaking ESL children have shown a significant correlation between English vocabulary knowledge and English word reading, and Manis, Lindsey, and Bailey (2004) found that language production skills in English

were correlated with later English reading in their Spanish-speaking English learners. By contrast, Durgunoglu et al. (1993) found that ESL learners' oral proficiency skills in either their L1 or L2 were not predictive of English word reading ability, and Wade-Woolley and Siegel (1997) did not find an effect of oral language ability on spelling performance in their ESL participants. Thus, the relationship between oral proficiency and literacy development in bilingual children remains unclear, and the influence of oral language skills on spelling performance in particular has received relatively little attention to date.

1.4 The present study

The preceding review suggests that bilingualism may affect English spelling development in different ways depending on the orthographic and phonological systems of the child's other language, in addition to his or her proficiency in English. In order to further examine the spelling performance of bilingual children with different home languages, this study will compare the spelling-related abilities (including oral proficiency, phonological awareness, and reading) of Chinese-English and Tagalog-English bilingual children, as well as the skills of monolingual English speakers. Chinese and Tagalog have been chosen because of differences in their relationships to English. Unlike English, Chinese is a monosyllabic and tonal language. Most Chinese syllables do not contain consonant clusters, and English phonemes such as /ʃ/, /v/, /θ/, /z/, and the voiced stops /b/, /d/, and /g/ do not exist in Cantonese, the particular language chosen for this study (Holm & Dodd, 1999). In addition, final stops are absent in Cantonese, and Cantonese speakers of English often fail to distinguish between voiced and voiceless stops in syllable-final position (Killam & Watson, 1983). As previously mentioned, the Chinese orthographic system also differs from that of English, in that the basic unit of Chinese writing,

the character, represents a monosyllabic morpheme rather than a phoneme (DeFrancis, 1989; Perfetti & Zhang, 1995).

By contrast, Tagalog shares the Latin alphabetic orthography with English, meaning that letter-phoneme mappings are used to assemble words. However, Tagalog has a more shallow writing system than English, as phonemes have a one-to-one correspondence with letters. The only exception to this system is the glottal stop, a contrastive feature in Tagalog which is not represented by a corresponding grapheme (Himmelmann, 2005). Tagalog also has some unique phonological characteristics: sounds such as /f/, /v/, /z/, /θ/, and /tʃ/ are not present in the Tagalog inventory, and consonant clusters only occur across syllable boundaries (except in borrowed words or contractions). In addition, there are no vowel-initial words in Tagalog (Himmelmann, 2005). Compared with both Chinese and English, Tagalog is rich in morphology, and the frequent use of several affixes in combination results in many polysyllabic words (see Malabonga & Marinova-Todd, forthcoming, for a review of the features of Tagalog). Although Tagalog has not been included in cross-linguistic studies to date, its status as one of the fastest-growing language groups in Canada (Statistics Canada, 2002) makes it particularly relevant to the field of ESL research.

Given the phonological and orthographic structures of Chinese and Tagalog as compared with those of English, the processes affecting English spelling development in ESL learners from these backgrounds may prove to be different. The potential influence of these two home languages on English spelling development will be assessed by investigating the following research questions:

(1) Are there differences between the three groups (Tagalog, Chinese, and English) in their overall performance on English language, reading, and spelling measures?

(2) Are there differences in the types and/or patterns of spelling errors made by each group?

(3) What factors (such as home literacy experience, oral proficiency, phonological awareness, and reading skills) are associated with spelling performance in the three groups?

2 METHOD

2.1 Participants

The participants in this study were 41 Grade 1 students from eight public elementary schools in Vancouver (see Table 1). Although 53 students were originally recruited and tested, 12 children were removed from the analyses for various reasons: 5 students were excluded based on language background factors; a further 5 had been previously diagnosed with speech-language, hearing, or cognitive impairments; and 2 students were excluded as outliers. Of the remaining sample, 15 students (9 girls, 6 boys) were Cantonese-English bilinguals, and their mean age at the time of testing was 6;10 (range = 6;5–7;3). A further 16 participants (8 girls, 8 boys) were Filipino children who spoke both Tagalog and English, and their mean age at the time of testing was 6;10 (range = 6;5–7;4). The remaining 10 participants (6 girls, 4 boys) were monolingual English-speaking children with a mean age of 6;11 (range = 6;5–7;3).

Table 1 Participant information

Language Group	**Number of Participants**	**Age (Mean, Range)**
Cantonese	15 (9 girls, 6 boys)	6;10 (6;5-7;3)
Tagalog	16 (8 girls, 8 boys)	6;10 (6;5-7;4)
English	10 (6 girls, 4 boys)	6;11 (6;5-7;3)

The bilingual children were included in the study if parent report indicated that either Tagalog or Cantonese was spoken in the home. Many of the children (81% of Cantonese speakers and 100% of Tagalog speakers) also spoke English with their families at times, but in all cases at least two members of the household (typically both parents) were reported to speak to the children in Tagalog or Cantonese. Efforts were made to recruit children who also had some literacy experience in Tagalog or Cantonese; this held true for all of the Chinese bilinguals but not for all of the Tagalog speakers, and thus variations in home language and literacy experience were instead considered in the analyses. For the monolingual English group, children were

included if their first and dominant language was English and they had been no more than minimally exposed to another language. As mentioned, none of the children included in the sample had been previously diagnosed with speech-language, hearing, or cognitive impairments.

2.2 Tasks

2.2.1 Oral proficiency

As previously discussed, the role of oral language skills in literacy development in bilingual children remains poorly understood. In order to examine the possible relationship between oral proficiency and spelling ability, the children's language skills were assessed using two subtests of the Test of Language Development-Primary: Third Edition (TOLD-P:3; Newcomer & Hammill, 1997).

Picture Vocabulary. In this task, the student was shown four pictures and asked to point to the picture corresponding to an orally presented vocabulary word (e.g. Show me 'mirror').

Grammatic Completion. The child was asked to finish a sentence started by the examiner (e.g. A lady likes to drive. Every day she _____). For both subtests, one point was given for each correct item and the percentage of correct responses was calculated. Standard scores were also obtained for analysis.

2.2.2 Phonological awareness

Phonological awareness has consistently been found to be associated with reading and spelling skills in English (e.g. Bradley & Bryant, 1983; Adams, 1990; Stuart & Masterson, 1992; Share & Stanovich, 1995. Two subtests of the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999) were administered to the children to measure these skills. The scores of these two subtests can be combined to obtain a composite phonological awareness score.

Elision. In this phoneme deletion task, children heard a word and were then asked to say the word without its initial consonant (e.g. Say 'ball' without the /b/).

Blending. Children heard words in small parts and were then asked to put the parts together to make a whole word (e.g. What word do these sounds make? Can-dy). The percentage of correct items was calculated for each child; standard scores and composite phonological awareness scores were also obtained.

2.2.3 Word reading

In their study of Grade 2 students, Wade-Woolley and Siegel (1997) found that reading skill had a more significant influence on spelling performance than did first language. In order to control for their results, children were administered the reading subtest of the Wide Range Achievement Test—3 (WRAT-3; Wilkinson, 1993). In this task, they were asked to name 15 upper-case letters, and then to read words such as *red*, *animal*, and *spell*. Both standard scores and percentages of correct responses were obtained for analysis.

2.2.4 Pseudoword reading

In Wade-Woolley and Siegel's (1997) study, pseudoword decoding was found to be a significant predictor of real and pseudoword spelling for both ESL and monolingual English children. To evaluate this finding, the students were asked to read a set of pseudowords from the word attack subtest of the Woodcock Language Proficiency Battery—Revised (WLPB-R; Woodcock, 1995). This list contains words such as *lish* and *snirk*. Testing was continued until the student missed an entire set of 6 items. One point was given for each correct item and the percentage of correct items was calculated, along with standard scores for each child.

2.2.5 Real word spelling

In order to evaluate children's spelling abilities in English and their phonological and orthographic knowledge, children were administered a dictation spelling test of 15 words (see Appendix A). This list was based on Wang and Geva's (2003a) and Bear, Invernizzi, and Johnston's (2004) inventories, with some modifications due to the addition of the Tagalog group and the lower grade level of the participants. The words contained several English orthographic factors that were found by Treiman (1993) to influence the spellings of Grade 1 students, including digraphs (e.g. *sh*ip), consonant clusters (e.g. *pl*ease), and word length (e.g. *happiness*). The words were read once by the examiner, then given in the context of a sentence, and then read again.

Three scoring systems were used for this task. First, the words were scored as either correct or incorrect according to conventional English spelling rules, and the percentage of correctly spelled words was calculated. Next, as in Wang and Geva's (2003a) study, a rating scale was developed based on scoring systems devised by Liberman, Rubin, Duques, and Carlisle (1985), Mann, Tobin, and Wilson (1987), and Morris and Perney (1984) in order to determine each child's developmental spelling level. These scales assign a score to each word based on the number of phonemes represented and the level of orthographic representation. As Wang and Geva (2003a) point out, this type of system has been adapted and used in various studies (e.g. Tangel & Blachman, 1992, 1995) in order to evaluate spelling development. The scale used here closely resembles Morris and Perney's (1984) and Wang and Geva's (2003b) scale. The score for each word ranged from 0 to 5 points, and points were awarded as described in Table 2.

Table 2 Developmental spelling scores

0 points	A random letter string
1 point	Any single consonant or vowel represented
2 points	Initial consonant plus other segments
3 points	Phonetic stage spelling – initial and final consonants plus vowel (letter name or substitution acceptable); one consonant in cluster may be omitted
4 points	Transitional stage spelling – basic orthographic patterns (e.g. CVCe); attempts to mark long vowels; both letters in consonant clusters; errors on digraphs and doubling letters acceptable
5 points	Correct spelling

Interrater reliability for this scoring system was established using Cohen's kappa coefficient to measure agreement between two independent raters for 20% of the words. Reliability was found to be high (Cohen's Kappa = 0.91).

Finally, the children's error patterns were analyzed in order to look for differences across groups in terms of spelling strategies used and orthographic conventions that proved difficult. Bear, Invernizzi, Templeton, and Johnston's (2004) error guide was modified to include other error types that frequently occurred in the spelling samples, resulting in the 12 mutually exclusive error categories shown in Table 3.

Table 3 Spelling error categories

Error Type	Definition	Example
th - Phonological error	Substitution of *f* for *th* (representing /θ/ phoneme)	*teef* for *teeth*
Other consonant substitution	Substitution of one consonant for another (other than *f* for *th*)	*baby* for *bappy* *fip* for *ship*
Digraph error	Wrong letter sequence, missing letter, or phonetic error in digraph	*elefant* for *elephant* *stikc* or *stik* for *stick*
Morphological error	Spelling according to sound rather than morphological rule, or omission of morpheme	*wantid* for *wanted* *dogz* or *dog* for *dogs*
Consonant cluster error	Omission, substitution, or insertion of letters in a consonant cluster	*wated* for *wanted* *fulying* for *flying*
Short vowel error	Substitution of one short vowel for another	*pat* for *pet*
Long vowel error	Incomplete or incorrect representation of long vowel	*ples* for *please* *teath* for *teeth*
Vowel Omission	Missing vowel (each missing vowel counts as one error)	*hm* for *home*
Consonant Omission	Missing consonant (each missing consonant counts as one error)	*shi* for *ship*
Insertion	Adding a letter (each inserted letter counts as one error)	*hokm* for *home*
Other	Any other error not included in the above categories, e.g. sequencing errors, letter reversals, other rule violations, etc.	*wnated* for *wanted* *happyness* for *happiness*
No Response	No response given	

A single word could contain more than one of these error types: for example, *tef* for *teeth* would have a long vowel error (*e* for *ee*) and a *th*-phonological error (*f* for *th*) and would be recorded as having two errors. The numbers of all types of errors in the spelling samples were counted and presented as a raw score for number of errors made. In addition, total numbers for each error type were calculated for every student in order to examine error patterns across groups. Two independent raters scored 20% of the data and interrater reliability was found to be high (Cohen's Kappa = 0.89).

