ACCENT VERSUS IMPAIRMENT IN BILINGUAL CHILDREN: ASSESSING BILINGUAL CHILDREN IN ENGLISH

by

JAMIE HACK

BA Simon Fraser University, 2007

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

MASTER OF SCIENCE

in

THE FACULTY OF GRADUATE STUDIES

(Audiology and Speech Sciences)

THE UNIVERSITY OF BRITISH COLUMBIA

(Vancouver)

April 2010

Abstract

Standard Speech Language Pathology (SLP) practice mandates that presence of a non-native accent not interfere with the assessment of bilingual children (Crago & Westernoff, 1997). However, in practice SLPs only have access to assessments that do not account for accent, potentially resulting in an over-referral of bilingual children. The current study compared the standard scores and phonological errors of 29 bilingual Cantonese or Mandarin English language learners (ages between 5;6 and 9;8 years) with 25 monolingual English children (ages between 6;8 and 9;4 years). Perceptual ratings of accent and proficiency of the children's speech by 10 SLPs were compared with standard scores on the Goldman-Fristoe Test of Articulation, second edition (Goldman & Fristoe, 2002). The results of the tests revealed that bilingual children with an accent had significantly lower standard scores than monolingual children, but not in the impaired range. The SLPs reliably agreed on the level of accent and proficiency, but only accent correlated significantly with the standard score for bilingual children. Furthermore, a description of the phonology of the bilingual children showed patterns consistent with a speech impairment according to English typical developmental norms (Grunwell, 1981). These findings add quantitative and qualitative data to existing protocols, and discourage the assessment of bilingual children with tests standardized on first-language English-speaking children. Furthermore, the results suggest that perceptual judgment is a useful complement to an SLP's assessment of bilingual children.

Table of Contents

List of Tables

Acknowledgments

Thank you first and foremost to my research supervisor, Dr. Stefka Marinova-Todd, for supporting me over the past year. This thesis would not have been possible without her guidance, encouragement, and support. I would also like to thank the members of my committee, Dr. May Bernhardt and Dr. Murray Munro, for their assistance, insightful questions and comments about my study. I am grateful for the support of the school district principals, teachers, and the students who participated in the study. I would also like to thank the Speech-Language Pathologists for their enthusiasm, time, and cooperation in this study, which made this study possible.

This study was supported by a grant from the Canadian Social Sciences and Humanities Research Council.

Dedication

To my Dad's never-ending encouragement.

1.0 Introduction

Accent is non-pathological (Munro & Derwing, 1995) and stems mainly from differences between first language (L1) and second language (L2) phonology (Flege, 1995). Therefore, the Canadian Association of Speech and Language Pathologists (CASLPA) has stated that accent needs to be taken into account when assessing children speaking English or French as a second language (Crago & Westernoff, 1997). According to the 2006 census, 43% of the population of the area of study in the lower mainland for this thesis speaks a non-official language (Statistics Canada, 2006). The school district in question (2009) had 28.8% of its students enrolled in ESL programs and 56.4 % of students coming from households where English is not the primary language. The large proportion of bilingual children underlies the need for SLPs to be informed by research in bilingual assessment. However, most SLPs only have access to a battery of articulation assessments standardized for first-language English speakers (Goldstein, 2001). Due to their design, these assessments do not differentiate developmental sound errors from bilingual 'errors' due to accent (Goldman & Fristoe, 2002). Furthermore, few studies on the development of bilingual phonology exist (Holm & Dodd, 1999). As a consequence of a lack of appropriate tools and developmental data, bilingual children may be mislabeled as speech impaired. Conversely, SLPs who are reluctant to assess bilingual children because of a lack of appropriate tools may miss children who need speech therapy.

The present study grew out of the investigator's clinical experience with SLPs in the region being investigated. When assessing bilingual children, there were gaps in the theoretical and clinical knowledge of practice. In theory, the SLPs knew it was inappropriate to administer speech assessments standardized to English to bilingual

children. However, the standard scores and phonological error patterns of bilingual output were not well-known. Clinically, SLPs knew accent was an indicator of bilingual speech, and they used perceptual judgments to determine accentedness; however, the reliability of such judgments in a clinical setting was not known. The present study aimed to address these gaps by administering a speech assessment standardized for English to bilingual children, and by comparing the standard scores and phonological errors with those of monolingual English children. In addition, the SLPs' perception of accent was compared to the test results and measured for reliability to determine its potential as a tool in the SLP assessment repertoire when working with bilingual children.

This chapter begins with a review of the research on the typical phonological development of monolingual English, Cantonese, and Mandarin followed by a summary of bilingual research, including a contrast of Mandarin and Cantonese phonology with English. The potential contributions of Chinese languages to accent in English are then reviewed. Research on atypical phonological development precedes a review of the assessment of speech. Finally, the chapter discusses research on the perception of accent and speech impairment, with the research hypotheses in conclusion.

1.1 Typical Phonological Development

1.1.1 English

Table 1 includes the English phonemic inventory. English consists of stops (p^h, b, t^h, d, k^h, g), nasals (m, n, ŋ), affricates (tʃ, dʒ), fricatives (f, v, θ, ð, s, z, ʃ, ʒ), and approximants (w, ɹ, l, j). Among the analyses of the L1 segmental acquisition of English phonology, two recent major studies have used large samples to determine typically developing English language normative data (Porter & Hodson, 2001; Smit, 1993). Smit (1993a) used a

phoneme-based analysis, whereas Porter and Hodson (2001) used a phonological pattern-based analysis. A phoneme-based analysis involves documenting the errors due to substitutions, deletions, and distortions of phonemes. This analysis looks at each segment in isolation for deviations from the target. The Goldman-Fristoe Test of Articulation (GFTA, Goldman & Fristoe, 1986) is an example of an assessment that uses this approach. In contrast, a phonological pattern analysis finds patterns in the segmental deviations and categorizes them into phonological processes (see discussion of Grunwell [1981] below).

Table 1 English Phonemic Inventory

	Place						
Manner	Labial	Labio-dental	Dental	Alveolar	Post-Alveolar	Palatal	Velar
Stop	p^h b			t^h d			k^h g
Nasal	m			n			ŋ
Affricate					tʃ dʒ		
Fricative		f v	θ ð	s z	ʃ ʒ		
Approximant	w			ɹ l		j	

Smit (1993a), as part of the Iowa-Nebraska Norms project, used a picture elicitation task to assess 1049 typically developing children ranging in age from 2;6 to 9;0. The sounds were elicited twice in the initial and final positions, except for /l/, which was elicited in the medial position as well. She found that by the age of five, stops, nasals, glides: /p, b, k, g, t, d, w, m, n, h, j/ and the fricative /f/ were acquired in the initial and final positions of the word. The fricatives /v, ʃ/ word initially and the affricates /tʃ, dʒ/ in all positions were acquired between the ages of four and seven. Conversely, the fricatives /s, z, θ, ð/ in all positions and /v, ʃ/ word finally showed mismatches for 5% to 15% of the children up to age nine. Between 5% and 15% frequency in error was considered typical in the study

across subjects. The liquids /l/ and /ɹ/ were acquired in all positions by age seven except for the initial /ɹ/, with errors present until nine years of age.

In contrast, Porter and Hodson (2001) and their SLP colleagues in California assessed 520 typically developing children between the ages of 2;6 and 8;0 using the Assessment of Phonological Processes – revised edition (APP-R, Hodson, 1986). They found that the children had acquired all phonemes (85% accuracy across children) by the age of four, except for liquids, /l/ and /ɹ/, which were acquired by age five. The sibilant phonemes (s, z, ʃ, z, tʃ, dʒ) were considered to be acquired by three years of age, but lisps (dentalization, lack of tongue grooving) continued to be present until seven. As shown, the reported age of acquisition can vary according to the criteria selected for phonological analysis.

Smit (1993b) used the Iowa-Nebraska Norms to determine the acquisition of word initial clusters using the same criterion for acquisition as Smit (1993a). The results suggested that cluster reduction is no longer typical after age 3;6 for monosyllabic words. Cluster reduction usually involved the deletion of the first consonant in an /s/ cluster and the second in a stop-liquid cluster. For example, /spun/ was reduced to [pun], whereas, /blæk/ was reduced to [bæk].

Grunwell (1981) performed a meta-analysis of research on the suppression of phonological processes in typically developing English children and summarized it into a developmental profile. She attempted to characterize the "changing relationship between child and adult pronunciation" (Grunwell, 1981, p. 173) by describing generalized patterns of substitution and deletion children use to approximate adult speech. For example, instead of describing [b] substituting for /p/ and [d], substituting for /t/ in isolation, a pattern of

voicing describes both errors in terms of a general pattern. I.e., as the children produce more adult-like speech, the assumption is that the processes disappear. The following processes appeared only infrequently after the age of 3;0: weak syllable deletion ([lun] for /bəlun/), final consonant deletion ([ba:] for /bat/), consonant harmony (assimilation; [gɑg] for /dɑg/), reduplication ([wawa] for /wɑtɹ/, cluster reduction ([tar] for /star/), stopping of /f, v, s, z/ ([pan] for /fan/), velar fronting ([tar] for /kar/), and prevocalic voicing ([bɪg] for /pɪg/). Stopping of /θ, ð, ʃ, tʃ, dʒ/, and gliding ([wɪp] for /lɪp/) continued beyond age five. Further research by Stoel-Gammon and Dunn (1985) found depalatalization (/ʃ/ to [s]) to be common after age three, whereas epenthesis (/sp/ to [səp]) was not. In general, most processes appeared to be resolved by age 7 years with gliding of liquids persisting longer than other processes (Grunwell, 1981; Porter & Hodson, 2001; Stoel-Gammon & Dunn, 1985). A list of all the phonological processes included in the present study and their definition is included in Appendix A. Phoneme-based and phonological pattern analyses have been used to analyze acquisition norms for other languages as well, including Cantonese and Mandarin described in the next section.

1.1.2 Cantonese

Table 2 illustrates the phonemic inventory of Cantonese from So and Dodd (1995) and Cheng (1991). Cantonese segments include labial /p, p^h/, alveolar /t, t^h/, and velar stops /k, k^h/, nasals /m, n, ŋ/, fricatives, /f, s, h/, affricates /ts, ts^h/, approximants /w, l, j/, and clusters /kw, k^hw/ word initially. Cantonese is primarily monosyllabic with the following segments in word-final position: /p, t, k, m, n, ŋ/. Cantonese uses an aspiration distinction between some segments. In 1993, So developed a screening tool for Cantonese monolingual children, the Cantonese Segmental Phonology Test (CSPT), as a screen for speech

impairment and to document the order of acquisition of Cantonese sounds. So and Dodd (1995) administered the screening tool to 268 Cantonese-speaking children between the ages of 2;0 and 5;0. The researchers reported that the unaspirated stops /p, t, k/, nasals /m, n/, the glottal fricative /h/, the lateral /l/, the semi vowels /w, j/ and final /m, n, p/ were acquired before the age of three at a criterion of 90% of the children using the segments correctly across subjects. Conversely, the aspirated stops /p^h, t^h, k^h/, fricatives /f, s/, affricates /ts, ts^h/, clusters /k^hw, kw/, and word-final stops /t, k, ŋ/ were acquired later, up to age five. The structural phonological processes most prevalent in Cantonese were segmental assimilation and reduction of the initial clusters /kw/ and /k^hw/. Other processes included stopping, fronting, backing, deaspiration and affrication. These were all considered typical up to 4;3 (So Dodd, 1995).

Table 2 Cantonese Phonemic Inventory

Manner	Place							
	Labial		Alveolar		Palatal	Velar		Glottal
	Initial	Final	Initial	Final		Initial	Final	
Stop	p, p^h	p	t, t^h	t		k, k^h, kw, k^hw	k	
Nasal	m	m	n	n		ŋ	ŋ	
Fricative	f		s					h
Affricate			ts, ts^h					
Approximant	w		l		j			

1.1.3 Mandarin

Table 3 describes the phonemic inventory of Mandarin from Zhu and Dodd (2000a) and Cheng (1991). This inventory includes labial /p, p^h/, alveolar /t, t^h/, and velar stops /k,

k^h/, nasals /m, n, ŋ/, affricates /ts, ts^h, tʂ, $tʂ^h$, tɕ, $tɕ^h$/, fricatives /f, s, ʂ, ɕ, x/ and approximants /l, ɹ/ in the word initial position. Mandarin does not have any consonant clusters, is primarily monosyllabic, and has the segment /n/ and /ŋ/ in the final position. As a voicing distinction, Mandarin uses aspiration. Zhu and Dodd (2000a) determined the order of acquisition of Mandarin phonemes through a study of 126 monolingual Mandarin-speaking children between the ages of 1;6 and 4;6. The first sounds mastered by children included nasals, stops, and fricatives /m, n, t, t^h ç, x, p, f/ in the initial and final position before three years old. After age three, the stops /p^h, k^h/ along with the affricates /tɕ, $tɕ^h$/, the liquids /ɹ, l/, and the fricative /s/ were acquired in the initial position at a criterion of 90% of the children using the segments correctly across subjects. /tʂ, $tʂ^h$, ts, ts^h ʂ/ were acquired after the age of 4;6. Gliding, aspiration, affrication, stopping, and assimilation were the processes apparent in Mandarin speaking children, all greatly decreasing by 4;6. On the other hand, fronting continued to be used by 89% of the children, and backing and deaspiration in the speech of 44% of the children past age 4;6 (Zhu & Dodd, 2000a). The order and patterns of acquisition of segments in monolingual children may give us insight into the acquisition of segments in bilingual children, discussed in the next section.

