Global Accentedness in Children Enrolled in a Mandarin-English Bilingual Program

Charlene Chan, Emily Goodridge, Joelle Lam

Supervisor: Karen Pollock; Reader: Luanne McFarlane

Accentedness in Mandarin-English Bilingual Children

ABSTRACT

The aim of this project was to pilot a study of perceived accentedness in the speech of students enrolled in Mandarin-English bilingual elementary schools in Edmonton. Seventeen students from Kindergarten to Grade Six were recorded repeating three sentences in Mandarin and three sentences in English. Their parents completed a questionnaire adapted from the *Alberta Language Environment Questionnaire* to determine a language richness score in each language based on language exposure and use outside of school. Students' first language was reported to be English (8), Mandarin (3), or Cantonese (6). Three native-English-speaking raters listened to the recorded English sentences, and provided an accentedness rating for each sentence. Three native-Mandarin-speaking raters did the same for the Mandarin sentences. A correlational analysis was conducted to determine the relationship between global accentedness ratings, age of onset, length of exposure, and richness scores in each language. Accentedness ratings in English were relatively low for all participants, regardless of L1, reflecting the role of English as the majority language in the community. Accentedness ratings were significantly correlated with length of exposure in Mandarin, but not in English. Replication with a larger and more evenly distributed sample is necessary. Recommendations for methodological refinement are provided and address participants, stimuli, and the parent questionnaire.

BACKGROUND INFORMATION

The city of Edmonton is home to the largest Mandarin-English bilingual program outside of China. The program, established in 1981 (Wu, 2005), is now offered in 14 public schools

throughout the city, which are attended by approximately 1800 students from Kindergarten to Grade Twelve. These schools support bilingual language development by offering half of their curriculum in English and the other half in Mandarin. It is a two-way bilingual program with children who speak English as their first language learning alongside children who speak Mandarin as their first language in the same classroom. Additionally, it serves as a maintenance program for Chinese students by facilitating regular exposure to Chinese language and culture (Wu, 2005). It also provides children who are moving to Canada from China with a supportive transitional program, helping them to adjust to the Canadian culture (Wu, 2005). Lastly, it can act as an immersion program for students whose first language is neither Mandarin nor English (Wu, 2005). Chinese native-speaking instructors with knowledge of the Chinese culture teach the Mandarin portion of the curriculum, while the English portion is generally taught by native English- speaking teachers who incorporate Canadian culture into their lessons (Wu, 2005).

The Mandarin-English bilingual program in Edmonton has a strong academic reputation with students consistently surpassing the provincial average on Provincial Achievement Tests (Wu, 2005). However, the development of native-like speech production skills by the students enrolled in this program has not been previously studied. The persistence of non-native pronunciation patterns, commonly known as an “accent,” has been a concern of school officials. Establishing an understanding of factors contributing to accentedness will be useful to educators and administrators for curriculum development, and this study represents a first step towards gaining this insight.

In comparison to research in other areas of second language development, such as grammar and vocabulary, there is limited research on pronunciation patterns in second

language learners (Derwing & Munro, 2005). Munro and Derwing (2011) also noted that the number of empirical studies looking at pronunciation instruction is very limited. This in turn gives teachers of second languages less evidence on which to base their practice, resulting in instruction based on intuition rather than research (Derwing & Munro, 2005). Teachers of English as a second language have high interest in empirical information about accent and pronunciation (Derwing & Munro, 2005). Among the studies that have looked at accentedness, most have involved young adults and immigrant learners (Thomson & Derwing, 2015). Therefore, Thomson and Derwing (2015) suggest that more research is needed on pronunciation instruction for learners of a variety of ages. Thomson and Derwing (2015) also highlighted the need for more research on pronunciation instruction for languages other than English.

One factor that has been shown to influence second-language (L2) pronunciation is interference from the first-language (L1) (Zhang & Yin, 2009). Interference from L1 refers to the influence that L1 has on the pronunciation of L2 (Zhang & Yin, 2009). Thus, it has been found that Chinese students may struggle with the pronunciation of English sounds due to interference from similar Chinese sounds. For example, when students are presented with a sound in L2 that does not exist in L1, they may substitute the unfamiliar sound with a similar sound from their L1 (Zhang & Yin, 2009). Certain English sounds (e.g., /æ/, /au/, /θ/, and /ð/) do not exist in Chinese. Therefore, Chinese L1 students may have difficulty perceiving these sounds, and when attempting to produce them, they will substitute the nearest approximation from their L1 (Zhang & Yin, 2009). A common example, is the substitution of /s/ or /z/ in place of /ð/ (Zhang & Yin, 2009). In other instances, a similar sound may exist in both languages, but

have subtle differences in articulation in each. For example, the English sound /ʃ/ (a post-alveolar fricative) differs from the Chinese sound /ʂ/ (a retroflex fricative) (Zhang & Yin, 2009). Another way in which interference can occur is when a sound is produced in the speaker's L1, but not as a separate phoneme. Therefore, the student does not perceive the sound as representing a meaningful phoneme (Zhang & Yin, 2009). For example, in Chinese, /ɪ/ and /i/ do not represent different phonemes, therefore, a Chinese student may not initially hear the difference between these two sounds (Zhang & Yin, 2009). However, in English, /ɪ/ and /i/ do represent different phonemes and are used to differentiate between different words (e.g., "sheep" and "ship") (Zhang & Yin, 2009). A further factor influencing interference is that English and Chinese differ in terms of how phonemes are combined. In Chinese, morphemes are usually composed of a consonant followed by a vowel and there are no consonant clusters (Zhang & Yin, 2009). Therefore, words ending in consonants such as "book" and "bed" would likely pose a challenge for Chinese speakers learning English. "Book" would likely be produced as /bukə/, and "bed" as /bedə/ (Zhang & Yin, 2009). Words containing consonant clusters such as "prompt" would likely also pose a challenge Chinese speakers learning English (Zhang & Yin, 2009). Additionally, different dialects of Chinese will influence English language acquisition differently. For example, Chinese students from Yunnan province commonly have difficulty differentiating between /æ/ (e.g., "b<u>a</u>d") and /e/ (e.g. "b<u>e</u>d"), as well as between /ŋ/ (e.g., "thi<u>ng</u>") and /n/ (e.g., thi<u>n</u>) (Zhang & Yin, 2009). Students from Sichuan often have difficulty differentiating /l/ and /n/ (Zhang & Yin, 2009). Chinese L1 students often do not distinguish between voiced and voiceless consonants (e.g., /b/ and /p/) (Zhang & Yin, 2009). English L1

students on the other hand, typically have difficulty with the aspirations when learning Chinese because aspiration is used contrastively in Chinese, but not in English (Zhang & Yin, 2009).

Global accentedness is a general perception of accentedness, determined by using a Likert rating scale, as opposed to more specific features of accentedness such as voice onset time, prosodic accuracy, speed, and intelligibility. Jesney (2004) conducted a systematic review and identified some factors that are associated with global accentedness in adult L2 learners. The lower an individual's global accentedness rating, the more native-like they sound to a listener. The review found that most studies showed earlier L2 age of onset generally being associated with lower perceived accentedness ratings (Yeni-Komshian, Flege & Liu, 2000; Piske, MacKay, & Flege, 2001), and that higher L1 use was associated with higher accentedness ratings in L2 (Yeni-Komshian, Flege & Liu, 2000; Guion, Flege & Loftin, 2000). Another factor associated with global accentedness was length of residence in the L2 environment, with longer residence being associated with lower accentedness (Flege & Fletcher, 1992).

This study examined factors related to accentedness in school-aged children in a Mandarin-English bilingual program. Specifically, it examined the correlations between age of language onset, length of language exposure, language richness score (i.e., a representation of meaningful exposure and use of a language), and global accentedness ratings by native listeners. It is hypothesized that children with a lower age of onset will have a lower global accentedness rating (*i.e.,* more native-like speech), that children with a longer length of exposure to a language will have a lower global accentedness rating, and that children with a higher language richness score will have a lower global accentedness rating. Since all of the

students in this bilingual program have exposure to both Mandarin and English, accentedness was examined in both languages.