2.2.6 Pseudoword spelling

Lexicality, or the presence of a lexical entry in the 'mental dictionary', was found to affect the spelling accuracy of both ESL and monolingual English speakers in Wade-Woolley and Siegel's (1997) study. In addition, Wang and Geva (2003b) found that Chinese ESL children performed more poorly than English children when spelling pseudowords, in spite of equivalent accuracy with real words, and studies of Chinese adults have found similar patterns in their reading and spelling in English (e.g. Haynes & Carr, 1990; Holm & Dodd, 1996). In order to assess these potential effects of lexicality, twelve pseudowords were dictated to the children (see Appendix B). Following the procedure used by Wang and Geva (2003b), the child was introduced to a doll named Nupi and told that he was from Neptune. The doll wanted the child to try to learn some Neptunese, so he was going to say some Neptunese words and have the child write them down on a piece of paper. One practice item was given.

This list was designed to resemble the real word list in terms of factors such as consonant clusters, digraphs, morphemes, and word length. As in the real word spelling task, three scoring systems were used to evaluate the children's performance on this test. First, each pseudoword was scored as correct if a correct pronunciation could be derived from the spelling, and if the word conformed to English spelling rules. For example, spelling of the word /kægz/ as *kagz* would be considered incorrect because English words ending with the /z/ sound after a consonant (typically plurals or third person singular verbs) are spelled with *s* (e.g. *dogs*, *tugs*). Although it is recognized that pseudowords have no designated spelling, and thus phonetic spellings (such as *kagz* for /kægz/) could also be considered correct, these types of spellings were counted as incorrect in the present study in order to maintain consistency between real words and pseudowords in terms of error types. Correct scores were added and the percentage of correctly

spelled items was calculated. Next, the developmental spelling scoring system was also used with this pseudoword list, and point values between 0 and 5 were assigned to each word. Two raters scored 20% of the data and interrater reliability was found to be high (Cohen's Kappa = 0.90). Finally, errors were counted according to the error category system described above, and high interrater reliability was achieved for this measure as well (Cohen's Kappa = 0.89).

2.2.7 Confrontation pseudoword spelling

In order to examine the children's visual-orthographic memory for written words, as well as their reliance on phonological recoding when faced with novel letter strings, Wang and Geva's (2003b) confrontation pseudoword spelling task was administered. The child was introduced to the Neptunese doll, Nupi, and as in the pseudoword spelling task, the child was told that Nupi wanted him or her to try to learn some Neptunese. In this case, however, the child was told that Nupi would show the child some words in Neptunese and ask the child to write them down on paper. The child was shown a string of letters on an index card for 2 seconds and then asked to write the word down. One practice item was provided, and there were 12 test items in total; six of the words were orthographically legitimate and pronounceable, while the other six were orthographically illegitimate, unpronounceable letter strings (see Appendix C).

Wang and Geva (2003b) designed this list to be controlled for orthographic and phonological complexity (using two consonant digraphs, *sh* and *th*, and one consonant cluster, *st*), as well as for visual similarity between the pronounceable and unpronounceable items (replacing the vowels in the pronounceable words with visually similar consonants in the unpronounceable items). As in Wang and Geva's (2003b) study, it was predicted that children who relied on visual processing in spelling (more specifically, the children who had been exposed to Chinese) would perform equally well with pronounceable and unpronounceable

words, while those who used phonological recoding (hypothesized to be the Tagalog and English-speaking children) would have more difficulty spelling the unpronounceable letter strings. The children's spelling of each word was scored as either correct or incorrect, and the percentage of correctly spelled items was calculated. To allow for comparisons between performance on pronounceable and unpronounceable letter strings, separate percentage correct scores were also calculated for these two groups of items.

2.3 Procedures

Prior to testing, detailed background questionnaires were sent to each child's primary caregiver(s) in order to establish the circumstances and intensity of both home language and English use outside of school, as well as the family's socioeconomic status (see Appendix D). At the end of the spring term of Grade 1 (April – June), each child participated in two 30-minute sessions in which standardized and experimental tasks of phonological awareness, oral proficiency, reading, and spelling were administered in English. The sessions were conducted by a native English speaker (either the author or a trained research assistant), and the two sessions took place on different days. The tests were administered in a fixed order within the sessions (see Table 4), and the order of the two sessions was counterbalanced across the participants.

Table 4 Test types and order

Session 1	**Session 2**
1. Real Word Spelling 2. Pseudoword Spelling 3. TOLD-P:3 – Picture Vocabulary 4. TOLD-P:3 – Grammatic Completion	1. Confrontation Pseudoword Spelling 2. CTOPP: Elision 3. CTOPP: Blending Words 4. WRAT-3 – Reading 5. WLPB-R – Word Attack

3 RESULTS

Because the main focus of this study was to examine group differences in language and literacy skills, the three groups were first compared in terms of their overall performance on these measures. Next, patterns in the children's spelling performance were examined, including the effects of lexicality, presentation modality, and orthographic legitimacy on spelling, as well as the developmental spelling and error scores. Finally, correlations between various skills and background factors and the reading and spelling measures were explored. Raw and/or percentage scores were used instead of standard scores for all comparisons between groups, in order to avoid bias against the bilingual groups due to standardization with monolingual English speakers. However, standard scores were included and discussed in some cases when considered relevant.

3.1 Group comparisons across measures

The means and standard deviations of the children's overall scores on each oral language, phonological awareness, reading, and spelling test are shown in Table 5. For the standardized tests, both raw and standard scores are provided, while percentage scores are provided for the spelling tests.

Table 5 Summary statistics for oral proficiency, phonological awareness, reading, and spelling tasks across groups (means and standard deviations)

Test	Chinese (*n=15*)		Tagalog (*n=16*)		English (*n=10*)	
	Raw	Standard	Raw	Standard	Raw	Standard
TOLD-P:3 Picture Vocabulary	12.73 (3.96)	8.20 (2.40)	15.44 (3.85)	9.81 (2.17)	20.10 (3.73)	12.60 (2.63)
TOLD-P:3 Grammatic Completion	5.93 (6.82)	4.73 (3.75)	11.88 (6.76)	7.56 (3.01)	17.90 (3.04)	9.60 (.843)
CTOPP Elision	6.80 (2.15)	9.80 (1.47)	9.13 (5.62)	11.06 (3.40)	8.30 (3.68)	10.30 (1.89)
CTOPP Blending	8.87 (2.26)	9.93 (1.34)	11.44 (2.94)	11.44 (1.97)	10.50 (2.84)	10.50 (1.35)
WRAT-3 Reading	23.67 (3.33)	106.87 (9.98)	28.75 (4.85)	121.06 (12.79)	26.40 (4.81)	111.80 (12.98)
WLPB-R Word Attack	6.47 (4.31)	107.47 (11.41)	12.00 (6.73)	118.06 (10.80)	7.00 (4.19)	107.10 (8.49)
Real Word Spelling (%)	46.67 (21.97)		57.08 (28.59)		50.67 (23.35)	
Pseudoword Spelling (%)	26.00 (18.44)		41.25 (27.54)		41.00 (20.79)	
Confrontation Pseudoword Spelling (%)	58.33 (22.27)		59.90 (27.08)		55.00 (24.60)	

Note: TOLD-P:3, Test of Language Development–Primary Version 3; CTOPP, Comprehensive Test of Phonological Processing; WRAT-3, Wide Range Achievement Test Version 3; WLPB-R, Woodcock Language Proficiency Battery–Revised. Standard deviations are in parentheses.

A series of analyses of variance (ANOVAs) and multivariate analyses of variance (MANOVAs) were conducted on the measures listed in Table 5, with language group as the independent variable. The results of the ANOVAs and those of post-hoc testing are discussed in greater detail below for each skill area tested. Although statistically significant results are highlighted, it is recognized that the small sample size may have affected these calculations; for this reason, trends and patterns in the data are emphasized over statistical significance in the discussion. Separate ANOVAs were also carried out with gender as the independent variable, but the results did not reveal any relevant gender-related differences, and therefore this was not included as a between-subjects variable in subsequent analyses.

3.1.1 Oral proficiency

Significant differences were found between language groups on both measures of oral proficiency: Picture Vocabulary, F (2, 38) = 10.95, $p < .001$, and Grammatic Completion, F (2, 38) = 11.67, $p < .001$. Post-hoc Tukey's honestly significant difference (HSD) tests showed that for the Picture Vocabulary test, the English monolingual group performed significantly better than both the Chinese and Tagalog bilingual groups. On the Grammatic Completion test, the English group again outperformed both the Chinese and Tagalog groups, and the Tagalog group also scored significantly higher than the Chinese group. In terms of standard scores, the two bilingual groups fell within the normal range of 8 to 12 on the Picture Vocabulary test, while the English group scored slightly above average. On the Grammatic Completion test, the English group scored within the average range, while both bilingual groups' scores fell more than one standard deviation below the mean.

3.1.2 Phonological awareness

The groups did not differ in their performance on the Elision task, but group differences were evident in the Blending scores, F (2, 38) = 3.60, $p < .05$. Post-hoc Tukey's HSD tests revealed that the Tagalog group obtained significantly higher percentage scores on the Blending task than the Chinese group, while the English group's scores did not differ significantly from either the Tagalog or the Chinese groups. The standard scores showed that all three groups' performance fell within the average range of 8 to 12.

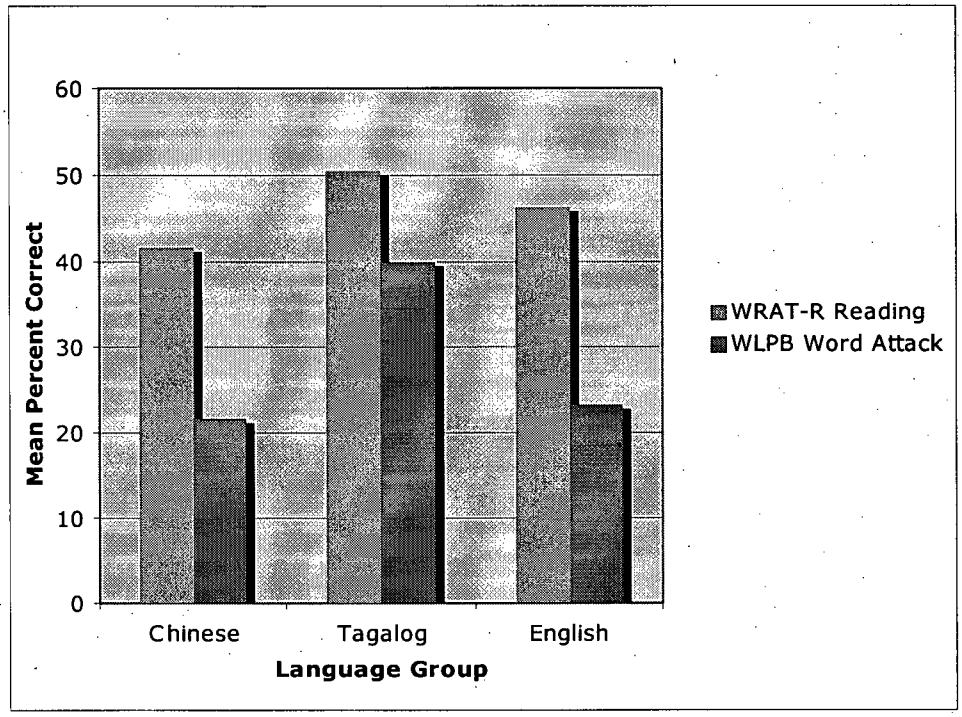
3.1.3 Reading

A main effect of language group was found on the WRAT-R Reading subtest, F (2, 38) = 5.31, $p < .01$. Post-hoc Tukey's HSD tests showed significant differences between the Tagalog and Chinese groups; the English group's scores did not differ significantly from those of the two

bilingual groups. Significant differences were also found between groups on the WLPB-R Word Attack test, F (2, 38) = 4.81, $p < .05$. Post-hoc Tukey's HSD tests showed that the Tagalog group again outperformed the Chinese group, while the English group did not significantly differ from the others. The standard scores on the WRAT-R Reading test showed that the Tagalog group performed in the above-average range, while the Chinese and English groups demonstrated high average performance. Similar patterns were found in the children's results on the Word Attack test, with the English group also scoring slightly above average on this task.