Table 3 Mandarin Phonemic Inventory

	Place						
Manner	Labial	Labio-dental	Alveolar		Retroflex	Palatal	Velar
			Initial	Final			
Stop	p, p^h		t, t^h				k, k^h
Nasal	m		n	n			ŋ
Affricate			ts, ts^h		tʂ $tʂ^h$	tɕ, $tɕ^h$	
Fricative		f	s		ʂ	ɕ	x
Approximant					l, ɹ		

1.1.4 Bilingual Phonological Development

The development of phonology in bilingual children in general is similar to that of monolingual children in the early stages; the first segments to appear are mainly coronal and labial stops, nasals, glides, and simple CV structures (e.g., *mama*; Eilers and Oller, 1982). Cantonese, Mandarin, and English phonology share some similarities in their development of segments, but differ in their use of phonological processes (see below). Cantonese and Mandarin are both primarily monosyllabic, use the aspiration distinction for voicing, and feature similar stops and nasals, the common fricatives /f, s/, affricates /ts, ts^h/, approximant /l/, and word final /n/. Cantonese has more word final sounds, whereas Mandarin has a greater variety of fricatives and affricates. Compared with the two Chinese languages, English has similar nasals and liquids. However, English includes more multisyllabic structures, uses a voicing distinction of segments rather than only an aspiration distinction (e.g., /p/ versus /b/), and has different fricatives /θ, ð, z, v, ʃ/ and affricates /tʃ, dʒ/. Finally, English has more word-final segments than Cantonese and Mandarin and more clusters. In general though, the three languages follow a common order of acquisition, with more complex sounds such as fricatives, liquids, velars, and affricates emerging later (Porter & Hodson, 2001; Smit, 1993; So & Dodd, 1995; Zhu & Dodd, 2000a).

The phonological processes of Mandarin and Cantonese are similar in their acquisition patterns. The only exceptions are gliding, which was exclusive to Mandarin and cluster reduction exclusive to Cantonese (So & Dodd, 1995; Zhu & Dodd, 2000a). In contrast, English uses different phonological processes with a different developmental order. Fronting disappears in English by age three typically (Grunwell, 1981), whereas in

Cantonese and Mandarin it is considered typical past the age of four (So & Dodd, 1995; Zhu & Dodd, 2000a).

Studies of bilingual children in Cantonese have found similarities in segmental acquisition and differences in process development as well (Holm & Dodd, 1999). For example, Holm and Dodd (1999) performed a longitudinal study of two Cantonese-English bilingual children. The children were tested at four-week periods between the ages of 2;3 and 3;1 and 2;6 and 3;5. They were assessed using standardized measures of articulation in Cantonese (CSPT) and English (GFTA) and presented with a similar order of segmental acquisition to monolinguals in each language. However, when the phonological processes employed by the bilingual children were analyzed, they resembled those of delayed or atypical English monolingual speakers. For example, the bilingual children used final consonant deletion past the age at which it was developmentally typical. Of the phonological processes apparent in the study, assimilation and deaffrication ceased by age three, whereas, cluster reduction, stopping, fronting, and final consonant deletion continued after age three. The main conclusion from the study was that bilingual development is distinct from monolingual development because of the different processes used. Unfortunately, with the small number of participants in the study, it is difficult to generalize the findings. Furthermore, no studies to date exist on Mandarin bilingual acquisition of English segments or processes.

Bilingual children have segmental errors that are consistent with the development of segments by monolingual children in each language. However, the process errors are consistent with a bilingual phonological system distinct from a monolingual system. In a

different class of errors are those caused by the interaction of the linguistic differences between the two languages being acquired, i.e., accent.

1.2 Bilingual Speech and Accent

Accented speech can be best described as "non-pathological speech produced by second language (L2) learners that differs in partially systematic ways from the speech characteristic of native speakers of a given dialect" (Munro, 1998, p. 139). Research from the field of second language acquisition (SLA) proposes a model for the systematic differences (Flege, 1995) and provides evidence of their segmental differences.

According to Flege's Speech Learning Model (SLM), the features of a bilingual child's L1 interact with the L2, affecting the output (Flege, 1995). Evidence for this theory can be found in a contrastive analysis of two languages. A contrastive analysis involves comparing the two phonemic inventories of the languages and predicting how the phonology of each could affect the production of the L2. For example, in Spanish, the segment /s/ does not occur word initially in the phonological inventory in clusters; however, it does occur in English. A contrastive analysis predicts Spanish speakers will use a phonological strategy to prevent the /s/ occurring word initially. Accordingly, the phonological process of epenthesis adds /ə/ word initially to English words beginning with /s/-clusters. For example, /skul/ becomes /əskul/ in Spanish accented English speech (Shah, 2002). A contrastive analysis of Cantonese and Mandarin phonemic inventories with that of English can suggest patterns of transfer between the languages, resulting in substitution patterns commonly observed in accented speech.

Considering the descriptions of the Cantonese, Mandarin, and English phonemic inventories previously, we can predict the difficult segments for bilingual speakers of

English contributing to accent. Word initially, Cantonese does not have the following English fricatives: /v, z, ʃ, θ, ð, tʃ, dʒ/ and word finally, Cantonese only has /p, t, k, m, n, ŋ/. The only clusters Cantonese has are /kw/ and /k^hw/ and its syllable structure is mostly monosyllabic (Holm & Dodd, 1999). Mandarin's phonemic inventory does not include the following English fricatives: /v, z, ʃ, ʒ, ʧ, ʤ, θ, ð/. Furthermore, Mandarin does not have any clusters, is mostly monosyllabic, and has /n/ and /ŋ/ word finally (Cheng, 1991). Conversely, the segments exclusive to Mandarin are the retroflexes /tʂ, $tʂ^h$, ʂ/, the palatals /tɕ, $tɕ^h$, ɕ/, and the velar /x/. Both Mandarin and Cantonese have the affricates /ts. ts^h/ and Cantonese has a word initial /ŋ/ not found in English.

The described differences contributed to the substitution patterns reported by Cheng (1991) as used by Mandarin and Cantonese learners of English in general. The common patterns reported for the two languages were [s] for /θ/, [f] for /θ/, [f] for /v/, and [w] for /v/ (Cheng, 1991). According to Cheng (1991) Mandarin speakers tended to substitute [z] for /ð/, exclusively, whereas, Cantonese speakers substituted [s] for /z/, [l] for /r/, [s] for /ʃ/, and [d] for /ð/ in initial or medial position. Both groups also deleted final consonants, reduced clusters, or used epenthesis to insert a /ə/ in clusters (Cheng, 1991).

In addition to the interaction of the L1 and the L2, personal variables can contribute to level of accent. According to Piske, Mackay, and Flege (2001) in a review of accent research, Age of L2 learning (AOL) and length of residence (LOR) were the two most studied variables contributing to accent. According to the authors, AOL was predominantly defined as the age at which an immigrant first arrived to a new country where most of the residents speak the new L2. Flege, Munro, and Mackay (1995) examined the accents of 240 native Italian speakers in Canada from children to adults and found AOL was related to

level of accent. Alternatively, according to Piske, Mackay, and Flege (2001), the contribution of LOR was much less clear. LOR is the length of time an immigrant has lived in a new country. It has been reported to be inconsistently related to accent and when it has been related, AOL had a stronger relationship.

Bilingual accented speech is due to the interaction between the phonological systems of the languages being acquired, and its level can be affected by variables such as AOL or LOR. In order to further differentiate errors due to accent from those due to impairment, English, Cantonese, Mandarin, and bilingual atypical phonological development is described in the next section.

1.3 Atypical Phonological Development

1.3.1 English

Similar to research on the typical development of phonology, research on atypical development has focused on segmental (phoneme-based) and phonological process (pattern-based) analyses. In contrast to research on typical development, which documents the errors of typically developing children, the atypical development data is acquired through studies of children with documented speech or language impairments. In 1993, Shriberg created a Speech Disorders Classification System (SDCS) to divide normal and disordered speech throughout a person's lifespan to aid in identifying genetic data for family traits of the disorder. He studied the speech of 78 children identified as speech impaired through a university clinic ranging from 2;6 to 10;7 in age. Based on connected speech samples, Shriberg (1993) used the percent consonants correct (PCC; Shriberg & Kwiatkowski, 1982) to identify constellations of consonants that were developed in a three-step order: the early-8, (p, b, j, n, w, d, m, h), the middle-8 (t, ŋ, k, g, f, v, tʃ, dʒ), and the late-8 (ʃ, θ, s, z, ð, l,

r, z). Shriberg and Kwiatkowski (1994) performed a follow-up longitudinal study over one year of 54 children with phonological disorders from the original Shriberg (1993) study, and found that within the classification system, the 10 children whose phonology disorders persisted past the year had lower performance on the early-8 group of phonemes at the second assessment time.

Further research has supported these findings. Rescorla & Ratner (1996) studied 29 children who were flagged as having a specific expressive language delay (SLI-E) at the age of two years (e.g., less than a 50-word vocabulary and no word combinations). Roberts, Rescorla, Giroux, and Stevens (1998) in a follow-up study assessed those same children's phonological skills, volubility development, phonetic inventory, and grammatical skills at age three and compared them with the patterns of 19 typically developing peers to determine improvement of speech and language skills by age three. The phonemic inventory was obtained through the GFTA (Goldman & Fristoe, 1986). By three years, within the SLI-E group, there were two groups: a late bloomer group and a continued delay group. Those who did not catch up (the continued delay group) were shown to have difficulty articulating phonemes that are generally acquired earlier: /p, b, t, d, k, g, w, j/ with no consistent differences on later-acquired phonemes.

To document infrequent phonological processes, Dodd and Iacono (1989) studied six children aged 3;0 to 5;8 with moderate-severe to severe speech impairment determined by percentage consonants correct (PCC; Shriberg & Kwiatkowski, 1982). A phonological analysis of conversational speech with some picture naming generated two types of errors: developmental (occurring in typically developing younger children, but not age-appropriate) and those that were not present or rare in typically developing children or 'atypical'.

Included in the phonological processes considered developmental were final consonant deletion, cluster reduction, weak syllable deletion, reduplication, gliding, stopping, voicing, fronting, and deaffrication. In comparison, for English, backing, initial and medial consonant deletion, affrication, nasalization and devoicing were atypical. These latter processes were less common in typically developing children and the authors suggested that they might be an indicator of prolonged speech impairment. However, their study was based on very few children.

According to these small-sample studies on children with speech impairments, those who show mismatches on typically earlier-acquired segments may be more likely to have persistent phonological impairments. Moreover, these children may use phonological processes rarely seen in typically developing children. The research on Cantonese and Mandarin children with speech impairments has used similar methodology.

1.3.2 Cantonese

Similar to atypical English phonological development, an analysis of the impaired speech of Cantonese children revealed patterns that are infrequent in typically developing children. So and Dodd (1994) described the speech errors of 17 Cantonese monolingual children consistently referred for disordered speech between the ages of 3;6 and 6;4. The children were assessed using the CSPT. Within the group, eight children were considered to have delayed phonology and five were considered to have 'disordered' speech. Whereas delay involves the delayed use of processes apparent in at least 10% of the population, disordered phonology includes processes used by less than 10% (10% was considered to be consistent with prevalence data on speech disorder; So & Dodd, 1994). Assimilation, cluster reduction, and deaffrication were patterns consistent with delayed monolingual

speech. In contrast, initial consonant deletion, gliding, and backing were apparent in the speech of the children classified as disordered.

1.3.3 Mandarin

Zhu and Dodd (2000b) studied the speech of 33 monolingual Putonghua (Mandarin) speaking children between the ages of 2;8 and 7;6. Of those, 18 had phonological delay and eight had disordered speech based on typical normative data from Zhu and Dodd (2000a). Of the processes described in the children classified as disordered, final consonant addition, syllable initial addition, and deaffrication were patterns rarely found in typically developing Mandarin speech and therefore considered 'atypical'. Similar to typically developing bilingual children, it may be expected that bilingual children with a speech impairment have a similar order of acquisition of segments with a distinct order of phonological processes. Unfortunately, the available research only includes data on the process analysis of bilingual children with a speech impairment.