The current study also served as a pilot project for a sentence repetition task, listener rating protocol, and parent questionnaire that will be used in a larger study of speech development in children learning a minority second language in the school setting. That larger scale study will include children learning Mandarin in the Mandarin-English bilingual program in Edmonton, Alberta as well as children enrolled in French immersion programs in Lethbridge, Alberta. The methods from this pilot study will inform the methods used in the larger study.

METHODS

Overview

In this study, elementary students attending a bilingual Mandarin-English school were recorded saying three sentences in English and three sentences in Mandarin. Parents of the students completed a questionnaire about the child's language background. Three native Mandarin-speaking raters and three native English-speaking raters listened to the recordings and rated each sentence on a global accentedness scale. A correlational analysis was used to determine any relationships between language accentedness ratings, participant's age of onset of English and Mandarin, length of exposure to each language, and language richness score. This study was approved by the Human Research Ethics Board at the University of Alberta.

Participants

Participants included 17 elementary school students (ranging from Kindergarten to Grade Six) who were enrolled in a Mandarin-English bilingual program through Edmonton

Public Schools. Flyers were distributed through after-school programs and local churches, as well as by word of mouth in order to recruit participants. Parents were given the option to have a free hearing screening for their child as compensation for participating in the study. Table 1 below shows the demographics of the students recorded.

Table 1
Participant Demographics

Characteristic	Frequency	Percentage
Gender		
Male	3	17.6
Female	14	82.4
Grade		
Kindergarten	1	5.9
One	1	5.9
Two	1	5.9
Three	4	23.5
Four	3	17.6
Five	6	35.3
Six	1	5.9
L1		
English	8	47.0
Mandarin	3	17.6
Cantonese	6	35.2
School		
Meadowlark	10	58.8
Meyonohk	7	41.2

Raters

Six university students were recruited to rate the global accentedness of the participant's sentences. These raters were students from the University of Alberta, selected based on the criteria that they were over 18 years of age, did not have any known hearing impairment, were native speakers of either English or Mandarin, and had not studied or worked in the field of linguistics. Three raters were native English speakers and three were native

Mandarin speakers who also spoke English. Table 2 below shows other languages spoken by the raters beyond their L1. The raters were required to be native speakers of either language because Flege (1984) shows that native speakers are highly sensitive to non-native pronunciations, thus giving us a more accurate perception of whether a production is 'native-like' versus 'non-native-like'. The native English-speaking raters judged the English sentences only and the native Mandarin-speaking raters judged the Mandarin sentences only. Raters were recruited through flyers on campus and word of mouth.

Table 2
Rater Language Demographics

Rater	Other languages spoken	Fluency
Native English Raters		
Rater 101	None	None
Rater 102	French	Limited fluency
Rater 103	French	Limited fluency
	Japanese	Limited fluency
Native Mandarin Raters		
Rater 201	English	Very fluent
Rater 202	English	Very fluent
	French	Quite fluent
Rater 203	English	Very fluent

Background Information Questionnaire

Parents of the study participants completed a background information questionnaire (see Appendix I). The questionnaire was provided in English or Mandarin based on the family's preference. The questionnaire was adapted from the *Alberta Language Environment Questionnaire* (*ALEQ*) (Paradis, 2011), and was used to gather information about the participant's language background and language exposure outside of school, specifically focusing on English and Mandarin. It included questions about the languages spoken to the

participant and the languages the participant uses when speaking to various significant individuals in the participant's life (e.g., grandparents, siblings, parents, day care workers). The questionnaire also revealed time spent in English versus Mandarin activities such as reading, watching TV, and other extracurricular programs. The *ALEQ* is a questionnaire designed for English as a second language (ESL) children. Several modifications were made for the present study. For example, the questionnaire was translated into Mandarin as it may have been the first language for parents of the participants. The main adaptation of the questionnaire was to include questions to understand the children's language development in both English and Mandarin, whereas the *ALEQ* primarily focused on English. For instance, details about age of onset of exposure were obtained for both English and Mandarin. Questions were also added regarding the parents' birthplaces and any trips to taken to Mandarin-speaking countries. Finally, the ALEQ is intended to be given as an interview. However, for the present study, parents completed the paper questionnaire at home.

From this questionnaire, an English and Mandarin richness score was calculated for each participant. The English richness score took three variables into account: English extracurricular activities, English literacy and language activities, and English interactions with friends. To determine the English richness score, the researchers first calculated the total number of hours spent speaking English in extracurricular activities each week. Next, each participant was assigned a score, which accounted for the amount of English literacy and language activities the participant did each week (the range of possible scores was 0 to 10). Next, each participant was assigned a score, which accounted for how often the participant spoke English with friends (the range of possible scores was 0 to 3). Finally, the total English richness score was calculated by

adding the individual scores obtained for each of the three previously mentioned variables. The same calculations were used to also obtain a Mandarin richness score and Other Language richness score. For a detailed description of how richness scores were calculated, see Appendix II. The richness calculation described above differed from that used by the *ALEQ* by accounting for the specific number of hours per week spent in extracurricular activities. The *ALEQ* scored extracurricular language exposure on a 0 to 2 scale (0 = no activities; 2 = activities every day). This modification allowed the richness score to distinguish between children who participate in the same number of activities each week; since activities may vary in length.

The length of exposure score was calculated by subtracting the participant's age of onset from grade level's age (*e.g.,* Grade 1 = 6 years of age). The age of onset was asked explicitly on the questionnaire.

Sentence Repetition Task

Each participant completed a sentence repetition task that involved repeating three English sentences and three Mandarin sentences. Data was gathered by the second and third author because they both spoke Mandarin. Each set of sentences was designed to include many different speech sounds in the particular language, as some sounds are more indicative of accentedness than others (Chan & Li, 2000). The authors attempted to find previous studies that used sentence stimuli and found several describing characteristics of the sentences, but did not find many that had appended the sentences. The English sentences (long version) used for this study were the same as those used in Hack, Marinova-Todd, and Bernhardt's (2012) study, while the Mandarin sentences were developed by using as many sounds in the language as possible. The sentences were controlled for length in order to reduce working memory load.

Two versions of the sentences were created. Longer versions included up to 9 or 10 syllables. Shorter versions were also created for the younger children, and contained 7 to 8 syllables. See Table 3 for both versions of the sentences. See Appendix III for stimulus pictures used.

Table 3
English and Mandarin sentences for repetition task, including Pinyin pronunciation and translation for Mandarin sentences

Sentence type	English	Mandarin
Practice sentence	1. The weather outside is nice.	1. 我喜欢读书。 *wǒ xǐ huān dú shū* "I like to read."
Stimulus sentence, short version	1. The elephant ate a plant. 2. Two big mice chased one little cat. 3. Five sheep get on a long train.	1. 姐姐有一辆汽车。 *jiě jiě yǒu yī liàng qì chē* "My sister has a car." 2. 熊猫喜欢吃苹果。 *xióng māo xǐ huān chī píng guǒ* "Pandas like to eat apples." 3. 他要牛肉和生菜。 *tā yào niú ròu hé sheng cài* "He wants beef and lettuce."
Stimulus sentence, long version	1. The elephant ate a banana plant. 2. Two big mice chased one little black cat. 3. Five sheep get on a long train.	1. 姐姐有一辆彩色的汽车。 *jiě jiě yǒu yī liàng cǎi sè de qì chē* "My sister has a colourful car." 2. 那只熊猫最喜欢吃苹果。 *nà zhǐ xióng māo zuì xǐ huān chī píng guǒ* "That panda likes to eat apples the most." 3. 冰箱里有牛肉和生菜。 *bīng xiāng li yǒu niú ròu hé sheng cài* "There is beef and lettuce in the refrigerator."

According to a systematic review by Jesney (2004), most previous studies used a sentence in order to judge accentedness. There was an increase in accuracy of rater's ratings for phrase stimuli as opposed to shorter words or sounds, which is why this study used sentences (Flege, 1984).