As previously discussed, studies with Chinese ESL-learning adults have found evidence of a lexicality effect in reading, in that Chinese speakers tend to have relatively greater difficulty with pseudowords than with real words when compared to native English speakers (e.g. Haynes & Carr, 1990; Holm & Dodd, 1996). In order to investigate these findings in school-aged bilingual population, a repeated measures ANOVA was conducted with language group as the between-subjects variable and lexicality (real vs. pseudowords) as the within-subjects variable. A main effect of lexicality was found [F (1, 38) = 85.044, $p < .001$], indicating that all children found it easier to read real words than pseudowords (see Figure 1). There was also a main effect of language group [F (2, 38) = 5.089, p < .05], as well as a significant interaction between language group and lexicality [F (2, 38) = 4.030 $p < .05$]. Post-hoc testing showed that the Tagalog children outperformed the Chinese participants on real-word reading, while scoring higher than both the Chinese and English groups on pseudoword reading.

Figure 1 The effect of lexicality on reading performance across groups



3.1.4 Spelling

No significant differences were found between groups in terms of real word spelling [F (2, 38) = .678, $p > .5$], pseudoword spelling [F (2, 38) = 2.07, $p > .05$], or confrontation pseudoword spelling [F (2, 38) = .121, $p > .05$] scores. However, further analysis of the scores and error patterns across groups on the three spelling tests was conducted and the results are discussed in the following section.

3.2 Patterns and types of errors on spelling measures

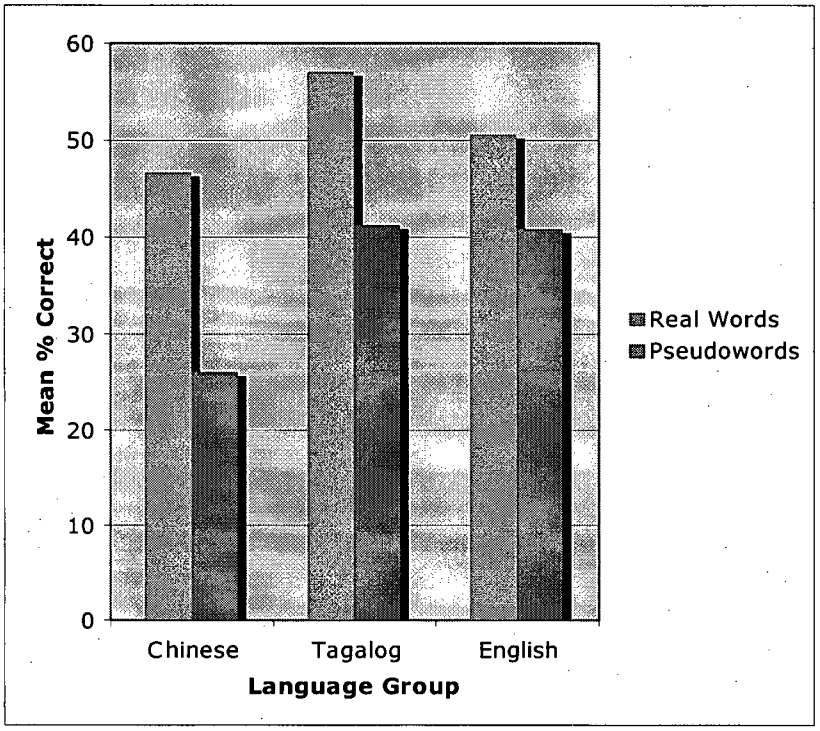
In order to explore potential patterns in the children's spelling performance, several additional analyses were conducted. Differences in spelling accuracy on the real and pseudoword spelling tests were examined to look for possible effects of lexicality, and the effect of modality of presentation of pseudowords was evaluated by comparing performance on the dictation and confrontation pseudoword spelling tasks. In addition, the groups' scores on

orthographically legitimate and illegitimate items on the confrontation pseudoword spelling test were compared to examine the effects of orthographic legitimacy. Finally, the groups' developmental spelling scores and frequencies of error types were also compared.

3.2.1 Lexicality and spelling performance

Wang and Geva (2003b) found that unknown pseudowords were more difficult for children to spell than familiar real words, and that Chinese children performed significantly more poorly than English children when spelling pseudowords. In order to examine this potential lexicality effect, a repeated measures ANOVA was conducted with language group as the between-subjects variable and lexicality (real vs. pseudowords) as the within-subjects variable. A main effect of lexicality was found [F (1, 38) = 21.841, $p < .001$], indicating that all of the children were better able to spell real words than pseudowords (see Figure 2). However, the effect of language group was not significant (F (2, 38) = 1.417, $p > .05$), nor was the interaction between language group and lexicality (F (2, 38) = .855, $p > .05$), suggesting that bilingual and native speakers benefited to the same extent by the presence of lexical entries when performing spelling tasks. This pattern differs somewhat from that found in reading performance: as previously discussed, the Tagalog-speaking children were not as disadvantaged on the pseudoword reading task as the other groups, while in spelling all three groups struggled with pseudowords. However, a potential trend in the same direction is apparent in Figure 2; although the interaction was non-significant, it appears from the graph that that Chinese group had relatively more difficulty with pseudowords compared to real words than the other two groups.

Figure 2 The effect of lexicality on spelling performance across groups

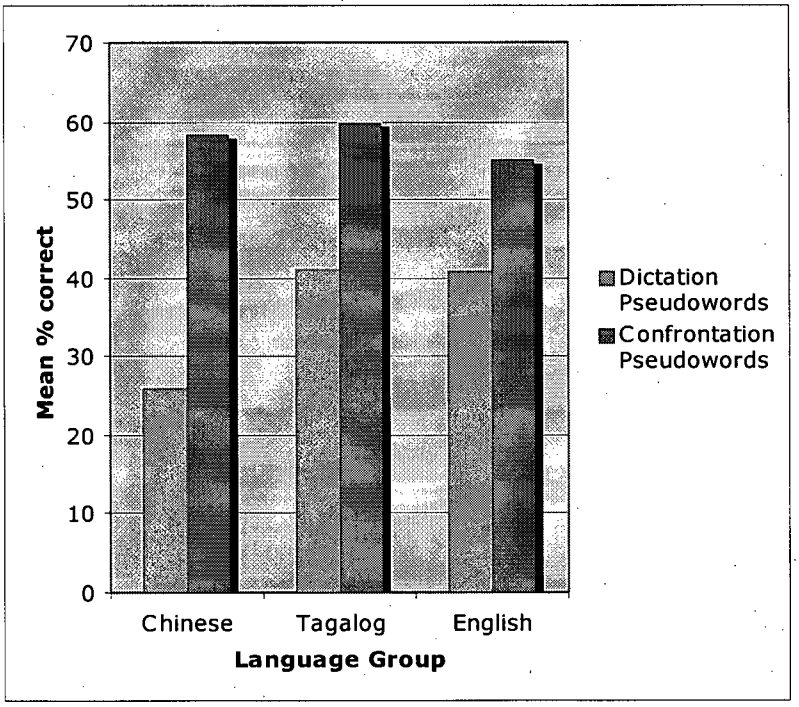


3.2.2 Presentation modality and spelling performance

In Wang and Geva's (2003b) study, six of the items in the confrontation spelling task were also used in the dictation pseudoword spelling task, allowing the authors to examine the effect of presentation modality (visual vs. auditory) on the children's ability to spell these items. Their results showed that the Chinese ESL children benefited more than the English children from visual presentation of the pseudowords. Although the items used in these two tasks in the present study were not identical, a similar analysis was carried out in order to look for evidence of visual strategy use in the Chinese group. A repeated measures ANOVA was conducted with language group as the between-subjects variable and presentation modality (visual vs. auditory) as the within-subjects variable. A main effect of presentation modality was found [F (1, 38) = 30.336, $p < .001$], indicating that all of the children had more difficulty with the dictation pseudoword spelling task. No significant effect of language group was found, and the

interaction between language group and presentation modality was also non-significant. However, it appears in Figure 3 that the Chinese group may have been slightly more disadvantaged by auditory presentation than the other two groups; further research is needed to investigate this potential trend, as it may provide further support for Wang and Geva's (2003b) findings.

Figure 3 The effect of presentation modality on spelling performance across groups



3.2.3 Orthographic legitimacy and spelling performance

In Wang and Geva's (2003b) study, Chinese children were found to perform better than English children when spelling both orthographically legitimate, pronounceable items and orthographically illegitimate, unpronounceable letter strings. In addition, the difference between accuracy scores in spelling legitimate and illegitimate items was much greater in the English group than in the ESL group. In order to evaluate these findings, the groups' scores on

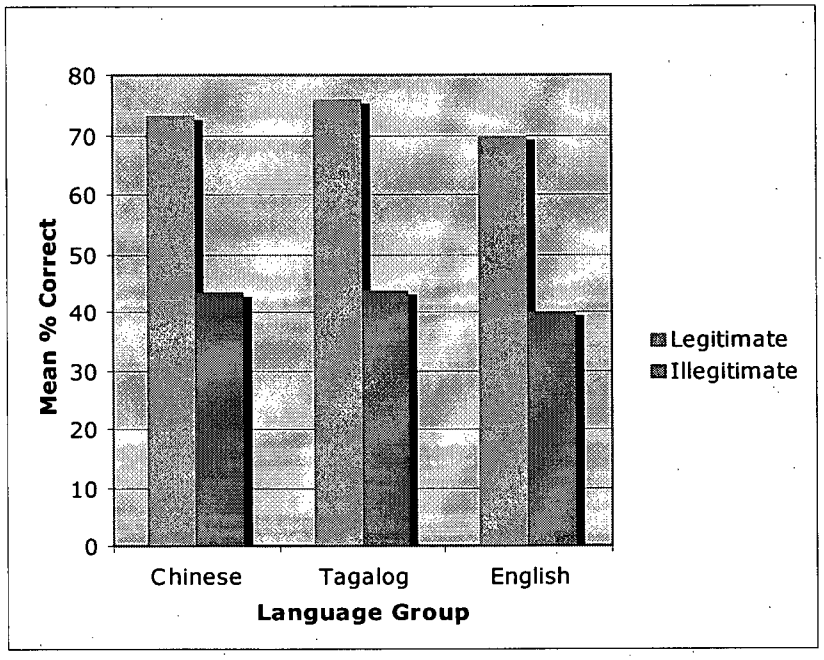
legitimate and illegitimate items in the confrontation pseudoword spelling task were compared (see Table 6 for means and standard deviations).