1.3.4 Bilingual

The differences between English and Cantonese atypical processes are revealed in an analysis of bilingual speech. Holm, Dodd, and Wei (1997) performed a case study on two Cantonese bilingual children with a speech disorder. Spontaneous speech was elicited with picture books in each language and the CSPT was administered for Cantonese phonology with the Goldman Fristoe Test of Articulation (GFTA) for English. The errors were categorized into expected, delayed, and atypical. Expected errors were those developmentally appropriate according to monolingual data in English (Dodd & Iacono, 1989) and Cantonese (So & Dodd, 1995). Delayed errors were those used by younger children, but not age-appropriate according to monolingual norms, whereas atypical were

those patterns occurring infrequently in monolingual research (Dodd & Iacono, 1989; So & Dodd, 1995). In Cantonese speech, the two children used the expected process of stopping and cluster reduction; the delayed processes of fronting, final consonant deletion, affrication, deaffrication, and consonant harmony (assimilation); and the atypical processes of initial consonant deletion, backing, addition, gliding, and nasalization. In contrast, their English speech contained the expected processes of gliding, stopping, weak syllable deletion, and cluster reduction; the delayed processes of fronting, stopping, final consonant deletion, and voicing; and the atypical processes of deaffrication, initial consonant deletion, backing, addition, nasalization, and affrication. The authors suggested that the bilingual children with speech impairments have different processes in error than two separate monolingual children, therefore reflecting delay or disorder. As with the typical bilingual research, it is difficult to generalize the findings because of the small number of participants. To date, there is no research on atypical Mandarin bilingual phonological development.

In summary, a comparison of the processes used in the three languages gives an indication of the processes a bilingual child may use. In English, backing, affrication, nasalization and devoicing are atypical processes used by children with speech impairments (Dodd & Iacono, 1989). Conversely, in Cantonese, initial consonant deletion, gliding, and backing are atypical (Holm, Dodd, & Wei, 1997) and Mandarin describes final consonant addition, syllable initial addition, and deaffrication as atypical (Zhu & Dodd, 2000b). The two bilingual speech-disordered Cantonese children from Holm, Dodd, and Wei (1997) used all of the atypical processes apparent in Cantonese (So & Dodd, 1994) from past research, but additionally used addition and nasalization in their Cantonese. Their English

included all of the atypical processes according to Dodd and Iacono (1989) along with deaffrication and addition. The atypical and additional processes suggest a different pattern of phonology for bilingual children with a speech impairment compared to monolingual children. However, the bilingual study had very few speakers and more research is required. In the next section, the assessment of speech in terms of phonological development is discussed.

1.4 Speech Assessment

The assessment of speech can involve the collection of a speech sample through conversation, a standardized assessment, a phonological analysis, or all three in combination. In concert with perceptual judgments of speech, these assessments can determine impairment and its severity and are used to develop therapy targets. These assessments are primarily performed in English by English examiners and therefore do not take accent into account well, resulting in the possible misdiagnosis of bilingual children.

A speech impairment has been described as indicating a phonological or articulation impairment or both. Articulation impairment is classified as referring to 'distortions' of the target sound and lends itself to a phoneme-based analysis (e.g., GFTA). On the other hand, phonological impairment includes phonological processes that children employ to approximate adult speech and is better assessed with a pattern-based analysis (Grunwell, 1981; Porter & Hodson, 2001). Articulation impairment does not always occur in isolation: co-morbidity with phonological impairment is common (Broomfield & Dodd, 2004). According to standardized assessments of individual phonemes, impairment refers to children outside of the average range (typically less than 1 SD).

A common tool for describing speech impairment in research is the percent consonants correct calculation (PCC; Shriberg & Kwiatkowski, 1982). In the ideal implementation of this method, a conversational language sample is taken, a narrow transcription is made of the child's speech and the total number of errors is calculated as a percentage of all of the segments produced. Research has shown that this measure is significantly associated with the severity of the impairment as rated by clinicians' perceptual judgment (Shriberg & Kwiatkowski, 1982). According to this tool, a score of less than 50% of consonants correct indicates a severe speech impairment. A limitation of this assessment is that error types are not differentiated; therefore, articulation distortions, omissions, and substitutions are all treated equally (Shriberg, Austin, Lewis, McSweeny, & Wilson, 1997). However, Shriberg et al. (1997) do suggest the PCC be used in conjunction with Shriberg's (1993) early-8, middle-8, and late-8 order of acquisition to prioritize therapy targets.

Standardized assessments of phonology are based on a similar principle of counting number of errors, (defined as mismatches with the adult target) but the calculation is compared with age and gender-matched peers. For example, the Goldman-Fristoe Test of Articulation second edition (GFTA-2; Goldman & Fristoe, 2002) uses a raw score based on the number of errors on a set of words. The selection of words contains all consonants in all positions and the standard score is based on the number of sounds in error. Similar to the PCC, the types of errors are not differentiated into developmentally appropriate phonological types or processes.

Cantonese and Mandarin have similar segmental screening tools based on research of phonological acquisition (CSPT; So, 1993; Zhu & Dodd, 2000a). These assessments

inform on developmental appropriateness, but do not include standard scores to compare subject test performance with that of peers.

Quantification of segmental errors alone is an incomplete approach to assess because it does not describe the consistent and general patterns children use to approximate adult speech; describing the phonological processes results in a more complete picture of a child's speech abilities and clearer targets for therapy (Shriberg et al., 1997). One of the many assessment tools for a quantitative phonological process analysis is the Natural Process Analysis (NPA; Shriberg & Kwiatkowski, 1980). Using this method, an SLP documents 100 different words produced in spontaneous speech and categorizes the error patterns into groups of the eight most common processes ranked in order. Other phonological pattern analysis instruments include the APP-R (Hodson, 1986; mentioned above) or an analysis using the order of acquisition of phonological processes (Grunwell, 1981).

Included in an SLP assessment battery for phonological impairment is a perceptual judgment about the severity of speech impairment (Shriberg & Kwiatkowski, 1982). Several studies have investigated a clinician's perceptual judgment of the severity of speech impairment in monolingual children (Garrett & Moran, 1992; Rafaat, Rvachew, & Russell, 1995; Shriberg & Kwiatkowski, 1982). Rafaat et al. (1995) split 14 SLPs into pairs, who independently rated the severity of phonological impairment of 45 preschool children aged 2;6 to 5;6. The children were rated in sentences, in single words and an overall global score was given for their severity of phonological impairment and intelligibility. Severity was measured using a 5-point nominal scale from normal to profound impairment, and intelligibility was measured using direct magnitude estimation, with completely

unintelligible on one end and completely intelligible on the other. The SLPs had to circle the best description for severity and mark the intelligibility on a line, which was later measured in millimeters (a prothetic measurement). The ratings were compared with GFTA percentile ranks and then calculated for reliability between raters. More severely ranked children and those with lower intelligibility were associated with lower percentile scores on the GFTA, except in the normal versus mild comparison where there was no significant difference. In terms of interrater reliability, for children over age 4;6 the reliability was 80%; for children under age 4;6, it was only 40% between each pair of raters. The results suggest that in older children SLPs reliably agree on severity of impairment and the severity ratings are related to standard score.

Traditionally, level of accent has also been measured using perceptual judgment (Piske, Mackay, & Flege, 2001). Similar to severity of speech impairment, the level of accent has been significantly correlated with number of segmental errors (Anderson-Hsieh, Johnson, & Koehler, 1992; Brennan & Brennan, 1981; Munro & Derwing, 1995). In a study by Munro and Derwing (1995), the authors compared accentedness (level of accent), intelligibility, and comprehensibility. Ten bilingual Mandarin adult speakers with English as an L2 were compared with two native-English speakers. They were recorded reciting a story card and their stories were presented to 18 monolingual English-speaking linguistics students who judged the utterances for accent on a 9-point Likert scale where 1 indicated no foreign accent and 9 indicated a very strong foreign accent. The speakers' utterances were also coded for phonetic and morphosyntactic errors. Results showed a high rating of accentedness for the Mandarin speakers, with accent highly correlated with phonetic errors

for 78% of the listeners. Because the elicited speech was spontaneous, specific sound targets were not examined.

Brennan and Brennan (1981) studied the accent of 9 Mexican speakers of English and 4 native-English speakers reading a 570-word standard passage and targeted specific sound errors. The researchers correlated the accentedness scores from three linguist raters on a 7-point accent scale to the frequency of errors on 18 sound substitutions of interest and found a positive significant relationship in all but one of the substitutions. The two studies suggest higher accent is correlated with more segmental errors. Because the standard scores of assessments such as the GFTA-2 are based on frequency of segmental errors, accented speech may result in a lower standard score.

The results of administering the standardized tests to bilingual children can be inferred from their design as well. The GFTA-2 derives the standard scores on the test from a normative sample that does not include bilingual children (Goldman & Fristoe, 2002). It is therefore possible that bilingual children will have more errors than the normative sample with a possible score in the impaired range as a result. A consequence may be over-referral, leading to increased financial burden on the schools and larger SLP caseloads. In addition, being "pulled-out" of class for therapy also reduces class time and has academic ramifications from reduced learning (Lidz & Pena, 1996). The lack of appropriate assessments may also result in SLPs not identifying bilingual children who have a speech impairment. Under-referral is then a concern: if speech impairment is left untreated, it can have negative long-term social and academic repercussions (Dodd, 1995).

In summary, standardized assessments are useful in determining performance relative to age-matched peers, but describing the phonological patterns of the errors aids in

determining targets for therapy. However, current SLP practice has English standardized tests being administered by English speakers, allowing for accent to affect the results.

1.5 The Present Study

The present study was designed to address some of the gaps in the literature concerning speech development of bilinguals and SLP perception of accent related to standardized measures of English speech. Past research has described the phonology of bilingual speakers and compared it with that of monolingual speakers during phonological development (Holm & Dodd, 1999); however, there have been no descriptions of the accents of bilingual children or their standard scores on English tests. In addition, to date, no studies have reported on whether SLPs can reliably determine the level of accent of bilingual children. The current study was designed to address these issues.

The present study thus describes the results of bilingual children with an accent who were administered an assessment that was standardized on the English monolingual population. The standard scores of bilingual children were compared with those of monolingual children and the relationship between the scores and perceptual ratings of accent and impairment by SLPs was analyzed. In addition, the phonological error types of bilingual children were compared with those of monolingual children and contrasted with monolingual typical development. The purpose of the study was to provide quantitative and qualitative data demonstrating the results of administering English standardized speech assessments to bilingual children and SLPs' ability to use accent judgments clinically.

1.6 Research Hypotheses

1. English, Cantonese and Mandarin appear to have a similar order of acquisition of segments (Smit, 1993; So & Dodd, 1995; Zhu & Dodd, 2000a). As a result, it is predicted that Cantonese-English and Mandarin-English bilingual children will have difficulty with similar segments as those of English monolingual children on the GFTA-2. However, bilingual speech tends to be accented due to differences in the two languages as well (Cheng, 1991; Flege, 1995). It is, therefore, expected that bilingual children with accent will have lower scores than their monolingual peers on the GFTA-2 because the assessment does not factor out the effect of errors due to accent.

2. Strength of accent correlates with the number of segmental errors in bilingual language learners (Anderson-Hseih, Johnson, & Koehler, 1992; Brennan & Brennan, 1981; Munro & Derwing, 1995) and perception of impairment has been related to the same in monolingual children (Garrett & Moran, 1992; Rafaat, Rvachew, & Russell, 1995; Shriberg & Kwiatkowski, 1982). The GFTA-2 bases the standard score on number of errors. As a result, for the bilingual children it is expected that SLPs' higher perceptual ratings of accent will be associated with lower standard scores on the GFTA-2. Similarly, for monolingual children it is expected that SLPs' higher perceptual ratings of impairment will be associated with lower standard scores on the GFTA-2.

3. Similar to previous research by Holm and Dodd (1999), it is expected that the bilingual children's English, Cantonese, and/or Mandarin segmental inventories will be similar to those of their monolingual peers (Smit, 1993; So & Dodd, 1995; Zhu & Dodd, 2000a); however the processes used by the children will be different, suggesting distinct phonological systems from monolingual children (Holm & Dodd, 1999). Consequently,

some of the processes may be considered delayed or atypical according to monolingual developmental data (Dodd & Iacono, 1989, Grunwell, 1981, Shriberg, 1993, Smit, 1993a).

2.0 Method

2.1 Participants

2.1.1 Bilingual Group

The bilingual group of children consisted of 16 native Cantonese speakers and 13 native Mandarin speakers in Grades 1-3 in the Lower Mainland, British Columbia, ranging in age from 5:6 to 9:8 (M = 7:4, SD = 0;11). There were 18 boys and 11 girls, and their home language as listed on their school record and subsequently reported by their parents was either Cantonese or Mandarin. All of the children's parents spoke their L1 to their children at home. Sixteen children were born in Canada and 13 were born in China (including two from Taiwan). The average length of residence (LOR) in Canada was two years two months (SD = 1;10) and age of arrival (AOL) was 5;2 (SD = 1;10). The amount of time the children spent in their home country was also described, ranging from none to more than a year; the children spent an average of two to three weeks in China per year.