The pre-recorded example sentences were spoken by a Canadian-born university student who had completed seven years of schooling in the Mandarin-English bilingual program. She was recruited because she speaks fluent English and Mandarin and is representative of the target population. Mandarin was her L1 and English her L2. She later learned Cantonese. Sentences were recorded in a quiet room at the university. She read the sentences aloud in English and Mandarin several times. The clearest recordings were chosen as the stimuli.

Each sentence was accompanied by a visual to help support the participant's memory. The sentences and visuals were presented via Microsoft PowerPoint on a laptop. The participants' productions were recorded using a Marantz Professional Solid State Recorder PMD661 digital audio recorder with a Shure WH20 head-mounted microphone. Participants 1-7 were recorded in a quiet room at an after-school program. Participants 8-10 were recorded in a quiet room at a community church. Participants 11-17 were recorded in a quiet area of a local library. Each participant was instructed to listen to a recorded sentence and then repeat the sentence. The participants were allowed to hear the sentence additional times if desired because memory was not the area of interest. One English practice sentence and one Mandarin practice sentence were included to ensure participants understood the task. Each participant was told that the study was investigating sentence repetition ability.

Each participant was presented with all three sentences in one language before being presented with the other language. The language of the first set of sentences presented was alternated between participants to attenuate any effects that language order may have on study results. For example, Participant #1 repeated the English sentences first and then the

Mandarin sentences, and Participant #2 repeated the Mandarin sentences first and then the English sentences. The practice sentences were given in the same order as the stimulus sentences (*i.e.,* the Mandarin practice sentence was given first if the participant repeated the set of Mandarin test sentences first). Practice sentences were given before starting any stimulus sentences.

Initially students were given the option to repeat longer versions of the sentences. This was discontinued after the seventh participant because several students had difficulty repeating the longer Mandarin sentences. For these students, half of the sentence was played and repeated at a time, and recordings were then stitched together using Audacity with a brief pause in the middle. All participants after the seventh student only repeated short versions of the sentences. Recordings were labelled with participant identification numbers and all identifying information was removed from the files.

Accentedness Rating Task by Native Speakers

Listener ratings were completed in a quiet room at the University of Alberta. Rating sessions were run by an undergraduate student volunteer. Each rater completed a questionnaire about their language background to determine eligibility (Appendix I). Listeners were asked to rate a series of sentences in either English or Mandarin according to their native-tongue (i.e., native-Mandarin speakers rated the accentedness of the Mandarin sentences). Stimuli were presented using E-Prime 2.0 software (Psychology Software Tools, Pittsburgh, PA). After hearing each sentence, listeners were asked to rate the sentence on a 9-point Likert scale. A rating of 1 indicated that the speaker sounded native-like, and a rating of 9 indicated that the speaker had a strong foreign accent. A 9-point scale was used because Southwood and Flege

(1999) reported ceiling effects for 7-point scales. Upon reviewing a plethora of other studies, Jesney (2004) concluded that a Likert scale was a reasonable tool for assessing global accentedness as opposed to sliding scales or direct magnitude estimations.

University students were used as raters to prevent any bias in familiar raters. Accentedness ratings can be influenced by an individual's knowledge such as how long the participant has been in the program or what the participant's L1 is. In order for results to be valid, an unbiased rater must be used (Derwing & Munro, 2005). Although there is still a degree of subjectivity in using blinded raters, this method is proven to have high reliability across groups (Derwing & Munro, 2005).

Raters first listened to the original three stimulus sentences, which the elementary-aged participants had repeated. No ratings were required. Then, they were given three practice trials using the participants' recorded practice sentences to familiarize themselves with the rating scale. The practice sentences were not used in the analysis.

Each rater listened to three blocks of sentences, where each block contained all of the participants' sentence stimuli in a randomized order. Thus, each sentence was rated a total of 3 times by each rater (i.e., nine times in total). Each rater controlled the pace of the experiment and the screen did not progress forward until a rating on the keyboard was given. They were given a short break between the blocks, which was controlled by the raters. Raters were not given any information about the mother-tongue language of the speakers. They were told that the sentences were produced by elementary students, that some students may have a speech impediment (e.g., lisps), and that some sentences were edited with a pause in the middle.

The global accentedness rating for each participant was determined by taking the mean of all the ratings across every sentence and rater. Each participant thus received one mean accentedness rating for each language.

RESULTS

While this study had a small sample size, the main purpose of this study was to explore and pilot procedures used for a larger study. The data from the questionnaire and the rating tasks were analyzed using IBM SPSS Statistics 24. The post-hoc analysis involved running separate bivariate correlations to obtain Pearson correlation coefficients of the English variables and Mandarin variables. Correlations were run between English global accentedness rating, English age of onset, English richness score, and English length of exposure. Correlations were also run between Mandarin global accentedness rating, age of onset, richness score, and length of exposure.

Tables 4 and 5 show the accentedness ratings, age of onset, length of exposure, and richness scores for English and Mandarin, respectively, for each participant. There were some patterns in variability of the English and Mandarin accentedness ratings as seen in Figure 1 and 2. For English accentedness ratings, English L1 participants had a smaller variability (SD=0.28) than Mandarin L1 participants and Cantonese L1 participants (SD=0.53, SD 0.47). Table 6 shows the mean for English accentedness ratings is higher for English L1 participants than Mandarin L1 participants (M= 1.50, and M=1.34). This can be explained by an English L1 participant's outlier score of 2.11 (Participant ML4-8S). The rest of the English L1 participants' English accentedness scores are clustered at a lower rating (See Figure 1). For Mandarin accentedness ratings, English

L1 participants had the highest mean ratings (M= 5.12, SD=1.90), followed by Cantonese L1 participants (M=3.62, SD=1.80), and then Mandarin (M=2.15, SD=0.54) (See Table 6). In general, English accentedness ratings are lower than Mandarin accentedness ratings across all participants. Overall there was greater variability in Mandarin accentedness ratings compared to English accentedness ratings.

Data Analysis

Correlation matrices for English and Mandarin are shown in Tables 7 and 8, respectively below. None of the English variables had strong or significant correlations. There were a few non-significant moderate correlations between English global accentedness rating and English richness score (r=-0.384), English age of onset and English richness score (r=-0.473), and English age of onset and English length of exposure (r=-0.417). Mandarin global accentedness rating and Mandarin length of exposure showed a strong and statistically significant correlation (r=-0.519, $p<0.05$), as did Mandarin age of onset and Mandarin length of exposure (r=-0.676, $p<0.01$). There were also non-significant moderate correlations between Mandarin age of onset and Mandarin global accentedness rating (r=0.326) and between Mandarin richness score and Mandarin global accentedness rating (r=-0.308).

Inter-rater reliability was good and excellent among the English and Mandarin raters, respectively. Intra-class correlation (ICC) estimates and their 95% confidence intervals were run on IBM SPSS Statistics 24, based on a mean-rating, absolute-agreement, and two-way random effect model. The ICC estimates for English and Mandarin sentences were 0.802 and 0.940 respectively.

Table 4

English global accentedness ratings, age of onset, length of exposure, and richness scores

ID	Grade	Global accentedness rating	L1	Age of onset (years)	Length of exposure (years)	Richness score
MLK-9S	K	1.556	English	0	5	15.00
MN1-1S	1	1.519	English	0	7	15.00
ML2-17S	2	1.593	English	0	7	14.00
ML3-10S	3	1.593	Cantonese	2	7	18.75
MN3-2S	3	1.333	English	1	8	14.50
MN3-3S	3	1.333	English	0	9	15.00
MN3-7S	3	1.000	Mandarin	3	6	18.50
ML4-15S	4	1.889	Cantonese	4	6	11.75
ML4-8S	4	2.111	English	0	9	15.00
MN4-5S	4	2.296	Cantonese	3	7	10.00
ML5-11S	5	1.074	Mandarin	2	9	12.00
ML5-12S	5	1.926	Mandarin	4	7	9.25
ML5-14S	5	1.741	Cantonese	4	6	11.75
ML5-16S	5	1.333	English	0	10	21.50
MN5-4L	5	1.222	English	0	11	12.00
MN5-6L	5	1.074	Cantonese	3	8	11.00
ML6-13S	6	2.296	Cantonese	3	9	11.75
Mean		1.582		1.706	7.706	13.93
SD		0.412		1.649	1.611	3.30

Note: Global accentedness rating was obtained from a scale of 1 to 9 (1 = native-like, 9 = strong foreign accent). Length of exposure was calculated from child's current age minus the age of onset. Richness score accounts for language of extracurricular activities, literacy and language activities, and interactions with friends.