Table 6 The effect of orthographic legitimacy on spelling in the three groups (means and standard deviations)

	Chinese (*n* = *15*)	Tagalog (*n* = *16*)	English (*n* = *10*)
Legitimate (%)	73.33 (25.04)	76.04 (31.60)	70.00 (26.99)
Illegitimate (%)	43.33 (25.82)	43.75 (26.44)	40.00 (27.44)

A repeated measures ANOVA was conducted with language group as the between-subjects variable and orthographic legitimacy as the within-subjects variable (legitimate vs. illegitimate). The results showed a main effect of orthographic legitimacy (F (1, 38) = 69.712, p < .001). Overall, participants performed better when spelling legitimate pseudowords than illegitimate items. However, contrary to Wang and Geva's (2003b) findings, significant effects were not found with respect to language group (F (2, 38) = .121, p > .5) or the interaction between language group and orthographic legitimacy (F (2, 38) = .048, p > .5) (see also Figure 4).

Figure 4 The effect of orthographic legitimacy on spelling performance across groups



3.2.4 Developmental spelling scores

As described previously, a developmental scoring system was used to further analyze the children's spelling performance on the real and pseudoword spelling tests. Table 7 summarizes the means and standard deviations for each group using this scoring system.

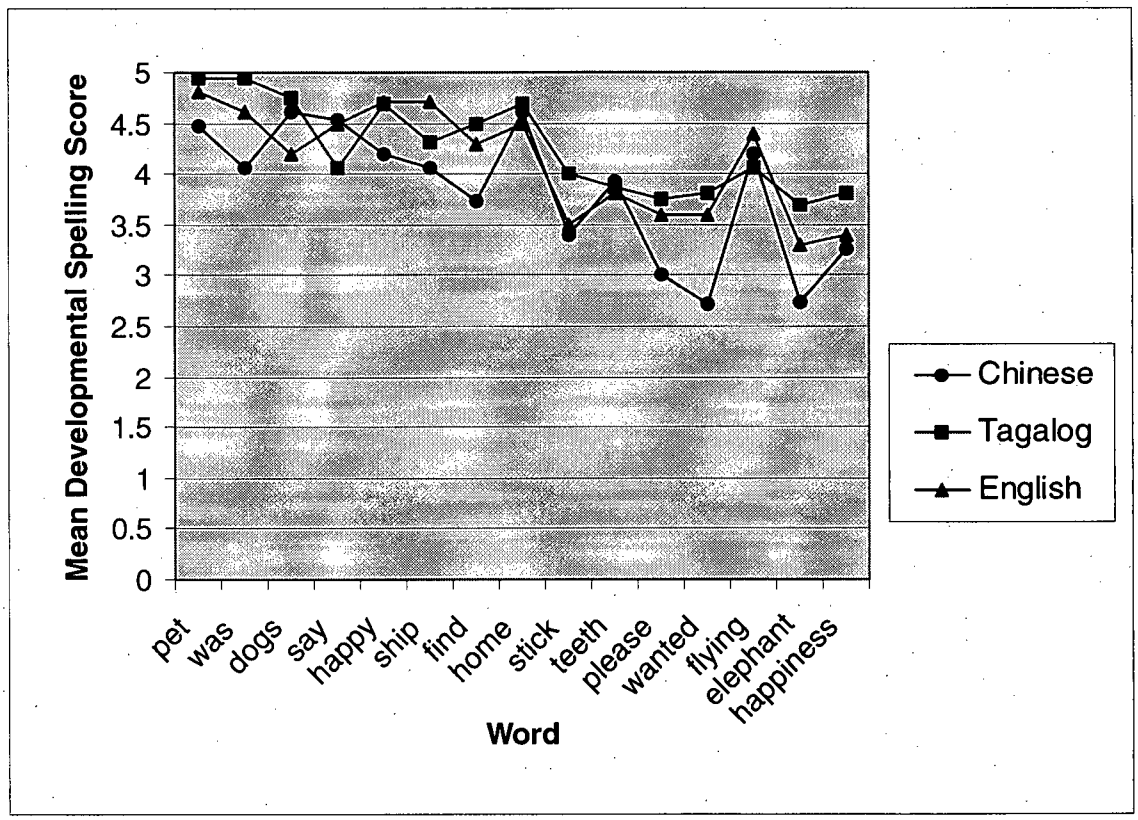
Table 7 Developmental scores for real and pseudoword spelling across groups (means and standard deviations)

	Chinese (*n = 15*)	Tagalog (*n = 16*)	English (*n = 10*)
Real Word Spelling – Developmental Score (%)	76.44 (17.74)	85.17 (13.31)	82.53 (11.37)
Pseudoword Spelling – Developmental Score (%)	66.80 (15.60)	75.25 (17.33)	78.20 (9.26)

As with the absolute scores for each spelling test, separate one-way ANOVAs were conducted using the developmental scores and no significant differences were found between groups for either real words (F (2, 38) = 1.40, $p > .05$) or pseudowords (F (2, 38) = 2.03, $p >$

.05). However, the Chinese students tended to obtain lower scores than both of the other groups on these two tests. In order to look for further differences, the children's performance on each word was also examined, and Figure 5 summarizes the three groups' developmental scores on the 15 real words tested.

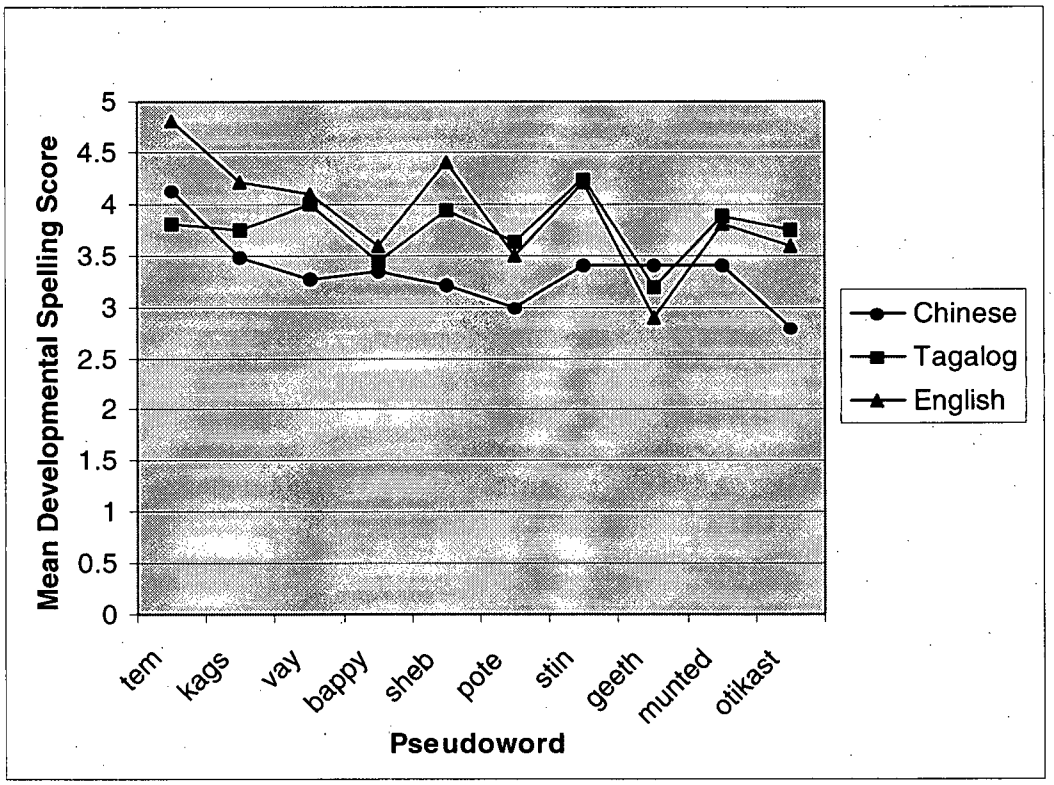
Figure 5 Developmental spelling scores for each word in the real word spelling task



From this graph it is evident that all of the children had more difficulty with longer words. However, there are also some differences across groups: the Tagalog group and the English group performed similarly on most words, obtaining scores above 4 points on most single-syllable words and above 3.5 points on longer items. The Chinese group, on the other hand, showed particular difficulty relative to the other two groups with longer words such as *wanted*, *elephant*, and *please*, scoring below 3 points on these items.

This process was repeated for the words used in the pseudoword spelling task; see Figure 6 for a summary of the three groups' performance on each pseudoword.

Figure 6 Developmental spelling scores for each word in the pseudoword spelling task



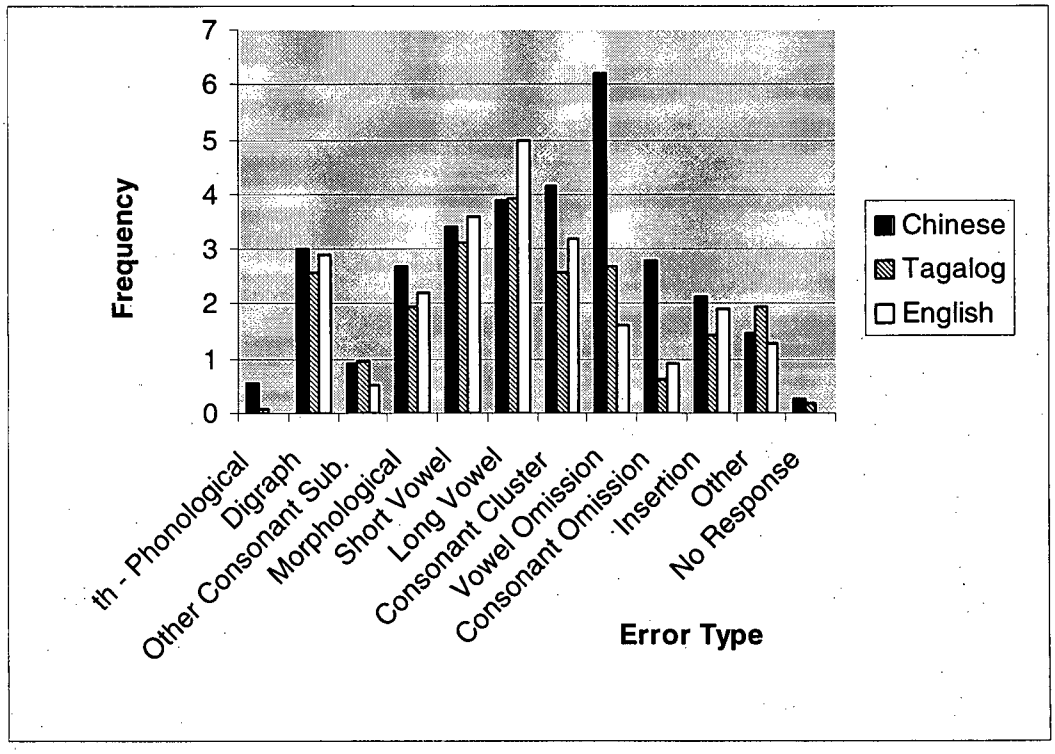
This graph shows similar group trends in pseudoword spelling as in the real word task: the Tagalog-speaking children scored similarly to the English group on most pseudowords, while the Chinese group generally scored lower than both of the other groups. In particular, the Chinese-speaking children exhibited difficulty with single-syllable items such as *sheb* and *stin*, as well as polysyllabic items such as *otikast*.