2.1.2 Monolingual Group

The English monolingual group of children consisted of 25 children who were born in Canada and had English as their only language as listed on their school record. In addition the parents indicated that English was the only language spoken in the home. Like the bilingual group, these participants were also recruited from Grade 1-3 classrooms in the same school district. The ages of these children ranged from 6;8 to 9;4 (M = 7;8, SD =

0;11). There were 16 males and 9 females. There was no statistically significant difference between the monolingual and bilingual groups of children in terms of age $t(54) = -1.6$, $p = .11$.

2.1.3 SLP Raters

The group of SLP raters consisted of 10 participants. The range of experience ranged from one to 40 years (M = 19.9). The SLPs were all monolingual speakers of English and had moderate to frequent clinical experience with foreign accent.

2.2 Materials

2.2.1 Language Questionnaires

A language questionnaire was given to all participants to determine language and background factors. The questionnaires for the monolingual and bilingual children along with the SLPs are included in Appendix B.

2.2.2 English Speech Assessments

The standardized test chosen to obtain all the English sounds and assess the children's speech was the Goldman-Fristoe Test of Articulation-2 (GFTA-2). The test has been used in research to determine the severity of speech impairment (e.g., Rafaat et al., 1995). It is a preferred clinical tool of SLPs because it generates a standard score to meet diagnostic requirements and it is fast and easy to administer (Goldman-Fristoe, 2002). This test consists of 54 pictures 39 consonant segments and clusters in individual words that are elicited through picture naming. The segments are located in the initial, medial, and final positions, and the clusters are in the initial position for a total of 77 sounds targeted. The amount of speech errors is standardized for American and Canadian English-speaking

children, adding some regional specificity. The results are presented using a raw score corresponding to the number of errors and a standard score related to age- and gender-matched peers.

In addition to the standardized assessment, the segmental errors were grouped into expected, delayed, and atypical categories based on typical and atypical developmental research. Expected errors were those deemed developmentally appropriate (Smit, 1993), delayed errors are inappropriate for the child's chronological age but appropriate for a younger child (Smit, 1993), while atypical errors were rarer patterns found in the speech of children with phonological impairments (Roberts et al., 1998; Shriberg, 1993).

Descriptions from Grunwell (1981) were used to describe phonological processes and their development. Porter and Hodson (2001) identified the Grunwell (1981) meta-analysis as a frequently cited study on the development of phonological processes, and their descriptions are contemporarily used in the field. Additional process labels for atypical speech come from Dodd and Iacono (1989). As with the segments, the process errors were categorized into expected, delayed, or atypical according to monolingual research (Dodd & Iacono, 1989; Grunwell, 1981; Porter & Hodson, 2001, Stoel-Gammon & Dunn, 1985). The motivation behind using a phoneme-based and pattern-based analysis was to capture as many errors as possible and describe the phonological patterns.

2.2.3 Cantonese and Mandarin Speech Assessments

To assess the Cantonese and Mandarin children's acquisition of phonology, the examiner used two L1 segmental assessments. The words used to assess Cantonese speech were those used by So (1993) for the Segmental Test of Cantonese (CSPT). The developmental norms were from So & Dodd (1995). Thirty-one pictures were included in

the assessment to elicit all 19 Cantonese consonants in all positions. Similarly, Mandarin speech proficiency was assessed using a screening test constructed at the University of British Columbia consisting of all of the segments in Mandarin (Bernhardt & Zhao, 2009). The Mandarin test has 40 pictures with 23 sounds. The developmental data for the test were based on Zhu and Dodd (2000a).

2.2.4 Accent Elicitation Task

Short sentences were used to assess the presence and degree of accent and speech proficiency from the children. They were designed to be short enough for the children to remember, but long enough capture variation in accent and proficiency. Mackay, Flege, and Imai (2004) found that sentences were an appropriate medium for measuring variation in accent and the length did not have an effect on accent ratings. Three sentences were chosen to elicit accent:

1. The elephant ate a banana plant.
2. Two big mice chase one little black cat, and
3. Five sheep get on a long train.

The sentences were designed to elicit sounds difficult for both monolingual and bilingual children. Fricatives (ð, f, s, v, ʃ), liquids (l, ɹ), and clusters (pl, bl, tɹ) are later developing or difficult for both bilingual and monolingual children (Smit, 1993; So & Dodd, 1995, Zhu & Dodd, 2000a). The reason that both developmental and bilingual errors were included was to determine variation in bilingual speech (accent) and monolingual speech (proficiency). In order to aid the children in remembering the sentences, visual

supports were created on PowerPoint slides that depicted the animals and items in the sentences. The sentences were audio-recorded on a digital recorder.

2.2.5 Perception Rating Scales

To assess level of accent, a Likert-type scale of degree of accent was created. A nine-point Likert scale where 1 = low foreign accent and 9 = strong foreign accent was used. Southwood and Flege (1999) recommended a 9-point scale due to ceiling effects found in a 7-point scale of accentedness. Because the monolingual children in the current study were not speech impaired, the term impairment was not used on the perceptual scale. Instead, the term proficiency was used because the monolingual children in this study are not speech impaired. Therefore, a more general description was used. 'Proficiency' has been used as a descriptor of speech ability in the research on speech-impaired children (Garrett & Moran, 1992; Rafaat, Rvachew, & Russell, 1995). A 9-point Likert scale was produced to measure proficiency where 1 = low proficiency and 9 = high proficiency. These two scales were placed in tandem; accent over proficiency (see Appendix C), and the SLP was asked to choose the accent rating scale if they felt the child had an accent or the proficiency rating scale if the SLPs did not detect an accent for each sentence. This layout was chosen because it was felt that having them rate all items on the two scales would have been too onerous.

2.3 Procedure

The investigator administered the GFTA-2 and the sentence elicitation to each monolingual and bilingual child individually in a quiet room in the elementary school. The GFTA-2 was administered first followed by the elicited sentences.

An assistant who spoke both Cantonese and Mandarin administered the L1 assessments in Cantonese and Mandarin. Some children did not know all of the vocabulary items in their first language and therefore had to repeat the items after the assistant. After the first language assessment, the investigator administered the GFTA-2. Similarly, some bilingual children did not know the English vocabulary items and had to repeat after the investigator.

To elicit accented utterances from the children, the investigator dictated three sentences and the children repeated the sentences using a delayed repetition task. The researcher modeled the sentence. The child then counted to five, and repeated the sentence. A repetition task was chosen over speech to avoid immediate imitation. If the child directly repeated the examiner, there would have been more imitation of the examiner's phonology. Flege, Munro and Mackay (1995) used a delayed repetition task and found their results were not affected by imitation. For the Chinese speakers, the assistant gave the instructions for the delayed repetition task in the child's first language, and then the children repeated the sentences from the examiner in English. Some children in both groups found the delayed repetition task difficult and required multiple repetitions. Repetitions were allowed to eliminate the word and morphosyntactic errors because these errors were not the target of the present study.

2.3.1 Perceptual Rating

All of the sentences produced by the children (162 in total) in the elicitation task were randomized and played to the SLP raters. The SLPs listened and rated in a quiet room in their home. They were instructed to choose either accent or proficiency based on whether the child had an accent for each sentence and were allowed to listen to each sentence only

once. The sentences were presented on a PowerPoint slide that included a number corresponding to each sentence to match a number on the rating sheet for the SLPs to coordinate the recording and the rating scale sheet.

2.4 Analysis

2.4.1 Data Coding

Two research assistants trained in transcription transcribed the GFTA-2 sessions of all 54 children with a rate of agreement of 93% based on broad transcription. The segment most disagreed upon was /θ/. The assistants reported difficulty determining whether they heard the [f] sound or not. The investigator scored the GFTA-2 based on the transcriptions. The types of errors were then classified according to monolingual phonological development.

Two Cantonese- and Mandarin-speaking research assistants each transcribed the Chinese words with an agreement rate of 99%. The assistants used broad transcription and compared the transcribed segments to target segments on the Cantonese and Mandarin assessments. The results were then compared with segment development norms from each language (So & Dodd, 1995; Zhu & Dodd, 2000a).

Each child had three sentences judged by 10 raters and could be rated with either the accent or proficiency scale, for many of the children, the choice of scales was inconsistent across sentences. For example, one sentence might have had a proficiency score and the other two an accent score. This created a dilemma in determining the mean accent or proficiency rating for each child because one mean may be based on three

judgments and the other on seven. This made comparison of mean accent or proficiency scores alone impossible.

To permit comparisons of accent and proficiency, a larger scale of the combined ratings was created, ranging from 1 to 19 with scores below 10 being considered accented and above 10 proficient. To accomplish this, 10 was added to all the proficiency scores and the accent scores were reversed. Therefore, a score of 5 on the proficiency scale was counted as 15 and a score of 4 in accent was converted to 6. In this way, a rating could contribute to either a higher score (proficiency; between 10 and 19 on the proficiency side of the scale) or a lower score (accent; between 1 and 9 on the accent side of the scale). This scale is labeled as the total perceptual score for the rest of this paper. Each sentence was averaged across the SLPs, and the three sentences were averaged for each child to create a mean total perceptual score.

To determine the validity of the total perceptual score scale, a proportional analysis was performed to determine the percentage of ratings as either accented or proficient corresponding to the total perceptual score. A Pearson *r* correlation was used to determine the effect and size of the relationship. The total perceptual score had a strong negative correlation with the percentage of accent scores $r(52) = -.98$, $p < .01$ and a strong positive correlation with the percentage of proficiency scores $r(52) = .98$, $p < .01$. Furthermore, to determine the validity of accent being below 10 on the total perceptual scale, the mean percentage of accent ratings for children below 10 on the total perceptual scale was calculated at 82% with a range of 52% to 93%. Therefore, at least half of the ratings for any total perceptual score in the accent range (below 10 on the total perceptual scale) were

given on the accent scale. Similar percentages were found for the proficiency ratings (M = 87%, range between 61% and 100%).

The variables that contributed to level of accent were taken from data included in the language questionnaires. These were gathered to determine if variability in the children's accents could be identified. Of all the questions asked, only Age of arrival (AOL), Length of Residence (LOR), and time outside of Canada had any variability and were therefore the variables measured against accent. AOA in the present study is equal to AOL in previous research (Flege, Munro, & Mackay, 1995). Length of time outside Canada per year came from the language questionnaires and was converted to a nominal value with 1 as no time outside Canada, 2 as one to seven days, 3 as two to three weeks, 4 as one month, and 5 as more than one month in order to perform the statistical analysis.

2.5 SLP Raters' Reliability

In order to determine the interrater reliability of accent and proficiency ratings by the SLPs, an intraclass correlation coefficient (ICC) was used with a criterion of $r_1 = .8$, $p < .05$, which has been considered as good reliability in past research (Munro & Derwing, 1995; Shrout & Fleiss, 1979). This measure has been used in past accent research to determine the agreement among groups of judges on perceptual ratings (Munro & Derwing, 1995). The ICC in the present study met criterion at $r_1 = 0.92$, $p < .01$, indicating acceptable agreement between the judges.

3.0 Results

3.1 Group Comparisons on the GFTA-2 and Total Perceptual Score

In order to compare the standard scores on the GFTA-2 and perceptual ratings, an independent sample t-test for unequal sample sizes was used due to the different size of the groups. Table 4 includes all of the mean GFTA-2 standard scores and perceptual scores for all the groups.

Table 4 Group Means on GFTA-2 and accent/proficiency variables

	Variables		
Group	Standard Score* M (SD)	Raw score (error total) M (SD)	Perceptual Score M (SD)
Bilingual (N = 29)	93.8 (10.9)	7.1 (5.4)	7.9 (3.9)
Accented (N = 19)	91 (10.1)	8.8 (5.3)	5.4 (1.8)
Non-Accented (N = 10)	99.4 (10.6)	3.8 (2.7)	12.5 (2.1)
Monolingual (N = 23)	97.4 (8.7)	4.2 (4.3)	13.9 (3.2)

**Mean = 100 +/- 15*

As expected, bilingual children had a mean perceptual rating in the accented range (below 10 on the perceptual scale), whereas the monolingual children had a perceptual rating in the proficiency range (above 10) and the scores were significantly different, $t(52) = -6.1$, $p < .001$. Unexpectedly, there was no significant difference between the mean standard scores on the GFTA-2 between the bilingual and monolingual group, $t(52) = -1.3$, $p = .19$. However, there were 10 children in the bilingual group who were not judged as

having an accent. The current study aimed to target accent as a contributor to lower scores on the GFTA-2; therefore a third group labeled *Accented* in Table 3 that included only bilingual children with accents was created. They were deemed accented because their mean scores fell below 10. Accordingly, children with mean scores on the perceptual scale above 10 (on the proficiency side of the scale) were removed, resulting in 19 bilingual children with an accent. Furthermore, two monolingual children were judged as having an accent and were thus removed from the current analysis. The children in both groups were re-included in the subsequent analyses in this paper. The *Non-Accented* group indicates the bilingual children without accents.