Table 5

Mandarin global accentedness ratings, age of onset, length of exposure, and richness scores

ID	Grade	Global accentedness rating	L1	Age of onset (years)	Length of exposure (years)	Richness score
MLK-9S	K	6.926	English	5	0	1.00
MN1-1S	1	6.741	English	3	4	7.00
ML2-17S	2	3.593	English	5	2	8.50
ML3-10S	3	2.815	Cantonese	5	4	5.00
MN3-2S	3	5.296	English	3	5	6.00
MN3-3S	3	6.667	English	3	6	7.00
MN3-7S	3	2.185	Mandarin	1	5	8.50
ML4-15S	4	2.778	Cantonese	5	5	10.50
ML4-8S	4	6.148	English	4	5	2.00
MN4-5S	4	6.593	Cantonese	3	4	5.00
ML5-11S	5	2.667	Mandarin	1	10	9.25
ML5-12S	5	1.593	Mandarin	1	10	4.00
ML5-14S	5	2.519	Cantonese	5	5	10.50
ML5-16S	5	3.926	English	5	5	8.50
MN5-4L	5	1.630	English	1	10	2.00
MN5-6L	5	2.222	Cantonese	3	5	5.00
ML6-13S	6	5.111	Cantonese	5	7	10.50
Mean		4.083		3.412	5.411	6.485
SD		1.972		1.622	2.671	3.083

Note: Global accentedness rating was obtained from a scale of 1 to 9 (1 = native-like, 9 = strong foreign accent). Length of exposure was calculated from child's current age minus the age of onset. Richness score accounts for language of extracurricular activities, literacy and language activities, and interactions with friends.

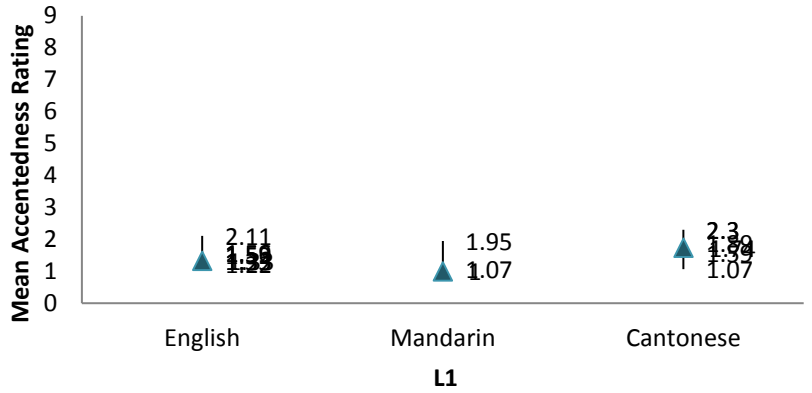


Figure 1. English accentedness rating by participant L1.

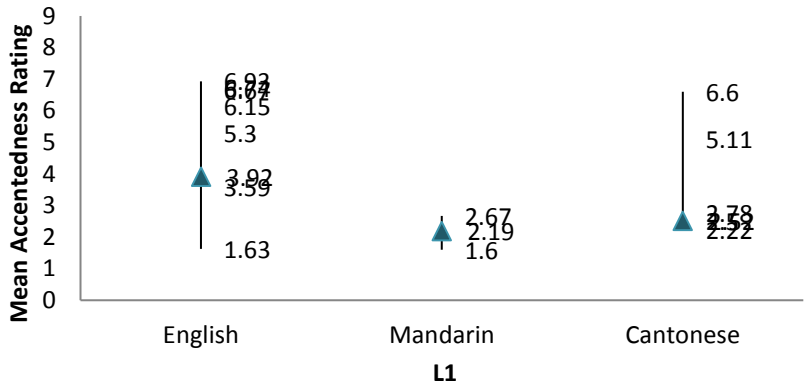


Figure 2. Mandarin accentedness rating by participant L1.

Table 6

Means and standard deviation of English and Mandarin accentedness ratings categorized according to language L1

	English Accentedness Ratings			Mandarin Accentedness Ratings		
	English L1	Mandarin L1	Cantonese L1	English L1	Mandarin L1	Cantonese L1
N	8	3	6	8	3	6
Mean	1.50	1.34	1.81	5.12	2.15	3.62
Standard Deviation	0.28	0.53	0.47	1.90	0.54	1.80

Table 7

Correlation coefficients for English global accentedness rating, age of onset, richness score, and length of exposure

	GAR		AO		RS		LE	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*
English global accentedness rating (GAR)	--							
English age of onset (AO)	0.256	0.321	--					
English richness score (RS)	-0.384	0.128	-0.473	0.055	--			
English length of exposure (LE)	-0.149	0.567	-0.417	0.096	0.058	0.825	--	

Note: * $p < 0.05$, two-tailed. ** $p < 0.01$, two-tailed.

Table 8

Correlation coefficients for Mandarin global accentedness rating, age of onset, richness score, and length of exposure

	GAR		AO		RS		LE	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Mandarin global accentedness rating (GAR)	--							
Mandarin age of onset (AO)	0.326	0.201	--					
Mandarin richness score (RS)	-0.308	0.228	0.038	0.886	--			
Mandarin length of exposure (LE)	-0.519*	0.033	-0.676**	0.003	-0.270	0.918	--	

Note: * $p < 0.05$, two-tailed. ** $p < 0.01$, two-tailed.

Intra-rater reliability was also calculated with IBM SPSS Statistics 24. Table 9, below, shows the intra-rater reliability score for each rater. Scores ranged from good reliability to excellent reliability.

Table 9
Intra-class correlation estimates of raters

Language	Rater	Intra-class correlation estimate
English	E1	0.849
	E2	0.741
	E3	0.714
Mandarin	M1	0.847
	M2	0.910
	M3	0.892

DISCUSSION

Interpretation of Results

Global accentedness ratings for English productions were low (from 1.0 to 2.3 on a 9 point scale), regardless of the L1 of the participants, and were not significantly correlated with age of onset, length of exposure, or richness scores. This is likely due to the fact that English is the dominant language in Edmonton. Thus, native-like English accents, among participants who speak Mandarin or Cantonese as a first language, might be more easily achieved than the antithetical due to inevitable environmental exposure to English. Global accentedness ratings for Mandarin productions were more variable (1.6 to 6.9). Accentedness ratings were not significantly correlated with age of onset or richness scores. However, there was a significant negative correlation ($r=-0.519$, $p=0.033$) between Mandarin global accentedness rating and

Mandarin length of exposure. This means that participants who were exposed to Mandarin for a greater number of years tended to have more native-like Mandarin accents than those who had fewer years of experience with Mandarin. This negative correlation makes sense and aligns with the authors' hypotheses. However, due to the small sample size, further research is needed in order to confirm or null the hypotheses.

The majority of the correlations examined in this study did not reach significance. However, this is not surprising considering the small sample size. Despite not being significant, there were several moderate level correlations, which should be re-examined in future studies using a larger sample size. There was a moderate, non-significant, negative correlation between English age of onset and English richness score ($r=-0.473$, $p=0.055$). Therefore, participants who learned English at a younger age tended to participate in more English activities, and were exposed to more English environments on a regular basis. There was also a moderate, non-significant, negative correlation between English global accentedness rating and English richness score ($r=-0.384$, $p=0.128$). This means that, participants with more native-like English accents tended to participate in more English activities, and were exposed to more English environments on a regular basis. Likewise, Mandarin global accentedness rating and Mandarin richness score were moderately, negatively correlated at a non-significant level ($r=-0.308$, $p=0.228$). Additionally, there was a moderate, non-significant, positive correlation between Mandarin global accentedness rating and Mandarin age of onset ($r=0.326$, $p=0.201$). This means that participants who started speaking Mandarin at a younger age generally had more native-like Mandarin accents than those who started speaking Mandarin at older ages.