3.2.5 Error analysis

In order to further examine group differences in spelling performance, a third type of analysis was conducted for the real and pseudowords spelled. As described previously, the

children's errors on each word were classified into 12 mutually exclusive categories. The frequency of one error type, morphological errors, was considered likely to differ between the real and pseudoword tests, since the children may not necessarily have interpreted the *–ed* and *–s* endings in the pseudowords *kags* and *munted* as constituting inflections. To evaluate this possibility, a repeated measures ANOVA was conducted for the frequency of morphological errors on these two inflections (*–ed* and *–s*), with language group as the between-subjects variable and test type (real vs. pseudowords) as the within-subjects factor. No significant main effects of test type or language group were found, nor was the interaction between test type and language group significant, suggesting that children in all three groups were equally likely to make morphological errors on real and pseudowords. Since the other error types were also considered equally likely to occur on either task, the total frequency of errors on the two tests combined was calculated for each group (see Figure 7).

Figure 7 Total spelling errors for each group (real and pseudoword tests combined)



Separate one-way ANOVAs were conducted for each error type, and a significant difference was found for *th*-phonological errors (i.e. substituting *f* for *th*), $F(2, 38) = 5.16$, $p = .01$. Post-hoc Tukey's HSD tests revealed that the Chinese group made significantly more phonological errors on the /θ/ sound than both the Tagalog group and the English group. Other patterns in the error types across groups, although not statistically significant, are worth noting: Chinese children frequently omitted letters, and all participants had particular difficulty with vowels (both short and long), consonant clusters, digraphs, and inflections.

3.3 Correlations with reading and spelling performance

In order to explore possible associations between literacy abilities and other skills and background variables, Pearson correlation coefficients were calculated separately for each group.[1] Developmental scores for the real and pseudoword spelling tests were used for the correlations, as well as the raw scores for orthographically legitimate and illegitimate items on the confrontation pseudoword spelling test, as these were considered more sensitive than the overall accuracy scores in measuring spelling performance. The results for each subset of factors are discussed below.

3.3.1 Oral proficiency

The relationships between the two oral proficiency measures (Picture Vocabulary and

[1] Because of the large number of correlation analyses conducted, the Bonferroni correction was applied in order to control for Type I error (Aron & Aron, 2003). However, with a resultant p-value of less than .001, virtually none of the correlations remained significant, suggesting that the correction may have increased the potential for Type II error. For this reason, correlations significant at the original levels of .05 and .01 are highlighted in the tables. However, due to the small sample size, it was felt that the magnitude of the correlations was more relevant than their statistical significance, and moderate to high correlations are therefore emphasized over significance in the discussion of the results.

Grammatic Completion) and performance on the three spelling measures is summarized for each group in Table 8. No relevant correlations were found in any of the groups: no strong correlations were found for the Chinese-speaking children, while the only significant correlation in Tagalog and English groups was between Grammatic Completion and pseudoword spelling.

Table 8 Correlations between oral proficiency and spelling performance by group

Measure	Real Words Developmental Score	Pseudowords Developmental Score	Confrontation Spelling Legitimate Items	Confrontation Spelling Illegitimate Items
		Chinese (*n = 15*)		
Picture Vocabulary	.296	.228	.344	-.182
Grammatic Completion	.406	.166	.086	.146
		Tagalog (*n = 16*)		
Picture Vocabulary	.468	.491	.247	.247
Grammatic Completion	.380	.601*	.214	.312
		English (*n = 10*)		
Picture Vocabulary	.014	.263	.125	-.080
Grammatic Completion	.570	.641*	.389	.009

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

As previously discussed, several studies with monolingual and bilingual populations have also explored the relationship between oral proficiency and other literacy-related measures, including phonological awareness and reading skills (e.g. Manis, Lindsey, & Bailey, 2004; Snow et al., 1998). In order to explore these possible associations, correlations were calculated between these scores in the three groups (see Table 9). Both oral proficiency measures were moderately correlated with Elision scores in the Tagalog group, while performance on the receptive vocabulary test was significantly correlated with both reading tasks. By contrast, only one moderate correlation was found in the Chinese group (between Picture Vocabulary and Elision), and no relationships were found in the English group.

Table 9 Correlations between oral proficiency, phonological awareness, and reading

Measure	Elision	Blending	WRAT-3 Reading	WLPB-R Word Attack
		Chinese (*n* = *15*)		
Picture Vocabulary	.625*	.467	.307	.171
Grammatic Completion	.048	.263	.144	-.004
		Tagalog (*n* = *16*)		
Picture Vocabulary	.639**	.435	.546*	.541*
Grammatic Completion	.637**	.254	.357	.327
		English (*n* = *10*)		
Picture Vocabulary	.168	.121	.152	-.206
Grammatic Completion	.490	.406	.627	.323

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.3.2 Phonological awareness

Table 10 provides a summary of the correlations between phonological awareness measures and spelling performance. From these results it appears that phonological awareness is correlated with some aspects of spelling in all groups. However, some group differences are also apparent: for the Chinese group, phonological awareness skills are moderately correlated with only pseudoword spelling and the legitimate items on the confrontation pseudoword spelling test, while these skills are correlated with all spelling measures in the Tagalog and English groups.

Table 10 Correlations between phonological awareness and spelling measures by group

Measure	Real Words Developmental Score	Pseudowords Developmental Score	Confrontation Spelling Legitimate Items	Confrontation Spelling Illegitimate Items
		Chinese (*n* = *15*)		
Elision	.506	.569*	.647**	.039
Blending	.409	.371	.731**	.249
		Tagalog (*n* = *16*)		
Elision	.518*	.505*	.600*	.566*
Blending	.605*	.650**	.574*	.323
		English (*n* = *10*)		
Elision	.786**	.480	.510	.674*
Blending	.402	.698*	.798**	.166

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Phonological awareness has consistently been shown to be associated with reading ability in both monolingual (e.g. Bradley & Bryant, 1983; Share & Stanovich, 1995) and bilingual (e.g. Chiappe, Siegel, & Gottardo, 2002; Lesaux & Siegel, 2003) populations. As shown in Table 11, this finding was replicated in the present study: across all three groups, at least one of the two phonological awareness scores was moderately to highly correlated with both real and pseudoword reading measures.

Table 11 Correlations between phonological awareness and reading measures by group

Measure	WRAT-3 Reading	WLPB-R Word Attack
	Chinese (*n* = *15*)	
Elision	.570*	.722**
Blending	.287	.234
	Tagalog (*n* = *16*)	
Elision	.703**	.625**
Blending	.545*	.616*
	English (*n* = *10*)	
Elision	.795**	.734*
Blending	.236	.290

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Because some of the errors examined in the spelling analyses may have been related to children's phonological skills, correlations between phonological awareness and spelling error types were also examined (see Table 12). Across all three groups, phonological awareness scores were negatively correlated with letter omissions, as well as with overall error frequencies. In the Tagalog and English groups, phonological awareness was also negatively correlated with consonant cluster and insertion errors.

Table 12 Correlations between phonological awareness and spelling error types

Measure	Elision	Blending
	Chinese (*n =15)*	
Total Errors	-.562*	-.423
th - Phonological	-.376	-.167
Digraph	-.458	-.403
Other Consonant Substitution	-.509	-.361
Morphological	-.446	-.442
Short Vowel	.003	.420
Long Vowel	.384	.262
Consonant Cluster	-.313	-.117
Vowel Omission	-.601*	-.561*
Consonant Omission	-.197	-.087
Insertion	.009	-.300
Other	-.020	-.034
No Response	-.133	-.018
	Tagalog (*n =16)*	
Total Errors	-.571*	-.633**
th - Phonological	-.148	-.402
Digraph	-.101	-.189
Other Consonant Substitution	-.090	-.311
Morphological	-.405	-.523*
Short Vowel	-.200	.002
Long Vowel	-.359	-.196
Consonant Cluster	-.618*	-.523*
Vowel Omission	-.449	-.604*
Consonant Omission	-.248	-.462
Insertion	-.582*	-.389
Other	-.450	-.632**
No Response	-.217	-.018
	English (*n =10)*	
Total Errors	-.729*	-.471
th - Phonological	N/A	N/A
Digraph	-.700*	-.308
Other Consonant Substitution	.029	-.334
Morphological	-.604	-.255
Short Vowel	-.506	-.144
Long Vowel	-.464	-.228
Consonant Cluster	-.722*	-.530
Vowel Omission	-.380	-.734*
Consonant Omission	-.456	-.329
Insertion	-.647*	-.681*
Other	-.268	.190
No Response	N/A	N/A

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.3.3 Reading

The relationships between real and pseudoword reading and the various spelling measures are summarized in Table 13. As expected, there were strong associations between reading and spelling measures across all three groups; in the Tagalog group, these associations also extended to the confrontation pseudoword spelling test.

Table 13 Correlations between reading and spelling performance by group

Measure	Real Words Developmental Score	Pseudowords Developmental Score	Confrontation Spelling Legitimate Items	Confrontation Spelling Illegitimate Items
		Chinese (*n* = *15*)		
WRAT-3	.675**	.759**	.557*	.194
Word Attack	.560*	.708**	.444	.051
		Tagalog (*n* = *16*)		
WRAT-3	.774**	.602*	.727**	.585*
Word Attack	.789**	.603*	.752**	.593*
		English (*n* = *10*)		
WRAT-3	.930**	.661*	.516	.384
Word Attack	.849**	.567	.442	.306

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

3.3.4 Background factors

Information from the background questionnaires completed by each child's parents or guardians was also considered in the analysis. Several of the factors examined are those that have been found to be relevant to literacy acquisition in several studies, including mother's level of education, number of books in the home, and frequency of reading at home (Payne, Whitehurst, & Angell, 1994; Snow et al., 1998). In addition, factors specifically relevant to the bilingual children's language and literacy experiences were also included, such as age of acquisition of English, length of residence in Canada, language dominance, parents' degree of

satisfaction with the child's language skills in both languages, and frequency of reading in the home language. Table 14 shows the group means for each of these variables.

Table 14 Mean values for background variables by group

Variable	Chinese (*n = 15*)	Tagalog (*n = 16*)	English (*n = 10*)
Mother's Education (avg. level completed)	Secondary	Post-secondary	Some post-secondary
Age of Acquisition of English (years)	3.80 (1.15)	1.58 (1.10)	--
Length of Residence (years)	6.17 (1.75)	5.05 (2.77)	--
Dominant Language[a]	.73 (.594)	1.56 (.629)	--
Parents' Satisfaction with child's English skills[b]	3.36 (1.22)	2.38 (1.66)	--
Parents' Satisfaction with child's home language skills[b]	3.36 (1.15)	4.29 (.726)	--
# of English books in the home	10 to 25	10 to 25	More than 25
# of home language books in the home	1 to 10	None	--
Frequency of reading in English	1 to 2 days a week	Almost everyday	Almost everyday
Frequency of reading in the home language	1 to 2 times a month	Never	--

Note: For all ordinal variables (mother's education, number of books in the home, frequency of reading in English and the home language), the information provided reflects the group average. For scale variables (age of acquisition, length of residence, parents' satisfaction with English and home language skills, language dominance), group means are listed along with standard deviations in parentheses.

[a] For the language dominance variable, 0 = dominant in home language; 1 = equivalent in English and home language; 2 = dominant in English.

[b] For the satisfaction variables, parents were asked to rate their satisfaction with their child's skills in each language on a scale from 0 (not satisfied at all) to 5 (very satisfied).