The bilingual children with accents had significantly lower standard scores on the GFTA-2 than monolingual children, $t(40) = -2.25$, $p = .03$. They also had more errors, $t(40) = 3.1$, $p < .01$, suggesting accent results in more errors and lower standard scores on the GFTA-2.

3.2 The Relationship between Perceptual Rating and Standard Scores

In order to examine the relationship between the perceptual ratings of accent and proficiency and standard scores on the GFTA-2, a Pearson-*r* correlation was used.

Results indicated that increased levels of accent (based on the total perceptual score) were associated with a decrease in the standard scores on the GFTA-2. This was apparent in the analysis of the total perceptual rating score being positively correlated with the standard score, $r(27) = .51$, $p = .005$ in the bilingual group. In contrast, proficiency ratings were not significantly correlated with the standard scores on the GFTA-2 for the monolingual group, $r(21) = .14$, $p = .48$.

3.3 Phonological Analysis

3.3.1 Segments

This section first includes the segmental errors present in both groups followed by a comparison of the segments with typical English norms. The phonological processes are then described in terms of typical English development.

All the segments in error from the GFTA-2 for both groups were compiled into four tables. Each row in the table was organized into columns of the segment in error, the position and substitution type and then the total based on token frequency. Segmental errors were separated from cluster errors for ease of reference. Table 5 includes the bilingual segmental errors in English, Table 6 the bilingual clusters, Table 7 the English segments in error and Table 8 the English clusters.

Table 5 Bilingual Segmental Errors in English

Target Segment	Word Position			Total
	Initial	Medial	Final	
θ	f(7), t(4), s(2)	f(14), s(5)	f(14), s(6)	53
ð	d(14)	d(11), z (3)^{m}	d(4)	32
z	s(1), dʒ(3), z^{l}(1)^{c}	s(3), z^{l}(1)^{c}	ø(3), s(1), z^{l}(1)^{c}	14
v	f(1)^{c}, b(3), w(4), r(1)^{m}		ø(3)	13
l	ø(1)^{c}	ø(1)^{c}	ø(8) w(1)^{m}	11
n			ø(4)	5
d			η(1)^{m}	
t			ø(4)	4
ʃ	s(2) ʃ^{l}(1)^{c}		ø(4)	4
s	s^{l}(1)^{c}	s^{l}(1)^{c}	s(1)	4
tʃ			s^{l}(1)^{c}	3
r	w(1)^{c}		ʃ(2), ø(1)^{m}	3
dʒ			ø(1)^{c}, w(1)^{m}	3
m		η(1)^{c}	ø(1)^{c}, tʃ(1)^{m}	2
f	ft(1)^{m}		ø(1)^{m}	2
g			ø(1)^{m}	2
k			ø(2)	2
w	v(1)^{m}		ø(1)	1
Sum:	49	40	70	1
				159

Note. ø=deletion, ^{l}=lateral release (lisp), ^{m}=Mandarin only error, ^{c}=Cantonese only error, tokens in parenthesis

Table 6 Bilingual cluster errors

Word-Initial Cluster	Substitutions	Total
kl	kr(5), k(1)[c]	6
kw	gw(4), kəw(1)[c], kr(1)[m]	6
kr	kw(3), gr(1)[c]	4
dr	d(1)[c], dw(2)[m], dl(1)[c]	4
br	b(3)	3
fr	f(2)[c], fw(1)[c]	3
gr	g(1)[c], gw(2)[m]	3
gl	gr(2)	2
st	t(1)[m], s[l]t(1)[c]	2
bl	bəl(1)[c], b(1)[m]	2
sw	səw(1)[m], s[l]w(1)[c]	2
sl	s[l]l.(1)[c]	1
sp	səp(1)[c]	1
pl	pw(1)[c]	1
Sum:		40

Note.,[l]. = lateral release (lisp), tokens in parenthesis

Table 7 Monolingual Segmental Errors for English

Segment	Position			Total
	Initial	Medial	Final	
	f(2)t (1) s (2)	f (4) s (2)	f(4) s (2)	18
θ		z (1)		
s	s^{l}(6)	s^{l}(4)	s^{l}(4)	14
r	w (4)	w (4)	w (4)	12
	ʒ̰ (1),	ʒ̰ (1),	ʒ̰ (2)	7
z	z^{l}(1)	z^{l} (2)		
	tʃ^{l}(1)	ts (2),	ts(1)	6
tʃ		tʃ^{1} (1)	tʃ^{1} (1)	
dʒ	dʒ^{l} (2)	dʒ^{l} (2)	dʒ^{l} (2)	6
ð	d(2)	d(2)		4
ʃ	ʃ^{l} (1)	ʃ^{l} (1)	ʃ^{l} (1) s(1)	4
v	l (1)			1
l	r (1)			1
Sum:	25	26	22	73

Note. ^{1} = lateral release (lisp), tokens in parenthesis

Table 8 Monolingual cluster errors

Word-Initial Cluster	Substitutions	Total
dr	dw(3)	3
fr	fw(3)	3
kw	kw(3)	3
sp	s^{l}p(3)	3
sl	s^{l}l(2)	2
fl	f(1),	2
	fw(1)	
sw	s^{l}w(1)	1
st	s^{l}t(1)	1
	Sum:	26

Note. ^{1} = lateral lisp, tokens in parenthesis

The segmental errors were organized into English monolingual developmental norms in Table 9 to demonstrate the similarities and differences between the English phonology of monolingual and bilingual children. The expected category includes developmentally appropriate errors, whereas the delayed category consists of errors used by younger children (Smit, 1993a). Atypical are patterns used by speech impaired monolingual children (Roberts et al., 1998; Shriberg, 1993). Structural errors such as cluster reduction errors are not included in the segment analysis because they are not considered segmental (Dodd & Iacono, 1989).

Table 9 Segments showing Errors for English

Monolingual Group	Bilingual Group
Expected	Expected
/θ/ (9), /s/ (14), /ɹ/ (12)	/θ/ (17), /s/ (3)[c], /ɹ/ (2)[c]
/z/ (10), /tʃ/ (7), /dʒ/ (5)	/z/ (11), /tʃ/ (2), /dʒ/[m] (1)
/ð/ (4), /ʃ/ (4), /v/ (1)	/ð/ (32), /ʃ/ (3), /v/ (9)
/l/ (1)	/l/ (1)[m]
Delayed	Delayed
Atypical	Atypical
	/w/[m] (1), /m/[c] (1)
	/n/[m] (1)

Note. The token frequency of errors is in parentheses; [c] is a Cantonese only error, [m] is Mandarin

The bilingual group had a total of 84 segment errors across children on the GFTA-2 and the monolingual group had 67 errors. As expected in hypothesis 3, the segments in error between the three languages were mostly similar and in accordance with monolingual typical development; children had difficulty with fricatives, affricates, and liquids. Unexpectedly, there were three atypical errors made by the bilingual group, namely for /w/, /m/, and /n/.

3.3.2 Phonological Processes

Table 10 presents the phonological process (both segmental and structural) organized into English monolingual developmental categories to demonstrate the differences between the processes used by bilingual and monolingual children. Studies by Grunwell (1981), Stoel-Gammon and Dunn (1985), and Porter and Hodson (2001) were used to determine developmental appropriateness, and Dodd and Iacono's (1989) data on six children were used to determine atypical phonological processes.

Table 10 Phonological Processes

Monolingual Group	Bilingual Group
Expected	Expected
Depalatalization (5), Gliding (33), Stopping of /θ/ or /ð/ (5)	Depalatalization (16), Gliding (6), Stopping of /θ/ or /ð/ (33)
Delayed	Delayed
Assimilation (10), Cluster Reduction (1), Alveolarization (7), Deaffrication (3)	Assimilation (35), Cluster Reduction (10), Alveolarization (17), Deaffrication (2), Stopping of /v/ (3) Epenthesis (4), Final Consonant Deletion (34)
Atypical	Atypical
	Affrication (3), Devoicing (7), Spirantization (1)[m], Omission of initial and medial consonant (2)[c]

Note. The token frequency of errors is in parentheses; [c] is a Cantonese only error, [m] is Mandarin

The total number of processes, including those of clusters was 174 for the bilingual group and 67 for the monolingual group. As predicted in hypothesis 3, the bilingual group used different processes in their English than the monolingual children. As a result, they might be considered delayed or atypical according to typical monolingual phonological development. The monolingual group used some processes considered delayed; however, the bilingual group had 66% of its processes in the delayed or atypical category, while the

monolingual group had only 30%. A large part of the bilingual delayed errors involved final consonant deletion (19% of the total). This structural error has the greatest opportunity of occurrence on the GFTA-2 because of the number of word-final consonants assessed (25 opportunities on the test), compared with an error such as stopping of /v/, which only has 3 opportunities on the test. Although the stopping of /v/ occurred rarely (3 times across children) and final consonant deletion occurred frequently (34 times across children), stopping may be relatively as prevalent because final consonant deletion has eight times as many opportunities to be present. Both the Mandarin and Cantonese-speaking children used all of the processes, except alveolarization and spirantization, used by the Mandarin children exclusively. The cluster reduction in both groups followed the patterns seen in Smit (1993b): initial /s/ deletion in s-clusters and the liquid deleted in initial stop-liquid clusters.

3.3.3 Results of Cantonese and Mandarin Assessments

None of the Mandarin children had any errors on the Bernhardt and Zhao (2009) assessment out of the 40 words. In contrast, three of the Cantonese children aged 7;8, 8;0, and 8;1 replaced /ts/ with [dʒ] in the Cantonese assessment. According to So and Dodd (1995) /ts/ is acquired later than other sounds and is reported to be difficult for Cantonese learners up to age five. As expected, the segmental acquisition of Cantonese and Mandarin by the bilingual children was developmentally similar to that of their monolingual Cantonese and Mandarin peers. However, only one process (voicing) was used by three children in Cantonese for the /ts/ substitution. This is unexpected and contrary to the bilingual children's English, which included delayed and atypical processes.

3.4 Level of Accent

In order to examine the relationship between the perceptual ratings of accent and the accent variables of AOL, LOR, and time outside Canada, a Pearson-r correlation was used.

Within the variables that were measured as a potential contributor to level of accent, only age of arrival (AOL) was marginally correlated with the total rating, $r(9) = -.58$, $p = .058$. Table 11 summarizes all of the relationships between the variables. Only 11 children were included in the analysis of AOL and LOR because not all parents reported the required information on the language questionnaire.

Table 11 Pearson-r correlations of contributors to accent

Accent Variables		df	Total Score
Length of Residence	*r*	9	.47
	p		.14
Length of time outside Canada	*r*	21	-.29
	p		.18
Age of Arrival	*r*	9	-.58
	p		.058
Age	*r*	9	-.20
	p		.29

4.0 Discussion

This study investigated the influence of foreign accent on the results of speech assessments standardized in English and administered to Cantonese-English and Mandarin-English bilingual children, and a monolingual English control group. The results of this study indicated that bilingual children with an accent had significantly lower scores on the GFTA-2 than the control group. Furthermore, the level of accent as measured by the total perceptual score (SLP judgments of accentedness) was negatively correlated with the

standard scores on the GFTA-2. In addition, bilingual children showed errors on the same segments as the monolingual English speakers but used some different phonological processes than the monolingual children. As a consequence they had the potential to be considered delayed or developing atypically according to monolingual speech standards. This chapter includes a discussion of the results related to the hypotheses, followed by an overview of clinical implications with limitations and directions for future research in conclusion.

4.1 The Effect of Accent on the GFTA-2 Standard Scores

As predicted in the first hypothesis, bilingual children with accents had lower standard scores on the GFTA-2. Although the segments in error were similar between the monolingual and bilingual group (difficulties with liquids, affricates, and fricatives), the bilingual group, on average, had more errors. It appears that the higher number of errors in the bilingual group was due to the presence of foreign accent because certain fricatives, and affricates are also difficult for bilingual Cantonese and Mandarin speakers of English and characterize the accented speech typical for speakers of those languages (Cheng, 1991). Specifically, /v, z, ʃ, ʧ, ʤ, θ, ð/ were difficult because they are not present in Cantonese or Mandarin. By design, the GFTA-2 did not differentiate accent errors from those of monolingual children. Therefore, bilingual children with accents would likely have standard scores on the GFTA-2 below those expected from monolingual children. Previous research has demonstrated that the three languages have a similar order of acquisition of segments common to the languages (Smit, 1993; So & Dodd, 1995; Zhu & Dodd, 2000a); however, none has quantified the number of errors made on these segments by bilingual children

compared with their monolingual peers. That the number of errors was greater, but the standard scores were still in the average range is important to note.