In general, accentedness ratings were relatively low for English sentences, regardless of L1. This might be due, at least in part, to English being the majority language in Edmonton. Thus, all participants have likely interacted with native English speakers in functional communication environments on a regular basis. It is likely that most of the children are exposed to more English than Mandarin during the week. The amount of exposure, along with social pressures to speak and learn English, may explain the lower accentedness ratings. Accentedness ratings of Mandarin sentences were low for Mandarin L1 children, but variable for others. This may be due to more variability in opportunities to use Mandarin among children who did not speak Mandarin as a first language (e.g., some Mandarin L2 children may have been exposed to Mandarin by family members and at community events, while others may have only used Mandarin in school). Additionally, the degree of accentedness among Mandarin L2 participants may have been influenced by L1. Some Mandarin L2 participants spoke English as a first language, while others spoke Cantonese. Cantonese is more similar to Mandarin than English is. Therefore, it is likely that Cantonese L1 participants were able to achieve a more native-like Mandarin accent than English L1 participants.

In carrying out this study, the authors were challenged by the following question: what is the target native Mandarin dialect in Edmonton? The target native English dialect can be operationalized based on the predominant dialect of English that is spoken in Edmonton. However, defining the target Mandarin dialect is not as straightforward. Perhaps the target dialect is that which is spoken in a particular geographic area in China. If this is the case, how do we determine which one? Alternatively, the target may be a Canadian dialect of Mandarin, which is distinct from the dialects spoken in China. This issue will need to be explored further in

future research. Teachers, parents, students and administrators from Mandarin-English bilingual schools, as well as members of the local Mandarin speaking community should be consulted in order to develop an answer to this question. Many children in the Mandarin-English bilingual program may have learned Mandarin from a variety of different dialects since it is not the majority language in Edmonton. This makes it difficult to define a target dialect.

The mean accentedness ratings in both languages support the hypothesis of this paper, barring the one outlier English accentedness rating for an English L1 participant. Mandarin L1 participants had the lowest mean score for Mandarin accentedness. Cantonese L1 participants had the next lowest mean score, followed by English L1 participants. This may be explained by Cantonese resembling Mandarin more than English does. Cantonese L1 participants had a higher English accentedness score than Mandarin L1 participants. This result should be interpreted cautiously due to the small sample size of Mandarin L1 participants.

The purpose of this study was to pilot procedures to be used in a larger study. The dearth of significant results can likely be explained by the small sample size, and by the relatively limited number of factors that were incorporated into the language richness scores. These points will be discussed in the next section, along with recommendations for methodological refinements for the larger scale study.

Limitations and Future Directions

Sentence Repetition Task. The stimulus recordings used to elicit sentences from participants were produced by a native-Mandarin speaker who also spoke Cantonese. Although she is representative of the Chinese-born-Canadian population and Mandarin-English bilingual program population, her Cantonese language skills may have affected her pronunciation of

English and Mandarin sounds. In the next study, it is recommended that a Chinese-born-Canadian individual who is a native-Mandarin speaker and fluent in English, who does not know any other languages be used to record the stimuli. This is most representative of the population we are targeting. One way to measure the accentedness of the stimulus recordings is to have all raters rate these sentences as well. Through the ratings, a definition of 'native-like' can be obtained since the stimulus recordings should sound native-like for our population.

While collecting recorded samples of participants, it was noted that repeating the Mandarin sentences was difficult for most participants. Thus, it is highly recommended to support the participant's memory with visuals and to use shorter sentences. However, even with the visuals, it is possible that the participants did not know the words used in the sentences. In the future, it would be helpful to consider whether the vocabulary and grammatical structures are consistent with the curriculum in the Mandarin-English bilingual program. In this study, the shorter sentences may not have included a wide variety of English and Mandarin sounds. Sentences used in future studies should include as many sounds as possible, especially those that are known to be more difficult for second language learners to pronounce correctly. Due to memory load, this study did not use delayed repetition. However, Flege, Munro, and Mackay (1995) found that delayed repetition has been shown to decrease the likelihood of simply imitating the recording, thus producing more spontaneous-like productions. Thus, it is recommended that this be explored further in future studies, perhaps with older populations or with more memory supports in place. Alternatively, in future studies, researchers should consider using a picture description task and sentence repetition. Although, there is value in using the standardized sentences in order to control phonetic content, a

picture description task may provide a better picture of the child's true abilities, as it is a spontaneous response (T. Derwing, personal communication, November 26, 2016).

Participants. Several participants in this study were native-Cantonese speakers. We did not exclude them because this pilot study focuses on methodology. In the future, studies should include more native-Mandarin participants. For participants who speak other languages, it is important to explore how this influences the accentedness of Mandarin and English. For instance, because Cantonese is more similar to Mandarin than English, would it have differing influences on the accentedness of those languages? Participants may also be involved in Cantonese-related extracurricular activities, literacy activities, or interactions, which will affect richness scores in a different way, compared to activities in other non-English, non-Mandarin languages because of the similarity between Cantonese and Mandarin. The effects of other languages on the accentedness of English and Mandarin also influence the raters' judgements. What a rater perceives as a Mandarin accent may in fact be a Cantonese accent on the English sentence. This is difficult to control for and quantify but is a worthwhile direction to pursue.

When recruiting participants, the flyer that was distributed had indicated that participants should have no delay or disorder in their first language development. The questionnaire also asked parents to indicate whether their child had been previously diagnosed with any speech, hearing, language, or learning deficiencies. However, there was at least one participant in this study with a speech sound disorder (i.e., a lisp) that was not indicated by the parent. The participant was not excluded from the analysis due to the small number of participants. In future studies, these children should be screened out and not included in the study as speech sound errors may affect global accentedness ratings assigned by listeners.

Listeners were told to disregard any speech impediments (*e.g.,* lisps) in the recordings, but if the affected speech sounds were the sounds that are known to carry accent, it could impact the assigned rating. Also, the listeners may not be able to distinguish between what is indicative of accent versus what is a speech impediment. The best approach would be to screen these children prior to recruitment, excluding them from the study.

In this pilot study, there were seventeen participants and six raters. For future studies, it is recommended to increase the number of participants and raters in order to increase the validity of the results. Participants repeating sentences should be distributed evenly across the grades in the bilingual programs as well. In the current study, the demographics were skewed towards the older grades, thus giving an incomplete picture of accentedness ratings across the bilingual programs' age span. It would also be beneficial to have a balanced English L1 and Mandarin L1 group, although this is unlikely due to the majority language of the environment (English). For this study, raters were not screened based on other languages they speak; thus, some speak French fluently in addition to English. Future studies should control for these factors as they can influence the rater's perception of English versus Mandarin accents.

Munro and Derwing (2011) pointed out that many studies that have examined the speech of second language learners have focused on the strength of foreign accent, thus implying that native-like production is the goal (Munro & Derwing, 2011). Yet, intelligibility has been observed to be the most important factor influencing successful communication (Munro & Derwing, 2011). Thus, in future work, raters should rate the "comprehensibility" of participants in addition to "accentedness". A 9-point Likert rating scale could still be used to examine comprehensibility with "1" representing "easy to understand", and "9" representing

"difficult to understand"(Tracy Derwing, personal communication, November 26, 2016). Future research should also examine the correlation between accentedness and intelligibility in school-age children. Furthermore, future studies should examine the attitudes of children in Edmonton's Mandarin-English bilingual program towards accentedness. Additionally, the goals of these children with respect to achieving a native-like pronunciation in their L2 should be investigated. Souza, Byers-Heinlein and Poulin-Dubois (2013) conducted a study with five to six-year-old children in Montreal. They found that both monolingual and bilingual children preferred to be friends with people who spoke their language with a native accent as opposed to those who spoke it with a foreign accent (Souza et al., 2013). It would be interesting to see if similar attitudes exist across Canada, and if these attitudes change as children get older.