Correlations between these factors and the children's spelling performance are summarized in Table 15. These analyses revealed very few associations between background variables and performance on the spelling tests. No significant correlations were found in the English group, but the correlations between mother's education level and most of the spelling measures were found to approach the moderate degree in this group. For the Tagalog children,

parents' degree of satisfaction with their child's English skills was associated with performance on all spelling tests. Correlations between these background variables and reading performance were also calculated, but no relevant associations were found.

Table 15 Correlations between background factors and spelling performance by group

Measure	Real Words Developmental Score	Pseudowords Developmental Score	Confrontation Spelling Legitimate Items	Confrontation Spelling Illegitimate Items
		Chinese (n = *15*)		
Mother's Education	.186	.246	-.007	-.256
Age of Acquisition	.445	.521*	.174	.434
Length of Residence	-.285	-.287	.172	-.213
Dominant Language	.048	-.099	.128	.109
Satis. with English	.016	-.117	-.049	-.021
Satis. with Chinese	-.361	-.202	-.372	-.142
# English books	-.220	-.307	-.120	-.286
# Chinese books	-.100	.004	-.188	-.020
Freq. Eng. Reading	-.425	-.457	-.234	-.636*
Freq. Chin. Reading	-.136	-.163	-.231	-.299
		Tagalog (n = *16*)		
Mother's Education	.203	.076	.040	.223
Age of Acquisition	.295	.359	.339	.481
Length of Residence	.271	.151	.264	.149
Dominant Language	.044	.102	.052	-.042
Satis. with English	.720**	.587*	.548*	.528
Satis. with Tagalog	-.058	.089	-.088	-.284
# of English books	-.089	-.037	-.059	-.044
# of Tagalog books	-.034	-.366	.090	.092
Freq. Eng. Reading	-.249	-.260	-.107	.109
Freq. Tag. Reading	-.112	-.581*	.002	-.012
		English (n = *10*)		
Mother's Education	.185	.431	.395	.430
# English books	.037	.311	.043	-.128
Freq. Eng. Reading	-.457	.008	.043	-.341

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4 DISCUSSION

4.1 Summary of findings

The results of this study suggest that there are important differences in how children from different language backgrounds approach spelling and reading in English, as well as some similarities across groups. The findings that are of particular interest pertain to comparisons between monolingual and bilingual children on overall language and literacy measures, differences between the two bilingual groups on these tasks, and patterns of spelling performance in the three groups.

4.1.1 Bilingual vs. monolingual children: Overall language and literacy performance

On measures of oral proficiency in English, both groups of bilingual children performed more poorly than the monolingual participants. On the vocabulary comprehension task, the bilingual groups' standard scores fell within the normal range, but the grammar task revealed weaknesses in their language production skills relative to the normative sample of monolingual children. However, despite their limited English proficiency, both groups were able to meet the levels of monolingual children on literacy-related measures such as phonological awareness, reading, and spelling. In fact, their standard scores for both reading tasks placed them in the high average to above average range when compared to the standardization sample. Consistent with these patterns of performance, the correlation analysis showed relatively weak associations between oral proficiency and literacy skills in all three groups. These results support previous research showing that oral language proficiency is not a strong predictor of literacy ability in bilingual populations (e.g. Durgunoglu et al., 1993; Geva & Siegel, 2000; Wade-Woolley & Siegel, 1997). On the other hand, phonological awareness abilities were moderately to highly correlated with reading in all three groups, as well as with some or all of the spelling measures.

This finding is consistent with claims made in other studies about the similar patterns and predictors of literacy development in both monolingual and bilingual speakers of English (e.g. Chiappe, Siegel, & Gottardo, 2002; Lesaux & Siegel, 2003). Moreover, previous studies have reported a facilitating effect of bilingualism on phonological awareness (e.g. Bruck & Genesee, 1995; Campbell & Sais, 1995); although the bilingual children in this study did not significantly outperform the monolinguals on these tasks, their superior performance on these measures relative to their oral language abilities may be similarly suggestive of a bilingual advantage in phonological awareness and literacy development.

4.1.2 Tagalog vs. Chinese children: Overall language and literacy performance

Although the bilingual children performed similarly to the monolinguals on most measures, significant differences were found between the two bilingual groups: the Tagalog-speaking children consistently outperformed the Chinese bilinguals on all phonological awareness and reading tasks. This pattern is similar to those found in previous studies comparing bilingual and ESL learners from alphabetic and nonalphabetic language backgrounds; for example, Bialystok et al. (1997) found that Spanish-English bilinguals scored higher than Chinese-English bilinguals on a phoneme segmentation task, while Wang et al.'s (2003) Korean ESL-learning participants outperformed Chinese ESL learners on phoneme deletion and reading measures. Similar to the explanations proposed by these authors, one possible interpretation of these results is that the bilingual advantage is more language-specific than language-general; in other words, perhaps there is something about Tagalog itself, as compared with Chinese, that facilitates bilingual speakers' literacy acquisition in English. As previously discussed, Tagalog is an orthographically shallow language with a one-to-one relationship between phonemes and graphemes. If learners of shallow languages tend to show advantages in phonological skills

relative to learners of deep languages (e.g. Cossu et al., 1988), the Tagalog group's strong phonological awareness skills may thus reflect transfer of these skills across languages. By contrast, the Chinese writing system corresponds to the syllabic rather than phonemic level, and the importance of phonological processing skills for Chinese literacy development remains in debate (e.g. Ho & Bryant, 1997; Perfetti et al., 2005; Perfetti & Zhang, 1995). It is possible, then, that the Chinese children's relative deficiencies in phonological awareness and reading reflect negative transfer from their home language.

Support for this hypothesis of language-specific transfer effects comes from the results of the correlation analyses. The Chinese bilinguals showed the fewest associations between phonological awareness and spelling. For this group, performance on the Elision and Blending tasks was moderately associated with accuracy on the pseudoword spelling task and the pronounceable items in confrontation spelling, whereas the Tagalog group also showed strong correlations with real word spelling and unpronounceable items. These results are consistent with the interpretation that the Chinese group relied on processing skills other than phonological awareness when spelling real words and unpronounceable letter strings, since these tasks can be carried out using visual rather than phonological strategies. By contrast, the robust correlations between phonological awareness and all of the spelling scores in the Tagalog group (and in the English group) may be reflective of these children's reliance on their strong phonological processing skills. Similarly, the Tagalog children showed associations between all reading and spelling measures, whereas the correlations with reading in the Chinese group did not extend to the confrontation pseudoword spelling scores, and were particularly low for the unpronounceable items in this task. The strong correlations in the Tagalog group suggest that these children made use of similar skills in all of the reading and spelling tasks, while the Chinese group seemed to

approach the confrontation spelling task differently. Further research is required to investigate these possible differences in processing profiles across language groups; for example, a similar study examining visual-processing skills and their relationship with literacy performance may provide additional evidence of the language-specific transfer of processing skills suggested by other researchers (e.g. Holm & Dodd, 1996; Wade-Woolley, 1999; Wang et al., 2003).

Another possible explanation for the Tagalog-speaking children's advantages in phonological awareness and reading could be related to differences in language and literacy experiences across groups. For example, as shown in Table 13, the Tagalog speakers tended to be more dominant in English than the Chinese speakers, and their average age of acquisition was lower. Their mothers' average level of education was also higher, and previous studies have found this variable to be associated with children's language and literacy development (e.g. Catts, Fey, Zhang, & Tomblin, 2001; Dollaghan, Campbell, Paradise, Feldman, Janosky, Pitcairn, & Kurs-Lasky, 1999). However, the fact that the Tagalog speakers performed more poorly than the monolingual children on the expressive language task suggests that experience with English is not the only relevant factor to consider. In addition, these background variables were not found to correlate with the children's reading and writing performance. This suggests either that background variables are insufficient to account for differences in performance between the bilingual groups, or that the measures used were not sensitive enough to reveal the effects of the children's home environments. With respect to mother's education level, it may also be the case that this variable was not associated with literacy performance in these particular immigrant populations in the same way as in monolinguals. For native English speakers, mother's education is often used as an index of the family's socioeconomic status, a factor that relates to parents' language use and their emphasis on literacy activities in the home (e.g. Hart &

Risley, 1992; Raz & Bryant, 1990). However, given the myriad motivations for immigrating to another country, as well as the fact that educational qualifications in one's home country may not be recognized in a new country of residence, it is possible that a mother's education level may not reflect the home language and literacy environment to the same extent in this population. Further studies should examine this variable in more detail in order to evaluate its validity with respect to immigrant groups; another measure of socioeconomic status or the home environment may prove to be more informative.

4.1.3 Spelling patterns across groups

Although the results showed group differences on the phonological awareness and reading tasks, no differences related to language group were found on the overall spelling measures. This pattern is consistent with Wade-Woolley and Siegel's (1997) study, in which the authors found that ESL and native English-speaking children performed equally well on spelling tasks despite differences in phonological awareness skills. However, closer examination of the patterns in spelling performance proved more informative about the approaches used by each group. For example, the error analysis revealed that the Chinese-speaking children made significantly more spelling errors on the /θ/ sound than both of the other groups. This is not unexpected given that this sound does not exist in Chinese; Wang and Geva's (2003a) Chinese-speaking participants had similar difficulty spelling the phoneme /θ/ in Grade 1, and their interpretation of this finding as reflecting negative transfer from the home language is supported here. Although the differences between groups in terms of error types were not significant, it is also evident from these analyses that the Chinese children tended to omit consonants and vowels, a pattern which may be suggestive of a less phonologically-based approach to spelling (i.e. difficulty sounding words out and assigning one letter per sound). The results of the correlation

analysis are consistent with this interpretation, as lower phonological awareness scores were associated with more frequent vowel omissions in all groups.

The word-by-word analyses also showed differences across groups. In the real word spelling task, the Chinese children exhibited difficulty relative to the other groups on longer words such as *wanted*, *please*, and *elephant*. For the word *wanted*, the Chinese children obtained an average score of 2.71; recall that a score of 2 was assigned to spellings consisting of the first letter plus other sounds (e.g. *wot*, *want*, *wtd*), while a spelling had to represent all of the salient sounds in a word in order to receive a score of 3 (e.g. *wotid*, *wantd*, *woted*). This average score suggests that the children had trouble representing all of the sounds in *wanted*, and given the difficulty of the inflectional ending and the lack of corresponding morphological forms in Chinese, it is perhaps not surprising that they found this word challenging. For the word *please*, the Chinese children received an average score of 3.0, indicating that they represented most of the salient sounds but made errors on the long vowel and/or consonant cluster (e.g. *pes*, *plis*, *peis*). The word *elephant* likely posed difficulties because of its length: the average Chinese score of 2.73 is representative of several vowel and consonant omissions (e.g. *elft*, *ele*, *elfite*). Similar patterns were noted on the pseudowords: compared with the Tagalog group, Chinese children had significant difficulty with the word *otikast*. The mean score of 2.80 on this word reflects omitted letters (e.g. *otks*, *otek*, *ockcas*); the average score of the Tagalog group, by contrast, approached four points, meaning that all the salient sounds of the word were represented. These differences across bilingual groups on longer words may reflect language-specific transfer: the Tagalog group may benefit from the rich morphological system of their home language, which results in many polysyllabic words, while the Chinese group may be

disadvantaged by their language's lack of inflectional morphology and its emphasis on the syllabic rather than phonemic level.