On average, the standard scores of the bilingual children on the GFTA-2 were not in the impaired range for either the accented (standard score of 91) or the non-accented (standard score of 99) bilingual children. Similarly, previous research on Cantonese-English bilingual children found that younger children (25 to 41 months) have a typical number of sounds in error (5%) in their English (Dodd, So, & Wei, 1996). Combined with the older children in the present study, the results suggest that Cantonese and Mandarin bilingual children may fall in the average range of number of English sound errors as a group. Where the present study diverges from past research is the comparison of the errors to accent.

Even when the presence and degree of foreign accent were taken into account, the bilingual children as a group were in the average range of scores on the GFTA-2. When the performance of each child was examined individually, however, the possible effect of strong foreign accent on the lower standard scores on the GFTA-2 became clearer. Six of the bilingual children (24% of the bilingual sample) were in what would be designated as a speech-impaired range (i.e., they had a SS $<$ 85). These six children also had some of the highest mean accent ratings at or above 6, indicating a mid- to strong accent. Taken together, these findings suggest that bilingual children with accents will not necessarily fall in the impaired range, but those with stronger accents are at a greater risk of doing so.

Not only do bilingual children with accents have lower scores on a standardized measure of English speech, but it was also found that an increase in the degree of foreign accent was associated with a decrease in the standard score on the GFTA-2. These findings support past research that revealed a stronger accent is associated with more phonetic errors

in accented speech (Anderson-Hseih, Johnson, & Koehler, 1992; Brennan & Brennan, 1981; Munro & Derwing, 1995). SLPs' perception of accent may involve more than the detection of segmental errors, though.

In addition to segments, previous research has demonstrated that prosody can also contribute to the degree of accent (Anderson-Hseih, Johnson, & Koehler, 1992; Munro & Derwing, 1995). In fact, out of all the variables measured by Anderson-Hseih, Johnson, & Koehler (1992), prosody had the highest correlation with accent. Although prosody was not measured in the present study, it is possible that the SLPs used it when making their judgments. Munro (2008) proposed that linguistic experts base their perceptual judgments on research pertaining to the qualities that most impact speech. Whereas the majority of research in speech pathology describes the segmental variation of speech (e.g., Smit, 1993, Porter & Hodson, 2001), we do not know the contribution of prosodic variation to perception of speech. Further research may need to be done on the relationship between speech impairment and prosody. An important finding associated with the relationship between accent and segmental errors was the reliability of SLP's accent judgments.

Past research on the perception of speech impairment has shown that SLPs can reliably agree on the severity of impairment in school-aged children (Rafaat et al., 1995). The present study has demonstrated that a group of SLPs can also reliably agree on the determination and degree of accent. These findings suggest the perception of accent is a reliable tool for SLPs and the high level of agreement in terms of the ICC (.92) suggests the level of agreement could generalize to SLPs outside of the present study with similar backgrounds and experience.

In contrast to the findings on accent, the perceptual rating of proficiency on the total proficiency scale was not related to the standard score in monolingual children. All but one of the monolingual children in the study had normal speech according to the GFTA-2 criteria (one child had a lateral lisp, which can put a child in the impaired range because of the number of s-clusters on the GFTA-2). As a result there was not much variation in proficiency, possibly contributing to the lack of relationship. In Rafaat et al.'s study (1995) there was no correlation between standard scores on the GFTA and the perception of speech impairment in children with low to mild phonological impairments, similar to the current study. These results suggest that when a sound feature is perceptually mild or normal no patterns in the variation will be found.

4.2 Phonology Comparisons

The phonological analysis of the results of the GFTA-2 indicated that bilingual segmental development is similar to that of monolingual development. However, there were three segments in error /m, n, w/ in the bilingual phonology that would be considered atypical according to monolingual developmental research (Shriberg, 1993). In fact, errors on /m/, /n/ and /w/ would be consistent with errors made by children who have persistent speech impairment because these segments are generally acquired earlier (Roberts et al., 1998; Shriberg, 1993). However, the design of the GFTA-2 accounts for the /m/ and /n/ errors. The /m/ and the /n/ both presented as the velar [ŋ] once each. These /m/ and /n/ patterns are consistent with assimilation because the elicitation word for the medial /m/ was /swɪmɪŋ/, making the influence of the final velar a possibility, and the elicitation word for final /n/ was /klɑʊn/ with the low back and mid-high vowel assimilating with the final consonant /n/ with [ŋ] as a result. The /w/ to [v] pattern is not as clear. Mandarin does not

have a /v/ consonant and therefore the substitution of a [w] is a common pattern for accented English (Cheng, 1991). The reverse is not observed in bilingual research, however. The elicitation word for initial /w/ was /wɪndo/ and on a narrowly transcribed second examination, the child produced [i^{w}ndo]. It may be the /w/ was assimilated with the high front vowel, resulting in the perception of a [v] to the assistant. In contrast to the phoneme-based analysis, a pattern analysis involving the description of phonological processes revealed more errors that may be considered delayed or atypical, but are logical given word contexts and accent.

As expected, because the phonological processes apparent in the bilingual children's English were distinct, they could be considered delayed or atypical according to monolingual English normative data. However, the children did not have difficulties with the segments that would suggest speech impairment on the Cantonese and Mandarin L1 assessments. In addition, a bilingual analysis revealed the contribution of accent to the sound errors, differentiating accent from impairment in the bilingual children. The contrastive analysis by Cheng (1991) accounted for the most common delayed and atypical phonological processes used by the bilingual children, such as final consonant deletion, epenthesis and cluster reduction. In addition, the substitution patterns reported in Cheng (1991) accounted for the alveolarization (/θ/ to [s] in Cantonese and /ð/ to [z] in Mandarin), and devoicing (/z/ to [s] and /dʒ/ to [tʃ]). Cheng's (1991) anecdotal data accounted for 92% of all the phonological process errors considered delayed or atypical. From these comparisons, it becomes clear that the speech errors in the bilingual group were likely due to language interaction between their L1 and L2, and not due to a speech impairment. Not all processes were accounted for in Cheng's (1991) data, however.

Affrication, and initial and medial consonant deletion are atypical patterns and assimilation and stopping of /v/ are delayed patterns left unexplained by the contrastive analysis. Previous research on bilingual children can account for some of the remaining processes. The two bilingual Cantonese children in the study of typical phonology by Holm and Dodd (1999) ceased to use assimilation, affrication, and initial consonant deletion before age 3, and stopping before age 4, contrary to the children in the current study. As mentioned previously, Holm and Dodd only had two participants compared to the 29 in the present study, possibly accounting for the difference.

Participant variables may also explain the differences between the two studies. The two children in the Holm and Dodd (1999) study arrived in Australia at six months, whereas the children in the present study arrived in Canada between two and ten years of age. Previous research has demonstrated that older ages of arrival (AOL) are associated with higher levels of accent (Flege, Munro, and Mackay, 1995). It is therefore possible that the children in the present study have stronger accents impacting their phonology.

Although assimilation is found in bilingual research, possibly accounting for some of the errors (Holm & Dodd, 1999), the use of that phonological process may have been due to the design of the GFTA-2. Assimilation occurred exclusively on the /θ/ in both the bilingual and monolingual group. The elicitation words for the /θ/ in the GFTA-2 are /baθ/, /baθtʌb/, and /θʌm/. All of these words include a labial consonant /b/ or /m/ triggering assimilation with the fricative, resulting in /f/, the common error pattern for English monolinguals also.

In contrast to the bilingual children's English, the Chinese and Mandarin of the children did not have distinct phonological patterns from typical monolingual children in

those languages. This is contrary to Holm and Dodd (1999) who found the children made errors atypical of monolingual development in their Cantonese and English. So and Dodd (1995) found that Cantonese children acquired their phonemic inventory earlier than English children. In addition, across Mandarin and Cantonese monolingual children, all processes appear to be suppressed by the age of five (So & Dodd, 1995; Zhu & Dodd, 2000a), which is younger than all the participants in the present study. In contrast, English processes may be apparent up to seven (Porter & Hodson, 2001). Therefore, it is possible the bilingual children in the present study had mastered their L1, but still had difficulties with English.

In summary, the differences in processes used by bilingual children in the present study suggest that bilingual children have some differences in their phonological system from monolingual children in English. Because of the distinct system, the bilingual children could be considered as delayed or impaired in their phonological acquisition. However, all of the segment errors and most of the process errors could be explained by accent (Cheng, 1991) and bilingual research and the design of the assessment explained the remainder (Holm & Dodd, 1999). Therefore, the errors produced by the bilingual children are likely due to language interaction and bilingual development, and not indicative of a speech impairment.

4.3 Clinical Implications

This section begins with a discussion of the clinical environment in which tests standardized to English might be administered to bilingual children. This is followed by the implications of administering such tests and ways in which SLPs can account for the errors.

Finally, the incorporation of the results into clinical practice is discussed with ideas for the practical application of the results.

The current diagnostic criteria for speech impairment along with a lack of appropriate tests may contribute to bilingual children being assessed with tests standardized for English. As previously mentioned, SLPs in North America generally do not have access to assessments standardized for languages other than English (Goldstein, 2001). Furthermore, there are situations where a standardized assessment is necessary. According to the manual of the GFTA-2, standardized tests of phonology were created to accommodate agencies' need for quantitative data to allocate funding for special needs. One such special need may be a phonological disorder. The three criteria for diagnosing a phonological disorder according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) are (1) the child not developing sound skills appropriate for his or her age, and (2) the poor sound skills interfere with success at home and school. (American Psychological Association, 2000). The first and last criteria require standardized measures. These guidelines along with the lack of assessments in languages other than English (Goldstein, 2001) may compel SLPs to use tests standardized for English on bilingual children.

Although it has been stated that bilingual children should not be assessed with monolingual standardized tests because their speech error patterns were not included in the normative data (Crago & Westernoff, 1997; Goldman & Fristoe, 2002), the standard scores of bilingual children have not been examined. Prior to the present research it would not have been possible to make a conclusive statement that a bilingual child with an accent will have a lower score than a monolingual child on the GFTA-2. Such a statement is now

supported. However, as a group, the bilingual children did not present in the impaired range. If they were assessed individually though, 6 out of the group of 25 (or 24%) would be in the speech-impaired range according to the GFTA-2. If we assume bilingual children are being assessed using inappropriate measures due to the reasons outlined above, it is possible that in general, as a group, they are not being misdiagnosed as speech impaired. However, it is the individual children (24% of the bilingual children in the present study) that presented as speech impaired that are a concern.

Compared with the prevalence of speech delay in the general population (9%; Shriberg, Tomblin, and McSweeney, 1999), the proportion of bilingual children in this category is almost three times as great. If the same number of Cantonese and Mandarin bilingual children enrolled in a school district were assessed incorrectly as having speech impairment, the result would be a large drain on the education system and increased SLP caseloads. As shown, it was the stronger accented children that fell into the impaired range. It is these accented children that underlie the need for assessments that are standardized for languages other than English and for bilinguals. The present study reveals ways in which these children can be identified before they are misdiagnosed.

When the results of the contrastive analysis of accented speech (Cheng, 1991) were taken into account, none of the bilingual children in the present study would be in the speech-impaired range. This is similar to previous research that has attempted to take dialectal variation into account when using standardized assessments (Cole & Taylor, 1990). That a similar accounting for errors in the present study eliminated the children in the speech-impaired range touts contrastive analysis as an important tool in determining the

effect of accent on bilingual output. In addition to a standardized analysis, the present research also examined the effective use of assessments targeting a bilingual child's L1.

Ideally, a bilingual SLP of the same L1 as the child should administer a normative test of phonology in the child's L1 (Crago & Westernoff, 1997). Accordingly, the results of the L1 assessments in the present study were integral in evaluating the bilingual child's speech. The current study revealed that bilingual children's segments in the L1 were similar to the monolingual children's. However, if atypical errors on the L1 assessments had been present, a speech impairment may have been suspected. If these assessments had not been available, these atypical errors may have been missed. However, an understanding of monolingual development may not be enough to understand bilingual phonology.

Previous research has shown and the present research confirmed phonological process development is distinct from monolingual development in bilingual children (Holm & Dodd, 1999). Therefore, the bilingual SLP should also have a good understanding of monolingual and bilingual research to be able to analyze the processes in terms of developmental appropriateness. The understanding of the bilingual research applies to non-bilingual SLPs as well. When L1 tests other than English are not available, the results of the present research have some practical applications.

One such application may be the development of a standard questionnaire for SLPs when assessing a bilingual child. The present research has shown AOL is a possible indicator of level of accent, level of accent is related to number of segmental errors on a standard test, and a sentence carried enough information for SLPs to make a reliable judgment of accent. Therefore, the questionnaire may consist of a question determining AOL and a Likert scale from 1 being no (or low) accent and 9 being strong accent on the

questionnaire to quantify the accent level. These can be obtained and rated during the interview process and contribute to the determination of which type of assessment to use and the interpretation of the results.