Background Information Questionnaire. With regards to the questionnaire portion of the study, the survey was based on the *ALEQ*, with some modifications and additional questions. This questionnaire gave a broader picture of participants' language development and use, but at the same time, it did not yield important information that would have been beneficial to include in our analysis (e.g., how many years the participant had been in the bilingual program). Because the *ALEQ* had an established method for calculating language richness scores, which accounted for language of extracurricular activities, language of literacy activities, and language spoken with friends, the language richness scores for this study were calculated in a similar manner. However, these calculations did not account for some information that may have given a more accurate picture of the participants' meaningful language environment (e.g., language in which the participants speak to their parents, number of years lived in Canada, number of years lived in other countries, number of years in the

bilingual program). In this study, the authors developed the richness score (i.e., how it would be calculated) based on questions in the parent questionnaire. For future studies, the method of calculating language richness score should be determined first, and can then be used to guide the development of survey questions. Establishing an idea of what information is necessary to obtain will allow the questionnaire to be more focused with fewer questions, possibly making parental responses more accurate as they remain motivated throughout the entire survey.

Some of the questions on the survey were unclear, and thus did not yield the intended information. This may have been resolved if the ALEQ had been administered as an interview, as the researchers would have been able to explain the question or provide clarification immediately. For instance, when asking about people that the participant interacts with on a regular basis (Appendix I, Section 4, Question 2b), parents are not included in the examples, and thus many responses did not include information on parents. Also, when asking about trips taken to a Mandarin-speaking country (Appendix I, Section 1, Question 7a), the question should explicitly state not to include years lived in a Mandarin-speaking country. The number of years lived in a Mandarin-speaking country should then have been addressed in a separate question. Another distinction that should have been made clear is between Chinese dialects (e.g., Mandarin vs. Cantonese). One participant's parents completed the questionnaire using "Chinese" as the language spoken without specifying the dialect. Since the study is focusing on the Mandarin dialect, other dialects like Cantonese are considered as an "Other" language.

Another important question in the survey that received inconsistent responses was the age at which the child started to learn English/Mandarin. This could mean different things to each parent. For instance, it could imply the age at which the child was first exposed to the

language or the age at which the child began to speak the language. Some parents responded to this question with “age 0”, which is likely the age of first exposure, while others did not indicate an age for any language that was younger than age 1, which is likely the age when they first spoke the language. In order to conduct analyses, there needs to be consistency in the reported age of onset. Because there were quite a few questions in the survey that received inconsistent responses across participants, these questions should either be reworded for better clarity, or the information could be obtained in an interview format, where the researcher could clarify the parent’s responses right away.

There were some questions in this study that should have been asked explicitly in the questionnaire, such as the number of years the participant had been in the bilingual program and the first language learned by the participant. This information could have been calculated or extrapolated from the current questionnaire, but data may have been more accurate if it was asked explicitly. The current questionnaire asks about age of onset of English and Mandarin. It is recommended that there be a question asking specifically about a participant's first language in future studies. In this way, any participants who learned another language learned before the onset of either English or Mandarin is accounted for.

In the current questionnaire, there was an imbalance between the type of questions asked regarding English and Mandarin. For instance, information was obtained about trips to Mandarin-speaking countries while living in an English-speaking country (Appendix I, Section 1, Question 7a), but there was no question inquiring about trips to English-speaking countries while living in a Mandarin-speaking country. This question was intended to inform about L2 exposure, and since all of the participants currently resided in an English-speaking country, it

was assumed that they would all have L2 exposure in the environment. However, this assumption may not hold true for participants who were born in a Mandarin-speaking country and moved to Canada at later age. By keeping the questions balanced between the two languages, it allows a more comprehensive picture of the participant's overall language development in both languages.

CONCLUSION

The findings of this pilot study will be used to inform methodological decisions surrounding the larger scale study on bilingual education in Canada. Most notably, future studies should establish a more concise and focused questionnaire with equivalent questions pertaining to each language. Additionally, future research should incorporate a more robust set of variables into the richness scores for each language. Furthermore, it would be beneficial to recruit a larger number of participants who represent an even distribution of native speakers from each language.

Establishing an understanding of factors contributing to accentedness will be useful to educators, and administrators for curriculum development. The current pilot study has provided some initial insight, which will be built upon in future studies.

Appendix I

UNIVERSITY OF ALBERTA

DEPARTMENT OF COMMUNICATION SCIENCES & DISORDERS

2-70 Corbett Hall
Edmonton, Alberta, Canada T6G 2G4
Tel: 780.492.5990
Fax: 780.492.9333
Corbett Clinic: 780.492.5314
MSc-SLP Inquiries: 780.492.0840
spa@rehabmed.ualberta.ca
www.spa.ualberta.ca

Speech Development in Bilingual School Children – Pilot Study
Chan, Lam, Goodridge, & Pollock (2016)

Parent Questionnaire

Your child must be enrolled in a bilingual Mandarin-English program to participate in this study.

Date: _____
Child's Name: _____
Date of birth of child: _____ Gender of child: _____
School: _____ Grade: _____

Primary Contact: _____
Relationship to child: _____
Phone number: _____
Email: _____

Section 1: Questions about your child

1a. Where was your child born (city, country): _____
1b. How long has he/she lived in Canada (years)? _____
List any countries he/she has lived in for more than one year:

2. Siblings related to your child:
(Please list additional siblings on the back if applicable).

Sibling 1: Date of birth: _____ Gender: _____
Sibling 2: Date of birth: _____ Gender: _____
Sibling 3: Date of birth: _____ Gender: _____

3. Does your child currently go to daycare or have a babysitter/nanny? Yes No

If yes, how many ***hours per week*** are they in daycare/babysitter's care? _____
What is the primary language spoken there? _____
Any further comments:

4. What extracurricular activities (outside school) does your child participate in weekly (Chinese school, sports, music, tutoring, etc.)? Please indicate the language spoken at the activity, and number of hours per week spent at each activity.

Activity	Language Spoken	Hours per week

5. Please describe your child's English-learning experience:

a. Age they started learning English: _____
b. Who did they learn English from (relatives, siblings, playmates, teacher, nanny, etc.)?

c. Environment in which they learned English (home, friend or relative's house, daycare, preschool, school, etc.)? Please describe.

6. Please describe your child's Mandarin-learning experience:
a. Age they started learning Mandarin: _____
b. Who did they learn Mandarin from (relatives, siblings, playmates, teacher, nanny, etc.)?

c. Environment in which they learned Mandarin (home, friend or relative's house, daycare, preschool, school, etc.)? Please describe.

7a. Has your child ever travelled to a Mandarin-speaking country? Yes No
If yes, please indicate how many times and how old your child was during the visits.

	Location	Duration	Approximate age of child at time of travel	Did your child have opportunities to interact with (speak/understand) local Mandarin speakers?
Trip 1				Yes Some No
Trip 2				Yes Some No
Trip 3				Yes Some No
Trip 4				Yes Some No
Trip 5				Yes Some No

8. What literacy and other language activities does your child do each week? (Please rate all that apply)

Reading: includes having books read to them/ looking at books. Most younger children will not know how to read themselves

Computer: includes Internet, games, storybooks on CD-ROM, etc. (include only those computer activities that involve language)
Movies: video or DVD (on computer or television)

2- Everyday
1- At least once a week
0- Almost never/ never

	In English	In Mandarin	In another language: *(please specify language)* _____
Activities	0 1 2	0 1 2	0 1 2
a. Read books or magazines	0 1 2	0 1 2	0 1 2
b. Uses a computer	0 1 2	0 1 2	0 1 2
c. Watches TV or movies	0 1 2	0 1 2	0 1 2
d. Storytelling	0 1 2	0 1 2	0 1 2
e. Singing Songs	0 1 2	0 1 2	0 1 2

9. What is the language(s) spoken between your child and the friends he/she plays with regularly? Please circle all that apply.