Although these analyses revealed interesting group differences, other expected contrasts in the effects of lexicality, presentation modality, and orthographic legitimacy on spelling performance were not found in the present study. Pseudowords were expected to be more difficult to spell than real words for all of the children, as previous research with both monolingual and ESL populations has shown this type of lexicality effect in reading and spelling (e.g. Rack, Snowling, & Olson, 1992; Wade-Woolley & Siegel, 1997). However, based on studies with Chinese ESL learners (e.g. Haynes & Carr, 1996; Holm & Dodd, 1996; Wang & Geva, 2003b), it was also hypothesized that the difference between real and pseudoword performance might be more pronounced for the Chinese group. The results were consistent with the first but not the second of these hypotheses: as in Wade-Woolley and Siegel's (1997) study, all of the children were disadvantaged to similar degrees when spelling pseudowords as compared with real words. It is clear from Figure 4, however, that the Chinese group tended to obtain lower scores than the other children on pseudowords, and it may be that a larger sample size would have produced more robust effects. It is also noteworthy that the Chinese-speaking children did have more difficulty with pseudowords in the reading tasks when compared with Tagalog speakers; further research is needed to examine these potential lexicality effects in both reading and spelling in these populations.

Contrasts were also expected between groups in terms of performance on pronounceable versus unpronounceable items on the confrontation spelling test, as Wang and Geva (2003b) found that Chinese ESL learners showed relatively less difficulty with unpronounceable items when compared with native English speakers. However, participants in all three groups

struggled with unpronounceable items to the same extent. The discrepancies between these findings and those of and Wang and Geva's (2003b) study may reflect the fact that their Chinese-speaking participants had more consistent exposure to Chinese orthography: all of their participants were in Grade 2 and had attended weekly heritage language classes or intensive Chinese summer programs since Grade 1, whereas the children in the present study were younger and tended to have less frequent literacy experiences in Chinese. If inferior performance with pseudowords and superior performance with orthographically illegitimate items are consequences of the Chinese children's use of visual, whole-word strategies in spelling, and the development of these strategies is dependent upon experience with a logographic script, then it is possible that the participants' limited Chinese literacy experience explains their patterns of performance in this study. Future studies involving children with different amounts of experience with Chinese script are needed to clarify these results.

In addition to these patterns in the children's spelling, the developmental and error analyses revealed several similarities across groups. For example, the structural features that resulted in the most errors for all of the children were those that have been identified as being difficult for young children to spell, namely digraphs, consonant clusters, inflections, and vowels (e.g. Bourassa & Treiman, 2001; Treiman, 1993). The mastery of these spelling conventions requires more advanced knowledge of English phonology, orthography, and morphology; for example, representing both consonants in a cluster requires segmenting the cluster into two separate phonemes (Bourassa & Treiman, 2001), and children must learn that tense vowels are spelled with at least one more grapheme (either a vowel digraph or silent *–e*) than the number of phonemes would suggest (Wade-Woolley & Siegel, 1997). It is therefore not surprising that all children found these conventions difficult. It may have been expected that the bilingual children

with poorer English skills might have shown more errors on these features, but correlation analyses revealed that only a few error types were significantly associated with oral proficiency in two of the groups, and thus this hypothesis was not supported. However, phonological awareness skills were more consistently associated with mastery of spelling conventions across groups, providing further evidence of the important role of phonology in English spelling.

The developmental scoring system also showed similar spelling patterns in the three groups: for example, on the real word test, children in all three groups received average scores above four points on most single-syllable words. This score indicates that they represented all phonemes in the words and attempted vowel combinations, reflecting the use of both phonological and orthographic knowledge in spelling. The average scores on monosyllabic words in the pseudoword spelling test were slightly lower, but generally remained above three points, meaning that the children had more difficulty with long vowels and clusters in these items. This finding is also unsurprising, as the children may have relied on sight word spelling to represent these features in the real word task, but no such strategy is available when spelling pseudowords. Consistent with the error analysis, the words that most children found difficult were those that were more than one syllable, as well as those that contained difficult-to-spell features such as consonant clusters, digraphs, and inflections.

4.2 Implications

This study has important theoretical implications, some of which have already been mentioned with respect to each major finding. The results of the correlation analyses showed that aspects of phonological processing are associated with reading and spelling performance regardless of language background, a finding which supports the hypothesis that reading development across languages depends on common cognitive processing skills (termed the 'the

central processing hypothesis' by Geva & Siegel, 2000). This theory has been put forth in several studies that have found phonological processing skills to be associated with both first and second language acquisition across a range of languages, including Italian (e.g. Cossu et al., 1988), Spanish (e.g. Durgunoglu et al., 1993), and Chinese (e.g. Gottardo et al., 2001; McBride-Chang & Ho, 2005). However, the results also revealed differences in the patterns of correlations between phonological awareness and spelling performance across groups, which may be indicative of language-specific processing skills involved in reading development. This finding is consistent with Katz and Frost's (1992) orthographic depth hypothesis, which suggests that differences in orthographic complexity translate into differences in the development of literacy skills. Based on these results, it seems that it may be more useful to combine these two theoretical frameworks when discussing bilingual literacy development, a suggestion also made by Geva and Siegel (2000).

Another finding of potential theoretical interest is related to the bilingual children's language and literacy backgrounds: it is noteworthy that although both groups had only limited exposure to literacy activities in the home language, they still performed significantly differently from each other on reading and spelling-related tasks. These trends in the data suggest that literacy experience in another language may not be necessary to produce effects on literacy development in English; in other words, exposure to another oral language may be sufficient to affect the processing skills underlying reading and writing. This is similar to the idea put forth by Yamada (2004) in his reply to Wang et al. (2003), where he proposed that processing differences attributed to particular orthographic systems might instead be explained by the phonological systems of the languages in question. Under this view, it is assumed that speakers of a language with a closer phonological form to English will exhibit more positive transfer of

phonological skills when reading English, while those whose language is phonologically very different from English will need to compensate for negative transfer effects by relying on alternative strategies such as visual-orthographic processing. Wang et al. (2004), on the other hand, maintain that it is nearly impossible to separate out the effects of orthography and phonology, while also arguing that the use of visual-orthographic skills by Chinese readers of English results from visual and orthographic differences between the two languages, rather than phonological differences. In the present study, bilingual children whose home languages have different orthographic and phonological relationships to English performed differently on phonological awareness and literacy tasks, but there was no evidence of stronger visual-orthographic skills in the Chinese group. These children all had limited experience with literacy activities in their home languages, but were regularly exposed to the spoken languages at home. Although the limitations of this study (discussed further in the following section) make it difficult to draw definitive conclusions, it is interesting to note that the children's experience with spoken language seems to have been adequate to produce group differences in some literacy-related skills. On the other hand, although the Chinese-speaking children did not appear to rely on phonological information in spelling to the same extent as the other children (as evidenced by the correlation patterns between phonological awareness and the various spelling measures), their equivalent performance on the confrontation spelling task suggests that their visual-orthographic processing skills may not have been strong enough to compensate for phonological difficulties. These findings suggest that both phonological and orthographic differences between languages may be important to consider: if a bilingual child has experience with only the spoken form of the home language, then the phonological abilities associated with reading may be affected, while additional experience with orthography may further influence the

processing skills used for reading and writing. In a study comparing the phonological awareness skills of pre-readers and readers from different language backgrounds, Cheung, Chen, Lai, Wong, and Hills (2001) similarly found evidence of joint effects of spoken language and orthography; the present study suggests that further research with bilingual children who are acquiring literacy in only one language may also shed light on this theoretical issue.

This study also has implications for researchers and educators working with bilingual populations. As previously discussed, relatively few studies have examined spelling performance in bilingual children, choosing instead to focus on word recognition as the main measure of literacy abilities. However, in the present study different patterns of performance were found in reading versus spelling performance across groups, suggesting that it is worthwhile to examine both aspects of literacy development in order to obtain a complete picture of children's abilities. In addition, many studies focus solely on overall accuracy in judging spelling skills, without closely examining the developmental trends or error patterns in each child's spellings. The significant results provided by these additional analyses in the present study are evidence of the utility of more detailed scoring schemes: developmental scoring systems based on stage models of spelling development provide useful profiles of a child's use of phonological, orthographic, and morphological strategies in spelling, while error analysis systems further clarify the specific orthographic features that children may find difficult. These findings suggest that both researchers and educators can learn valuable information about a child's literacy-related knowledge and skills from these types of analyses.

A further practical implication concerns the support provided to bilingual and ESL learners in the public education system. The majority of the bilingual children in this study had been designated ESL learners upon school entry, and were receiving either in-class or pull-out

ESL support in their schools. However, the Tagalog- and Chinese-speaking students demonstrated different profiles in terms of English language and literacy performance: the Tagalog speakers exhibited deficits in oral language but adequate (or slightly superior) reading and spelling skills, while the Chinese group struggled with both oral language and specific literacy-related skills such as representing novel phonemes and spelling longer words. These findings suggest that literacy assessment and intervention techniques that take the characteristics of the child's home language into account may be more effective for both Chinese and Tagalog-speaking students. For example, Tagalog-speaking children may be able to draw on their strong phonological abilities when reading and writing in English, but may require additional practice with orthographic conventions that do not reflect one-to-one correspondences between graphemes and phonemes. Chinese children, on the other hand, may benefit from phonological awareness training, while also being encouraged to make use of other processing skills through approaches such as sight word training. As discussed in a recent article in the popular media in Vancouver (The Georgia Straight, August 17-24, 2006, Volume 40, No. 2017), children from different language and cultural backgrounds are at risk of low educational achievement and drop-out later in their school careers. For this reason, it is becoming increasingly critical to develop more effective methods to promote academic success in students from different language backgrounds.

4.3 Limitations

As mentioned throughout this discussion, one major limitation of this study is the small sample size. Recruitment issues made it difficult to obtain groups that would be large enough to achieve adequate statistical power. Some of the trends in the data, such as the Tagalog-speaking children's tendency to outscore English monolinguals on most of the literacy tasks, may have

reached statistical significance if the number of participants in each group had been larger. However, appropriate statistical techniques were chosen in order to alleviate the effects of these small sample sizes. In addition, findings that support previous research have been emphasized, and important trends in the data that could be supported with further research have been noted. A further limitation is related to the background information collected from parents: as previously discussed, differences were found in the language and literacy experiences of the two groups of bilingual children, as well as in their parents' education levels. Although these differences were considered in the analyses, future studies should attempt to control for the effects of the home environment by recruiting participants with more similar patterns of language use.

In order to avoid excessive testing of the participants, certain additional measures were omitted from this study; for example, nonverbal abilities were not assessed here, but future studies should control for this variable as a possible influence on the children's performance on other tasks. In addition, only one measure related to visual-processing skills was included: the confrontation pseudoword spelling task, and more specifically the orthographically illegitimate half of this test. This decision was made based on the robust group differences found on this task in Wang and Geva's (2003b) study, as it was felt that it would be a sensitive measure of visual-orthographic processing skills. However, given the fact that group differences were not found on this test, it may have been more informative if other visual tasks had also been administered in order to clarify the association between underlying cognitive processes and reading and spelling performance in the three groups.

In spite of these limitations, the results of this study contribute important information to the growing field of bilingual language development and its impact on English literacy

acquisition. It is evident from the present findings that there are both similarities and differences in the course of spelling development in children from different linguistic backgrounds: on the one hand, phonological awareness appears to be associated with English spelling performance regardless of language background, but at the same time, the associations between specific spelling tasks and related underlying skills seem to differ across language groups. In addition, certain features of English spelling are equally difficult for all grade one children to spell, while the bilingual children's performance on other items may reflect aspects of their home languages. These findings provide support for the notion that literacy development is the result of both language-specific and language-general processes. Future research should build on these findings by examining these component processes in more depth: for example, specific phonological awareness tasks may be more associated with reading and writing development in certain linguistic groups than others, and the same may be true of visual-orthographic processing skills. Studies of bilingual populations with varying degrees of exposure to literacy activities in their home language would also help to clarify the relationship between phonology, orthography, and underlying skills in literacy development. By continuing to explore the routes to reading and spelling in bilingual speakers, we can improve existing theoretical accounts of literacy acquisition, while also facilitating the academic success of this growing population.