4.4 Limitations of the Study

The present study required an accurate account of the children's phonology. However, two limitations to the study may have contributed to an inaccurate representation of their phonology. The delayed repetition task was used successfully in past research to reduce imitation (Flege, Munro, & Mackay, 1995). However, in that study repetitions by the examiner were not allowed and the sentences were short. In the present study, however, the examiner allowed repetitions to account for morphosyntactic errors and missed words that occurred. The repetitions occurred due to the length of the sentences; the children may have had difficulty remembering them. The multiple repetitions may have led to more imitation and less segmental variation due to accent. In the future, shorter sentences would be preferable, especially when working with young children. Furthermore, the delayed repetition task in the Flege, Munro, and Mackay (1995) study framed the repetition as a response to an intervening question, making it easier to recall. In the current study the children counted to five out of context of the repeated sentence possibly making it more difficult to remember. The counting was assumed to be easier for the bilingual children who were not familiar with English. In the future, an intervening question would be preferable to ensure that the children remember the sentence.

Repetition on the GFTA-2 may have led to some imitation as well. When a bilingual child did not know the label for an item on the GFTA-2, the examiner had to say the item with the child repeating. These repetitions may have reduced the number of segmental

errors in the study because the children were imitating the examiner's correct pronunciation rather than their own, possibly confounding the results. The same problems occurred on the Mandarin and Cantonese assessments. These issues may indicate that some of the vocabulary items on the respective tests are not suitable for bilingual children. Items such as *shovel* on the GFTA-2 were difficult for the newly arrived Mandarin and Cantonese speakers as it is probably not common in their English-speaking environment, whereas *bus*, /pasi/, was difficult for the Cantonese children on the CSPT as it is a school item and probably more familiar in English. The most difficult word for the Mandarin children was *vegetables,* /ts^{h}ai/. A bilingual assessment would have to take into account the vocabulary used in the L1 and L2 contexts. In the case of the present study, school vocabulary would be appropriate in English, whereas home items would suit Cantonese and Mandarin.

In addition to imitation, the design of the perceptual rating scale may have confounded the results. As mentioned, the design of the accent and proficiency rating scale did not allow for a direct means comparison of the two variables. Therefore, a total perceptual rating score scale was created, possibly an arbitrary measure. There was evidence that the scale was a valid representation of accent and proficiency (e.g., the high percentage of rating scores associated with each side of the spectrum); however, accent and proficiency are not naturally on two ends of the same spectrum. This design may have especially affected scores that were closer to the central 10 range on the total perceptual scale. For example, it is possible that a child with a low accent was put in the low proficiency range because of a few high proficiency ratings by some raters. In the future, accent and proficiency should be rated separately.

4.5 Directions for Future Research

The results from the phonological processes on the Cantonese and Mandarin assessments suggest that the bilingual children did not have a speech impairment; however, further research with larger numbers of children is required to determine the repertoire of processes bilingual children use and their typical development. SLPs need to know what to expect in the typical and atypical speech of bilingual children in order to make diagnostic and therapy decisions.

In particular, there have been no previous studies on the development of Mandarin bilingual speech in children; therefore, the present study contributes data on the segments and processes used by bilingual Mandarin children. In general it appears Mandarin and Cantonese bilingual children have similar orders of acquisition of segments and use similar processes in their English. In terms of segments, the bilingual Mandarin children showed difficulty with most of the same segments as the bilingual Cantonese children. The segments that Mandarin children showed errors for exclusively were /dʒ/, /w/, and /n/. In terms of processes, the Mandarin children mostly used the same processes as the Cantonese speakers; the only differences were spirantization used by Mandarin speakers and omission of English initial and medial consonants used by Cantonese speakers. It is not surprising that the two languages were similar because they have similar segments and show similar processes in their development (So & Dodd, 1995; Zhu & Dodd, 2000a). Furthermore, as described in chapter 1, Mandarin and Cantonese have been reported to share similar substitution patterns in their accented English (Cheng, 1991).

Although some data on the bilingual language of Mandarin speakers in English and Mandarin was gathered in the present study, longitudinal bilingual research needs to be

done on the acquisition of Mandarin and English, similar to Holm and Dodd (1999) for Cantonese. There were differences between Holm and Dodd (1999) and the present study that need to be investigated further. Currently, there are no bilingual studies of typical or atypical Mandarin bilingual speech with which to compare the present results.

In addition to the future directions in bilingual phonological research, the present study identifies the need for further research in speech perception. Research has been performed on the perception of speech impairment (Garret & Moran, 1992; Rafaat et al., 1995; Shriberg & Kwiatkowski, 1982) and presently the perception of accent. The next direction in the research is to investigate the perception of bilingual impaired speech. In such a study the interaction of accent and impairment could be explored and SLPs analyzed on their ability to agree on accent, impairment or both. Clinically, SLPs may be less reluctant to assess bilingual children with a speech impairment if they have a better idea of its perceptual characteristics.

Finally, the present study has some potential implications on the methods for analyzing bilingual speech. The present study included a segmental (phoneme-based) and a process (pattern-based) analysis in order to include more types of sound errors. Smit (1993a) mentioned that a phoneme-based analysis includes a wider range of sound errors because it includes errors unexplained by processes. In contrast, Porter and Hodson (2001) preferred a pattern-based analysis because targeting processes in therapy allowed an SLP to target multiple phonemes at once. The pattern-based analysis in the present study revealed the unique patterns in bilingual phonology, whereas, the phoneme-based analysis, for the most part, revealed similarities in the two groups. This contrast suggests a pattern-based

analysis may be preferable for future studies on bilingual speech development to examine the differences in phonology from monolingual children.

4.6 Conclusion

CASLPA recommends that the assessment of bilingual children should account for the possible presence of a foreign accent (Crago & Westernoff, 1997). The current study provided quantitative data that supported this recommendation: bilingual children with accents had lower standard scores on the GFTA-2. However, as a group, these children did not fall into the speech impaired range. It was the individual children with stronger perceived accents that were associated with scores in the impaired range (below 1 SD). In general, higher accent was associated with lower standard scores. The phonological analysis of the errors in this study further demonstrated the distinct nature of bilingual speech development and provides SLPs with a pattern of processes that can be expected due to accent when assessing a bilingual Mandarin-English or Cantonese-English child. Without this information, the bilingual children's speech may be considered delayed or atypical according to monolingual normative data. In describing the phonology of the bilingual children, the current study added to the existing research on Cantonese bilingual speech acquisition of English and initiated research on the bilingual acquisition of Mandarin and English. In terms of practice, it was shown that SLPs could rely on their perceptual judgments of accent to determine whether to assess a bilingual child with an assessment standardized to English and predict the possible outcomes of such an assessment.

References

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.* 4th ed. text revised. Washington DC: American Psychiatric Association, 2000.

Anderson-Hsieh, J., Johnson, R., & Koehler, K. (1992). The relationship between native speaker judgments of nonnative pronunciation and deviance in segmentals, prosody, and syllable structure. *Language Learning, 42,* 529-555.

Bernhardt, B. H., & Zhao, J. (2009). Mandarin assessment of phonology: University of British Columbia. Unpublished manuscript.

Brennan, E. M., & Brennan, J. S. (1981). Measurement of accent and attitude toward Mexican-American speech. *Journal of Psycholinguistic Research, 5,* 487-501.

Broomfield & Dodd (2004). The nature of referred subtypes of primary speech disability. *Child Language Teaching and Therapy, 20,* 135-151.

Chan, A. & Li, D. (2000). English and Cantonese phonology in contrast: explaining Cantonese ESL learners' English pronunciation problems. *Language, Culture, and Curriculum, 13*, 67-85.

Cheng, L. (1991). *Assessing Asian language performance: Guidelines for evaluating limited-English proficient students (2nd ed.).* Oceanside, CA: Academic Communication Associates.

Cole, P., & Taylor, O. (1990). Performance of working class African American children on three tests of articulation. *Language, Speech, and Hearing Services in Schools, 21,* 171-176.

Crago, M, & Westernoff, F. (1997). CASLPA – Position paper on Speech-Language Pathology and Audiology in the multicultural and multilingual context. *Journal of the Speech Language Pathologists and Audiologists, 9,* 1-4.

Derwing, T., & Munro, M. (1997) Accent, intelligibility, and comprehensibility: evidence from four L1s. *Studies in Second Language Acquisition, 20,* 1-16.

Dodd, B. (1995). *Differential diagnosis and treatment of children with speech disorder.* London: Whurr.

Dodd, B., & Iacono, T. (1989) Phonological disorders in children: changes in phonological process use during treatment. *British Journal of Disorders of Communication, 24,* 333-351.

Dodd, B., So, L., & Wei, L. (1996) Symptoms of disorder without impairment. In B. Dodd, R. Campbell and L. Worrall (Eds.), *Evaluating Theories of Language Evidence from Disorder.* (pp. 119-136) London: Whurr.

Flege, J. (1995) Second-language speech learning: theory, findings, and problems. In W. Strange (Ed.), *Speech Perception and Linguistic Experience: Issues in Cross-language Research.* (pp. 229-273) . Timonium, MD: York Press.

Flege, J., Birdsong, D., Bialystok, E., Mack, M., Sung, H., & Tsukada, K. (2006).

Degree of foreign accent in English sentences produced by Korean children and adults. *Journal of Phonetics, 34,* 153-175.

Flege, J., Munro, M., & MacKay, I. (1995). Factors affecting strength of perceived foreign accent in a second language. *Journal of the Acoustical Society of America, 97*, 3125-3134.

Garrett, K., & Moran, M. (1992). A comparison of phonological severity measures. *Language, Speech and Hearing Services in Schools, 23,* 48-51.

Goldman, R. & Fristoe, M. (1986). *Goldman-Fristoe Test of Articulation.* Circle Pines, MN: American Guidance Service.

Goldman, R. & Fristoe, M. (2002). *Goldman-Fristoe Test of Articulation Second Edition.* Circle Pines, MN: American Guidance Service.

Goldstein, B. (2001). Assessing phonological skills in Hispanic/Latino children. *Seminars in Speech and Language, 22,* 39-49.

Grunwell, P. (1981). The development of phonology: a descriptive profile. *First Language, 2,* 161-191.

Hodson, B. (1986). *Assessment of Phonological Processes – Revised.* Austin, TX: PRO-ED.

Holm, A., & Dodd, B. (1999). A longitudinal study of the phonological development of two Cantonese-English bilingual children. *Applied Psycholinguistics, 20,* 349-376.

Jones, R. & Evans, S. (1995). Teaching pronunciation through voice quality. *ELT Journal, 43,* 244-252.

Khan-Lewis, N. (2002). *The Khan-Lewis Phonological Analysis Tool.* Circle Pines, MN: American Guidance Service.

Lidz, C. S., & Peña, E. D. (1996). Dynamic assessment: The model, its relevance as a nonbiased approach, and its application to Latino American preschool children. *Language, Speech, and Hearing Services in Schools, 27,* 367–372.

Mackay, I., Flege, J., & Imai, S. (2006). Evaluating the effects of chronological age and sentence duration on degree of perceived foreign accent. *Applied Psycholinguistics, 27,* 151-183.

Munro, M. J. (2008). Foreign accent and speech intelligibility. In J. G. Hansen Edwards & M. L. Zampini, (Eds.). *Phonology and Second Language Acquisition* (pp. 193-218). Amsterdam: John Benjamins.

Munro, M. J., & Derwing, T. (1995). Foreign accent, comprehensibility, and intelligibility in the speech of second language learners. *Language Learning, 45,* 73-97.

Munro (1998). The effects of noise on the intelligibility of foreign-accented speech. *Studies in Second Language Acquisition, 20,* 139-154.

Oller, D. K., & Eilers, R. E. (1982). Similarity of babbling in Spanish- and English-learning babies. *Journal of Child Language, 9,* 565–577.

Piske, T., Mackay, I., & Flege, J. (2001). Factors affecting degree of an L2: a review. *Journal of Phonetics, 29,* 191-215.

Porter, J. H., & Hodson, B. W. (2001). Collaborating to obtain phonological acquisition data for local schools. *Language, Speech, and Hearing Services in Schools, 32,* 162–171.

Rafaat, S. Russell, R., & Rvachew, S. (1995). Reliability of clinical judgments of severity of phonological impairment. *American Journal of Speech-Language Pathology, 4,* 39-46.

Rescorla, L., & Ratner, N. B. (1996). Phonetic profiles of toddlers with specific expressive language impairment (SLI-E). *Journal of Speech and Hearing Research, 39,* 153-165.

Richmond School Board. (2009). *Enrollment Information.* Retrieved from: http://www.sd38.bc.ca/District/About/DAC/S05423F60-060CBFC6

Roberts, J., Rescorla, L., Giroux, J., & Stevens, L. (1998). Phonological skills of children with Specific Expressive Language Impairment (SLI-E): Outcome at age 3. *Journal of Speech, Language, and Hearing Research, 41,* 374-384.

Shah, A.P. (2002). Temporal characteristics or Spanish-accented English: acoustic measures and their correlation with accentedness rating. *Dissertation Abstracts International, 63*, 4147-B.