English	Never	Sometimes	Usually	Almost Always
Mandarin	Never	Sometimes	Usually	Almost Always
Other *(please specify)* _____	Never	Sometimes	Usually	Almost Always

11. Has your child ever been diagnosed with any speech/ hearing/language/ learning deficiencies, or behavioral/ other developmental problems that may affect his/ her speech. Please check all that apply.

- ☐ Unclear speech
- ☐ Incorrect pronunciation/articulation of a few speech sounds
- ☐ Stuttering
- ☐ Significantly smaller vocabulary than other children of the same age
- ☐ Deficient verbal communication (lack of logic or cohesion in his/her speech)
- ☐ Normal verbal communication, but with reading deficiency which affects his/her school performance
- ☐ Delayed acquisition, but does not have any of the above problems or deficiencies
- ☐ Hearing problems
- ☐ Rarely speaks in general; shows lack of interest in verbal communication
- ☐ Other problems that may affect his/her speech or verbal communication (please specify) _____
- ☐ None

12. Would you be interested in a free hearing screening for your child?* Yes No
* To be conducted at Corbett Hall (U of A) outside school hours.

Section 2: Questions to Parent 1:
Relationship to your child: _____

1. Does the child always live in the same household as you? Yes No
If not, approximately how many days a week does he/she live with you? _____

2a. Where were you born (city, country): _____
2b. How long have you lived in Canada (years)? _____
List any countries you have lived in for more than one year:

3. How much English do you speak? (Circle one option)

0 **Not fluent in English**	**1** **Limited Fluency in English**	**2** **Somewhat fluent in English**	**3** **Quite fluent in English**	**4** **Very fluent in English**
No understanding or speaking ability	Some understanding and can say short, simple sentences	Good understanding and can express myself on many topics	Can understand and use English adequately for work and most other situations	Can understand almost everything. Very comfortable expressing myself in English in all situations.
	E.g. can answer the phone in English	E.g. can go to the doctors and explain what's wrong	E.g. can communicate effectively with teachers at teacher interviews; could work in the service-industry; can follow movies or tv shows.	

Comments/ descriptions of the abilities in English:

4. What language(s) do you speak most often with the other people in your home (not including your child)? _____

5a. Do you work outside the home/are you a student? Yes No
5b. What language do you use in the workplace/ school? _____

6a. What education levels have you (Parent 1) completed?

Education	**Completed?**	**Language of Instruction**
Primary	Yes No	
Secondary	Yes No	
College	Yes No	
University- Degree	Yes No	
University- Master	Yes No	
University- PhD	Yes No	

6b. Please note any other educational experiences here:

Section 3: Questions to Parent 2:
Relationship to your child: _____

1. Does the child always live in the same household as you? Yes No
If not, approximately how many days a week does he/she live with you? _____

2a. Where were you born (city, country): _____
2b. How long have you lived in Canada (years)? _____
List any countries you have lived in for more than one year:

3. How much English do you speak? (Circle one option)

0 Not fluent in English	**1 Limited Fluency in English**	**2 Somewhat fluent in English**	**3 Quite fluent in English**	**4 Very fluent in English**
No understanding or speaking ability	Some understanding and can say short, simple sentences	Good understanding and can express myself on many topics	Can understand and use English adequately for work and most other situations	Can understand almost everything. Very comfortable expressing myself in English in all situations.
	E.g. can answer the phone in English	E.g. can go to the doctors and explain what's wrong	E.g. can communicate effectively with teachers at teacher interviews; could work in the service-industry; can follow movies or tv shows.	

Comments/ descriptions of the abilities in English:

4. What language(s) do you speak most often with the other people in your home (not including your child)? _____

5a. Do you work outside the home/are you a student? Yes No
5b. What language do you use in the workplace/ school? _____

6a. What education levels have you (Parent 2) completed?

Education	**Completed?**	**Language of Instruction**
Primary	Yes No	
Secondary	Yes No	
College	Yes No	
University- Degree	Yes No	
University- Master	Yes No	
University- PhD	Yes No	

6b. Please note any other educational experiences here:

Section 4: Questions about language environment
1. Are there other adult relatives in the home? (e.g., grandparent)? Yes No
If yes, how many? _____
If yes, are one of these adults the child's primary caregiver? Yes No
What is their relationship with the child: _____

2a. Who does your child interact with on a **regular** basis outside of home and school? Please list the relationship of each individual (e.g. day care worker, aunt, uncle, sibling 1, sibling 2, babysitter, coach, other)

2b. For each of the people listed previously, please answer the following questions in the table below using the scale:
0- Never
1- Seldom
2- 50% of the time
3- Usually
4- *Almost always*

List individuals here	How often does this individual speak **English** to your child?	How often does your child speak **English** to this individual?	How often does this individual speak **Mandarin** to your child?	How often does your child speak **Mandarin** to this individual?
Parent 1	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
Parent 2 (if applicable)	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4

If Mandarin and English are the only languages spoken, skip 2c.
2c. If your child regularly interacts with speakers of other languages (not English or Mandarin), please specify which language and complete the following table.

Language: _____

List individuals here (e.g. grandmother)	How often does this individual speak _____ to your child?	How often does your child speak _____ to this individual?
	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4

Thank you for completing this questionnaire!

Appendix II

Appendix II

The following protocol was used to calculate the language richness scores for each child:

English Richness:

1. Go to Section 1, question 4 of the parent questionnaire.
2. Add the **hours** per week for all **English** extracurricular activities (see example below).

Example:

Activity	**Language Spoken**	**Hours per week**
Chinese School	Cantonese	3 hour
Piano	English	45 mins
Swimming	English	1 hour
Tutoring	Mandarin	2 hours
Sunday School	Mandarin	1 hour

Total hours for English extra curricular activities = 0.75 + 1 = 1.75

3. Go to Section 1, question 8 of the parent questionnaire
4. In the **English column**, take the sum of the circled numbers for activities a. through e. (see example below).

Example:
2- Everyday
1- At least once a week
0- Almost never/ never

	In English	**In Mandarin**	**In another language:** *(please specify language)* Cantonese
Activities			
a. Read books or magazines	0 1 **2**	0 **1** 2	0 **1** 2
b. Uses a computer	0 1 **2**	0 **1** 2	0 **1** 2
c. Watches TV or movies	0 **1** 2	**0** 1 2	0 **1** 2
d. Storytelling	0 1 **2**	0 **1** 2	0 **1** 2
e. Singing Songs	0 1 **2**	0 **1** 2	0 **1** 2

Total English score for other literacy and language activities = 2 + 2 + 1 + 2 + 2 = 9

5. Go to Section 1, question 9 of the parent questionnaire.
6. Look at the circled response in the **English row**, and assign the appropriate score. Scores are assigned based on the following criteria: Never = 0, Sometimes = 1, Usually = 2, Almost always = 3 (see example below).

Example:

English	Never	Sometimes	Usually	Almost Always
Mandarin	Never	Sometimes	Usually	Almost Always
Other *(please specify)* Cantonese	Never	Sometimes	Usually	Almost Always

English score for interactions with friends = 3

7. Calculate the total English richness score using the following equation:

English richness score = [Total hours for English extra curricular activities] + [Total English score for other literacy and language activities] + [English score for interactions with friends]

Mandarin Richness:

1. Go to Section 1, question 4 of the parent questionnaire.
2. Add the **hours** per week for all **Mandarin** extracurricular activities (see example below).