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Appendix A

Real Word Spelling Task
(adapted from Bear, Invernizzi, Templeton, & Johnston, 2004; Wang & Geva, 2003a)

Instructions: Say to the student, "I am going to read some words to you, and I would like you to write them for me. Try to spell them as best you can. I will say the word, then read a sentence with the word in it, and then say the word again. You only have to write the word once. Try your best. If you are not sure how to spell a word, it's okay to guess."

1.	PET	A hamster is a good pet.	PET
2.	WAS	I knew where the girl was.	WAS
3.	DOGS	The boy has two dogs.	DOGS
4.	SAY	What did the man say?	SAY
5.	HAPPY	Today he is happy.	HAPPY
6.	SHIP	He went sailing on a ship.	SHIP
7.	FIND	What did you find?	FIND
8.	HOME	After school the boy walked home.	HOME
9.	STICK	The dog likes to play with a stick.	STICK
10.	TEETH	I can see your teeth.	TEETH
11.	PLEASE	She always says please.	PLEASE
12.	WANTED	I don't know what she wanted.	WANTED
13.	FLYING	The blue bird is flying.	FLYING
14.	ELEPHANT	At the zoo she saw an elephant.	ELEPHANT
15.	HAPPINESS	Her smile showed her happiness.	HAPPINESS

Appendix B

Pseudoword Spelling Task

Instructions: Show the student the puppet and say, "This is my friend Nupi. He's from Neptune, and he speaks Neptunese. He wants you to try and learn some Neptunese. He's going to say some words in Neptunese, and then he wants you to write them down on a piece of paper. Let's try one." Give one practice item, "DOB".

1. TEM
2. KAGS
3. VAY
4. BAPPY
5. SHEB
6. POTE
7. STIN
8. GEETH
9. MUNTED
10. OTIKAST

Appendix C

Confrontation Pseudoword Spelling Task
(Wang & Geva, 2003b)

Instructions: Show the student the puppet and say, "This is my friend Nupi. He's from Neptune, and he speaks Neptunese. He wants you to try and learn some Neptunese. He's going to show you some words in Neptunese, and then he wants you to write them down on a piece of paper. Let's try one." Give one practice item, "KIPS". Show each word to the student for 2 seconds.

1. PCTH
2. NESH
3. POTH
4. STKV
5. VIST
6. THCP
7. SHEN
8. THOP
9. NFSH
10. STIV
11. SHFN
12. VKST

Appendix D

Parent Questionnaire

Please write, check or circle the appropriate response to the following questions.

1. Please list all the individuals that currently live in your home.

NAME (optional)	RELATIONSHIP TO CHILD	AGE (If over 18 years use 'Adult')	What language(s) does this person speak?

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOUR GRADE ONE CHILD.

2. What is the full name of *your grade one child*? _____

3. What is *your child's* birthdate? _____/_____/_____
day / month / year

4. In what country was *your child* born? ☐ Canada
☐ Other (where? _____)

5. How many years has *your child* lived in Canada? _____ years.

6. Since *your child* has lived here in Canada, about how much time per year does he/she spend in a **Cantonese/Tagalog-speaking** country?
☐ none ☐ 1 to 7 days ☐ 2 to 3 weeks ☐ 1 month ☐ more than 1 month

7. What language did *your child* learn first?
☐ English ☐ Cantonese/Tagalog ☐ Both ☐ Other _____

8. What language(s) does *your child* use when he/she talks to you at home?
☐ English ☐ Cantonese/Tagalog ☐ Both ☐ Other _____

9. At what age did *your child* start to learn English? _____
Where did *your child* first learn English?
☐ home ☐ preschool/daycare ☐ Kindergarten ☐ other _____

10. Who speaks **Cantonese/Tagalog** to *your child*? (Please mark all that apply)

☐ mother	☐ father	☐ mother's side grandmother
☐ mother's side grandfather	☐ father's side grandmother	☐ father's side grandfather
☐ other relatives	☐ brothers/sisters	☐ his/her friends
☐ neighbours	☐ shopkeepers	☐ other

11. Who speaks **English** to *your child*? (Please mark all that apply)

☐ mother	☐ father	☐ mother's side grandmother
☐ mother's side grandfather	☐ father's side grandmother	☐ father's side grandfather
☐ other relatives	☐ brothers/sisters	☐ his/her friends
☐ neighbours	☐ shopkeepers	☐ other

12. Does *your child*:

☐ watch TV in what language: _____
☐ listen to the radio _____
☐ play computer games _____

13. Do you have **Cantonese/Tagalog books** for *your children* in your home?

☐ yes ☐ no

If yes, how many:

☐ BETWEEN 1 AND 10
☐ BETWEEN 10 AND 25
☐ MORE THAN 25

14. Who reads to *your child* in **Cantonese/Tagalog**? (Please mark all that apply)

☐ mother	☐ father	☐ brothers/sisters
☐ grandparents	☐ other relatives	☐ no one

15. How often do you read **Cantonese/Tagalog** books with or to *your child*?

☐ ALMOST EVERY DAY
☐ 3 TO 5 DAYS A WEEK
☐ 1 TO 2 DAYS A WEEK
☐ 1 TO 2 TIMES A MONTH
☐ LESS THAN 1 TO 2 TIMES A MONTH
☐ NEVER

16. Do you have **English books** for *your children* in your home?

☐ yes ☐ no

If yes, how many:

☐ BETWEEN 1 AND 10
☐ BETWEEN 10 AND 25
☐ MORE THAN 25

17. Who reads to *your child* in **English**? (Please mark all that apply)

☐ mother	☐ father	☐ brothers/sisters
☐ grandparents	☐ other relatives	☐ no one

18. How often do you read **English** books with or to *your child*?
- ☐ ALMOST EVERY DAY
- ☐ 3 TO 5 DAYS A WEEK
- ☐ 1 TO 2 DAYS A WEEK
- ☐ 1 TO 2 TIMES A MONTH
- ☐ LESS THAN 1 TO 2 TIMES A MONTH
- ☐ NEVER

19. What other literacy activities do you do with *your child* at home?

In Cantonese/Tagalog
- ☐ read magazines or newspapers
- ☐ point out print in the environment (on boxes or signs)
- ☐ practice writing (e.g. printing letters, words, journals)
- ☐ other _____
- ☐ none

In English
- ☐ read magazines or newspapers
- ☐ point out print in the environment (on boxes or signs)
- ☐ practice writing (e.g. printing letters, words, journals)
- ☐ other _____
- ☐ none

20. What kinds of writing activities does *your child* do in **Cantonese/Tagalog**?
- ☐ printing characters or letters
- ☐ printing words
- ☐ writing stories or journals
- ☐ other _____
- ☐ none

21. How often do you write with *your child* at home in **Cantonese/Tagalog**?
- ☐ ALMOST EVERY DAY
- ☐ 3 TO 5 DAYS A WEEK
- ☐ 1 TO 2 DAYS A WEEK
- ☐ 1 TO 2 TIMES A MONTH
- ☐ LESS THAN 1 TO 2 TIMES A MONTH
- ☐ NEVER

22. What kinds of writing activities does *your child* do in **English**?
- ☐ printing letters
- ☐ printing words
- ☐ writing stories or journals
- ☐ other _____
- ☐ none

23. How often do you write with *your child* at home in **English**?

- ☐ ALMOST EVERY DAY
- ☐ 3 TO 5 DAYS A WEEK
- ☐ 1 TO 2 DAYS A WEEK
- ☐ 1 TO 2 TIMES A MONTH
- ☐ LESS THAN 1 TO 2 TIMES A MONTH
- ☐ NEVER

24. How **satisfied** are you with *your child's* level of **Cantonese/Tagalog skills** and **English skills?**

CANTONESE skills

- ☐ 5--very satisfied
- ☐ 4
- ☐ 3
- ☐ 2
- ☐ 1--not satisfied at all

ENGLISH skills

- ☐ 5 -- very satisfied
- ☐ 4
- ☐ 3
- ☐ 2
- ☐ 1-- not satisfied at all

25. What language(s) would you like *your child* to speak when he/she graduates from high school?

☐ English ☐ Cantonese/Tagalog ☐ Both ☐ Other _____

26. What language(s) would you like *your child* to read and write when he/she graduates from high school?

☐ English ☐ Cantonese/Tagalog ☐ Both ☐ Other _____

27. Before starting kindergarten, did *your child* attend daycare, pre-school, pre-kindergarten or a similar program? ☐ Yes ☐ No

If yes, please fill in the following information for each program *your child* attended:

Program	How many years was *your child* in this program?	What language was spoken most of the time in this program?	In this program, were most students native Cantonese/Tagalog speakers or native English speakers?
Daycare			
Preschool			
Pre-Kindergarten			
Other _____			

28. Before *your child* went to kindergarten, would you say *your child* spoke:

- ☐ only Cantonese/Tagalog
- ☐ both Cantonese/Tagalog and English, but home language better
- ☐ Cantonese/Tagalog and English equally well
- ☐ both Cantonese/Tagalog and English but better English
- ☐ only English

29. Has *your child* ever received any kind of formal instruction in **Cantonese/Tagalog**?
☐ yes ☐ no
If yes, what kind? (tutor at home, group classes, etc.) _____
For how long? (list approx. dates, e.g. Dec. 05 – present _____
How many times per week? _____
In what areas? (speaking ,writing, reading)? _____

30. Has *your child* received any **English** instruction outside of regular schooling?
☐ yes ☐ no
If yes, what kind? (tutor at home, group classes, etc.) _____
For how long? (list approx. dates, e.g. Dec. 05 – present _____
How many times per week? _____
In what areas? (speaking ,writing, reading)? _____

31. Does *your child* attend: ☐ extracurricular activities in what language: _____
(e.g. music/dance/art lessons, sports, etc.)
☐ community activities in what language: _____
(e.g. community centre, church, etc.)

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOURSELF

32. What is your relationship to the child participating in this project?
☐ mother ☐ father ☐ other (please specify: _____)

33. What country was *your child*'s mother/guardian born in? _____
What is the total number of years that she has lived in Canada? _____ years.

34. What country was *your child*'s father/guardian born in? _____
What is the total number of years that he has lived in Canada? _____ years.

35. What is the MOTHER/GUARDIAN'S highest level of education completed at this time?
☐ none
☐ some primary education
☐ completed primary education
☐ some high school
☐ graduated from high school
☐ some college or trade school
☐ received associate's degree or trade certification
☐ received bachelor's degree (Major: _____)
☐ some graduate study
☐ received graduate degree
☐ other

36. Would you say you speak:

- ☐ only Cantonese/Tagalog
- ☐ both Cantonese/Tagalog and English, but better Cantonese/Tagalog
- ☐ Cantonese/Tagalog and English equally well
- ☐ both Cantonese/Tagalog and English but better English
- ☐ only English

37. How well can you read:

In **Cantonese/Tagalog**	☐ Not at all	☐ Not very well	☐ Well	☐ Very well
In **English**	☐ Not at all	☐ Not very well	☐ Well	☐ Very well

38. How well can you write:

In **Cantonese/Tagalog**	☐ Not at all	☐ Not very well	☐ Well	☐ Very well
In **English**	☐ Not at all	☐ Not very well	☐ Well	☐ Very well

Thank you very much for your cooperation!