Shriberg, L. D., & Kwiatkowski, J. (1980) *Natural Process Analysis: A procedure for phonological analysis of continuous speech samples*. New York: John Wiley & Sons.

Shriberg, L. D., & Kwiatkowski, J. (1982). Phonological disorders III: A procedure for assessing severity of involvement. *Journal of Speech & Hearing Disorders, 47,* 256-270.

Shriberg, L. D., & Kwiatkowski, J. (1994). Developmental phonological disorders I: A procedure for assessing severity of involvement. *Journal of Speech & Hearing Disorders, 37,* 1100-1126.

Shriberg, L. D. (1993). Four new speech and prosody-voice measures for genetics research and other studies in developmental phonological disorders. *Journal of Speech and Hearing Research, 36,* 105-140.

Shriberg, L. D., Austin, D., Lewis, B. A., McSweeny, J. L., & Wilson, D. L. (1997). The Percentage of Consonants Correct (PCC) metric: Extensions and reliability data. *Journal of Speech, Language & Hearing Research, 40,* 708-722.

Shriberg, L., Tomblin, J., McSweeny, J. (1999). Prevalence of speech delay in 6-year-old children and comorbidity with language impairment. *Journal of Language and Hearing Research, 42,* 1461-81.

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86,* 420-428.

Smit, A. B. (1993a). Phonologic error distributions in the Iowa-Nebraska articulation norms project: consonant singletons. *Journal of Speech, Language, & Hearing Research, 36,* 553-547.

Smit, A. B. (1993b). Phonologic error distributions in the Iowa-Nebraska articulation norms project: consonant singletons. *Journal of Speech, Language, & Hearing Research, 36,* 931-947.

So, L. (1993). *Cantonese Segmental Phonology Test (research version).* Hong Kong: Department of Speech and Hearing Sciences, Hong Kong University.

So, L., & Dodd, B. (1994). Phonologically disordered Cantonese-speaking children. *Clinical Linguistics & Phonetics, 8,* 235-255.

So, L., & Dodd, B. (1995). Cantonese-speaking children's acquisition of phonology. *Journal of Child Languag*e, *22,* 473-495.

So, L., Dodd, B., & Wei, L. (1997). Speech disorder in preschool children exposed to Cantonese and English. *Clinical Linguistics & Phonetics, 11,* 229-243.

Southwood, M., & Flege, J. (1999). Scaling foreign accent: Direct magnitude versus interval scaling. *Clinical Linguistics & Phonetics, 13,* 335-349.

Statistics Canada. (2006). *Richmond British Columbia Census Demographic Information.* Retrieved from: http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92591/details/page.cfm?B1=All&Code1=5915015&Code2=59&Custom=&Data=Count&Geo1=CSD&Geo2=PR&Lang=E&SearchPR=01&SearchText=Richmond&SearchType=Begins

Stoel-Gammon, C., &. Dunn, C. (1985). *Normal and Disordered Phonology in Children.* Austin, TX: Pro-Ed.

Zhu, H., & Dodd, B. (2000a). The phonological acquisition of Putonghua (Modern Standard Chinese). *Journal of Child Language, 27,* 3-42.

Zhu, H., & Dodd, B. (2000b). Putonghua (Modern Standard Chinese)-speaking children with speech disorder. *Clinical Linguistics & Phonetics, 14,* 165-191.

Appendix A: Definitions of Phonological Processes

Process	Definition
Gliding	A liquid consonant (e.g., /l/) produced as a glide (e.g. [j])
Fronting	A target phoneme at the back of the mouth (e.g., a velar; /k/) is replaced with a front phone (e.g., an alveolar sound; [t])
Depalatalization CHANGE ORDER OF TARGET/SUB	An alveolar fricative or affricate (e.g., [ts]) replaces a palatoalveolar fricative or affricate (/tʃ/)
Stopping	A fricative (e.g., /f/) is replaced with a stop ([p])
Affrication	An affricate (e.g., [tʃ]) replaces a fricative (e.g., /s/)
Deaffrication	A fricative [s] replaces an affricate (tʃ)
Backing	A front consonant (/t/) is replaced with a back consonant ([k])
Assimilation	The spreading of features from one segment to another in the word (or between words) (e.g., [gʌk] instead of /dʌk/)
Weak syllable deletion	An unstressed syllable is deleted, often an initial unstressed syllable ([lun] for /bəlun/)
Epenthesis (Vowel)	A vowel (e.g., /ə/) is inserted between two consonants ([səpun] instead of /spun/)
Cluster Reduction	The deletion of a consonant in a cluster ([bɑk] instead of /blɑk/)
Alveolarization	An alveolar ([t]) replaces another consonant (/θ/)
Spirantization	A target sound becomes a fricative (e.g., /w/, > [v]/

Note: *from Grunwell (1981) and Dodd and Iacono (1989); examples in parentheses

Appendix B: Language Questionnaires

Bilingual Language Questionnaire

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOUR GRADE 1-3 CHILD.

1. What is the full name of *your child*? _____

2. Child's Birth date? _____

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

4. When did your child arrive in Canada? Month____ Year_____

5. Since your child has lived here in Canada, about how much time per year does he/she spend in a **Cantonese/Mandarin speaking** country?

☐ none ☐ 1 to 7 days ☐ 2 to 3 weeks ☐ 1 month ☐ more than 1 month

6. Who speaks **Cantonese/Mandarin** 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

☐ neighbors ☐ shopkeepers ☐ other

7. 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

☐ neighbors ☐ shopkeepers ☐ other

8. How important is it for you that *your child* is able to **speak in Cantonese/Mandarin**?

☐ 5 -- very important

☐ 4

☐ 3

☐ 2

☐ 1--not important at all

9. How important is it for you that *your child* is able to **speak in English**?

☐ 5 -- very important

☐ 4

☐ 3

☐ 2

☐ 1--not important at all

10. Did your child show typical development of speech and language skills in **Cantonese** until you moved to Canada?

☐ Yes ☐ No

11. How **satisfied** are you with *your child's* level of **Cantonese/Mandarin skills / English skills?**

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

The following questions relate to the mother (or the female head of household).

If no mother, then note here and continue with question 17 ○.:

12. What country/province was the mother/guardian born in? _____

    How long has she lived in Canada? _____.

13. What is the mother's native language? _____

14. What language does the mother most often use when addressing her child? _____

    Would you say the mother speaks:

    ☐ only Cantonese

    ☐ both Cantonese and English, but home-language better

    ☐ Cantonese and English equally well

    ☐ both Cantonese and English but better English

    ☐ only English

15. What is the mother's highest level of education completed at this time?

    ☐ none

    ☐ graduated from high school

    ☐ received bachelor's degree (Major: _____)

    ☐ received graduate degree

    ☐ other

The following questions relate to the father (or the male head of the household):

16. What country/province was your child's father/guardian born in? _____

    How long has he lived in Canada? _____.

17. What is the father's native language? _____

18. What language does the father most often use when addressing his child? _____

19. What is the FATHER/GUARDIAN'S highest level of education completed at this time?

- ☐ none
- ☐ graduated from high school
- ☐ received bachelor's degree (Major: _____)
- ☐ received graduate degree
- ☐ other

20. Would you say the father speaks:

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

Thank you very much for your cooperation

Monolingual Questionnaire

PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOUR GRADE 1-3 CHILD.

1. What is the full name of *your child* who is currently in Grade 1-3?

   _____

2. What is *your child's* birth date? ___/____/_____
   day/month/year

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

(country/province/city)

4. Does your child have a nanny who speaks another language? Yes ☐ No ☐
   If yes, what language(s)? _____

5. Does your child receive any formal instruction in a language other than English?
   Yes ☐ No ☐
   If so, what language(s)? _____
   What kind? (tutor at home, group classes, etc.) _____
   How many times per week? _____
   In what area? (speaking ,writing, reading)? _____

6. Has your child ever lived in a non-English speaking country?
   Yes ☐ No ☐
   If so, which country? _____
   When and how long? _____

7. Did your child show typical development of speech and language skills in English?
   Yes ☐ No ☐

8. Please list all of the languages that your child speaks, including his/her native language. (Please indicate the native language by underlining or circling it.)

THE FOLLOWING QUESTIONS ARE ABOUT ACTIVITIES YOU DO WITH YOUR CHILD.

9. Does *your child* : ☐ watch TV in what language: _____
   ☐ listen to the radio _____
   ☐ play computer games _____

10. How many hours of **English** language television does *your child* watch every day?

_____ hours per day

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

PARENTAL DEMOGRAPHICS

The following questions relate to the mother (or the female head of household).

If no mother, then note here and continue with question 25 ○.:

12. What country/province was the mother/guardian born in? _____
How long has she lived in Canada? _____.

13. What is the mother's native language? _____

14. What language does the mother most often use when addressing her child? _____

15. What is the mother'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

The following questions relate to the father (or the male head of the household):

If no father then note here and this is the end○.

16. What country/province was your child's father/guardian born in? _____

    How long has he lived in Canada? _____.

17. What is the father's native language? _____

18. What language does the father most often use when addressing his child? _____

19. What is the FATHER/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

SLP Language Questionnaire

1. In what country were you born? ☐ Canada
   ☐ Other (_____)
   (country/province/city)

2. How long have you lived in Canada? _____

3. How long have you been practicing Speech Language Pathology?

---

4. Which populations have you worked with (children, adults)?

How long for each population?

---

5. Which school districts have you worked in?

How long for each district?

---

6. How long have you been working in this school district?

---

7. How much experience do you have in working with children with a foreign accent?
   ☐ No experience ☐ Moderate experience ☐ Frequent experience

Appendix C: Accent Rating Sheet

Instructions: You will hear a recording of a sentence. For each recording, please circle an accent rating OR a speech proficiency rating where 1 = no accent or low proficiency and 9 = a strong accent or high proficiency. Please circle the number that corresponds to your rating.

1.

Low Foreign Accent **Strong Foreign Accent**

1	2	3	4	5	6	7	8	9

Low Proficiency **High Proficiency**

1	2	3	4	5	6	7	8	9

2.

Low Foreign Accent **Strong Foreign Accent**

1	2	3	4	5	6	7	8	9

Low Proficiency **High Proficiency**

1	2	3	4	5	6	7	8	9

3.

Low Foreign Accent **Strong Foreign Accent**

1	2	3	4	5	6	7	8	9

Low Proficiency **High Proficiency**

1	2	3	4	5	6	7	8	9

4.

Low Foreign Accent **Strong Foreign Accent**

1	2	3	4	5	6	7	8	9

Low Proficiency **High Proficiency**

1	2	3	4	5	6	7	8	9

5.

Low Foreign Accent **Strong Foreign Accent**

1	2	3	4	5	6	7	8	9

Low Proficiency **High Proficiency**

1	2	3	4	5	6	7	8	9

Appendix D: UBC BREB Ethics Approval

The University of British Columbia
Office of Research Services
Behavioural Research Ethics Board
Suite 102, 6190 Agronomy Road, Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - MINIMAL RISK

PRINCIPAL INVESTIGATOR:	INSTITUTION / DEPARTMENT:	UBC BREB NUMBER:
Stefka Marinova-Todd	UBC/Medicine, Faculty of/Audiology & Speech Sciences	H09-00571

INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:

Institution	Site
N/A	N/A

Other locations where the research will be conducted:
Elementary schools in the Richmond and Vancouver school districts also independent schools in the Lower Mainland

CO-INVESTIGATOR(S):

Jamie Lee Hack

SPONSORING AGENCIES:

Social Sciences and Humanities Research Council of Canada (SSHRC)

PROJECT TITLE:
The difference between accent and impairment in children

CERTIFICATE EXPIRY DATE: April 16, 2010

DOCUMENTS INCLUDED IN THIS APPROVAL:	DATE APPROVED:
	April 16, 2009

Document Name	Version	Date
Consent Forms:		
Bilingual Consent (English)	2	March 30, 2009
Bilingual Consent (Cantonese)	1	April 5, 2009
Parental Consent	1	February 24, 2009
Speech Pathologist Consent	1	February 24, 2009
Questionnaire, Questionnaire Cover Letter, Tests:		
Speech Pathologist Questionnaire	1	February 26, 2009
Accent Rating	1	February 26, 2009
Parent Bilingual Questionnaire	1	February 26, 2009
Parent Monolingual/Impairment Questionnaire	1	February 26, 2009
Letter of Initial Contact:		
Speech Impaired Recruitment	2	March 30, 2009
Bilingual Recruitment	2	March 30, 2009
SLP letter	1	February 26, 2009
Monolingual Recruitment	2	March 30, 2009

The application for ethical review and the document(s) listed above have been reviewed and the procedures were

Appendix D: UBC BREB Ethics Approval

found to be acceptable on ethical grounds for research involving human subjects.

Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:

Dr. M. Judith Lynam, Chair
Dr. Ken Craig, Chair
Dr. Jim Rupert, Associate Chair
Dr. Laurie Ford, Associate Chair
Dr. Anita Ho, Associate Chair