Example:

Activity	**Language Spoken**	**Hours per week**
Chinese School	Cantonese	3 hour
Piano	English	45 mins
Swimming	English	1 hour
Tutoring	Mandarin	2 hours
Sunday School	Mandarin	1 hour

Total hours for Mandarin extra curricular activities = 2 + 1 = 3

3. Go to Section 1, question 8 of the parent questionnaire
4. In the **Mandarin column**, take the sum of the circled numbers for activities a. through e. (see example below)

Example:
2- Everyday
1- At least once a week
0- Almost never/ never

	In English	**In Mandarin**	**In another language:** *(please specify language)* Cantonese
Activities			
a. Read books or magazines	0 1 **2**	0 **1** 2	0 **1** 2
b. Uses a computer	0 1 **2**	0 **1** 2	0 **1** 2
c. Watches TV or movies	0 **1** 2	**0** 1 2	0 **1** 2
d. Storytelling	0 1 **2**	0 **1** 2	0 **1** 2
e. Singing Songs	0 1 **2**	0 **1** 2	0 **1** 2

Total Mandarin score for other literacy and language activities = 1 + 1 + 0 + 1 + 1 = 4

5. Go to Section 1, question 9 of the parent questionnaire.
6. Look at the circled response in the **Mandarin row**, and assign the appropriate score. Scores are assigned based on the following criteria: Never = 0, Sometimes = 1, Usually = 2, Almost always = 3 (see example below).

Example:

English	Never	Sometimes	Usually	Almost Always
Mandarin	Never	Sometimes	Usually	Almost Always
Other *(please specify)* Cantonese	Never	Sometimes	Usually	Almost Always

Mandarin score for interactions with friends = 1

Mandarin richness score = [Total hours for Mandarin extra curricular activities] + [Total Mandarin score for other literacy and language activities] + [Mandarin score for interactions with friends]

Other Language Richness:

1. Go to Section 1, question 4 of the parent questionnaire.
2. Add the **hours** per week for all **Other Language** extracurricular activities. If more than one Other Language is present calculate a separate score for each language (see example below).

Example:

Activity	**Language Spoken**	**Hours per week**
Chinese School	Cantonese	3 hour
Piano	Spanish	45 mins
Swimming	English	1 hour
Tutoring	Mandarin	2 hours
Sunday School	Mandarin	1 hour

Total hours for Cantonese extracurricular activities = 3
Total hours for Spanish extracurricular activities = 0.75

3. Go to Section 1, question 8 of the parent questionnaire.
4. In the **Other Language column**, take the sum of the circled numbers for activities a. through e. (see example below). If more than one Other Language is present calculate a separate score for each language.

Example:
2- Everyday
1- At least once a week
0- Almost never/ never

	In English	In Mandarin	In another language: *(please specify language)* Cantonese
Activities			
a. Read books or magazines	0 1 2	0 1 2	0 1 2
b. Uses a computer	0 1 2	0 1 2	0 1 2
c. Watches TV or movies	0 1 2	0 1 2	0 1 2
d. Storytelling	0 1 2	0 1 2	0 1 2
e. Singing Songs	0 1 2	0 1 2	0 1 2

Total Cantonese score for other literacy and language activities = 1 + 1 + 1 + 1 + 1 = 5

5. Go to Section 1, question 9 of the parent questionnaire.
6. Look at the circled response in the **Other row**, and assign the appropriate score. Scores are assigned based on the following criteria: Never = 0, Sometimes = 1, Usually = 2, Almost always = 3 (see example below). If more than one Other Language is present calculate a separate score for each language.

Example:

English	Never	Sometimes	Usually	Almost Always
Mandarin	Never	Sometimes	Usually	Almost Always
Other *(please specify)* Cantonese	Never	Sometimes	Usually	Almost Always

Cantonese score for interactions with friends = 1

7. Calculate the total Other Language richness score for each additional language using the following equation:

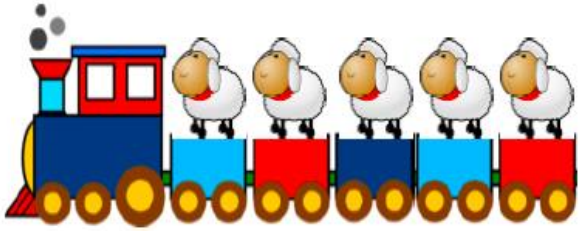
Other Language richness score = [Total hours for Other Language extracurricular activities] + [Total Other Language score for other literacy and language activities] + [Other Language score for interactions with friends]

Appendix III

The following stimulus pictures were presented along with each sentence. The same picture was shown for both the long and short versions of the sentences.

1. The elephant ate a plant.

2. Two big mice chased one little cat.
(http://cliparts.co/black-cat-outline)



3. Five sheep get on a long train.

1. 姐姐有一辆汽车。

2. 熊猫喜欢吃苹果.

3. 他要牛肉和生菜

REFERENCES

Chan, A.W., & Li, D.S. (2000). English and Cantonese Phonology in Contrast: Explaining Cantonese ESL Learners' English Pronunciation Problems. *Language, Culture, and Curriculum, 13*(1), 67-85.

Derwing, T. M., & Munro, M.J. (2005). Second language accent and pronunciation teaching: A research-based approach, *TESOL Quarterly*, *39*(3), 379–97.

Flege, J.E., & Fletcher, K.L. (1992). Talker and listener effects on degree of perceived foreign accent. *Journal of the Acoustical Society of America*, *9*(1), 370-389.

Flege, J.E., Munro, M.J., & MacKay, I.R.A. (1995). Factors affecting strength of perceived foreign accent in a second language. *Journal of the Acoustical Society of America*, *97*(5), 3125-3134 .

Flege, J.E. (1984). The detection of French accent by American listeners. *Journal of Acoustical Society of America*, *76*(3), 692-707.

Guion, S.G., Flege, J.E., & Loftin, J.D. (2000). The effect of L1 use on pronunciation in Quichua-Spanish bilinguals. *Journal of Phonetics*, *28*, 27-42.

Hack, J., Marinova-Todd, S. H., & Bernhardt, M. (2012). Speech assessment of Chinese-English bilingual children: accent versus developmental level. *International Journal of Speech-Language Pathology*, *14*(6), 509-519.

Jesney, K. (2004). *The Use of Global Foreign Accent Rating in Studies of L2 Acquisition*. Report prepared for the Language Research Centre, University of Calgary.

Munro, M. J., & Derwing, T. M. (2011). The foundations of accent and intelligibility in pronunciation research. *Language Teaching*, *44*(3), 316-327.

Paradis, J. (2011). Individual differences in child English second language acquisition: comparing child-internal and child-external factors. *Linguistic Approaches to Bilingualism, 1*(3), 213-237.

Piske, T., MacKay, I.R.A., & Flege, J.E. (2001). Factors affecting degree of foreign accent in an L2: a review. *Journal of Phonetics*, *29*, 191-215.

Psychology Software Tools, Inc. [E-Prime 2.0]. (2012). Retrieved from http://www.pstnet.com.

Southwood, M., & Flege, J. (1999). Scaling foreign accent: direct magnitude versus interval scaling. *Clinical Linguistics and Phonetics*, *13*(5), 335 – 349.

Souza, A. L., Byers-Heinlein, K., & Poulin-Dubois, D. (2013). Bilingual and monolingual children prefer native-accented speakers. *Frontiers in Psychology*, *4*, 953. http://doi.org.login.ezproxy.library.ualberta.ca/10.3389/fpsyg.2013.00953

Thomson, R. I., & Derwing, T. M. (2015). The Effectiveness of L2 Pronunciation Instruction: A Narrative Review. *Applied Linguistics*, *36*(3), 326-344.

Wu, J.Z. (2005). Bilingual education in Western Canada and Chinese language minority students' self perceptions of their citizenship and ethnicity. *Canadian and International Education / Education canadienne et internationale, 34*(1), 22-30. Retrieved from: http://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=1029&context=cie-eci

Yeni-Komshian, G.H., Flege J.E., & Liu, S. (2000). Pronunciation proficiency in the first and second languages of Korean-English bilinguals. *Bilingualism: Language and Cognition*, *3*(2), 131-149.

Zhang, F. & Yin, P. (2009). A Study of Pronunciation Problems of English Learners in China. *Asian Social Science*, 5(6),141-146.