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Interaction in bilingual Cantonese-Putonghua phonological acquisition

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ABSTRACT

This study investigated the existence and mechanism of interaction in bilingual phonological acquisition of two tonal languages (Cantonese and Putonghua). A total of 60 children aged 3;00 to 4;00 were recruited from Hong Kong and Shenzhen, including 20 Cantonese-Putonghua successive bilinguals, 20 Cantonese and 20 Putonghua monolinguals. Cantonese Segmental Phonology Test (So, 1992) and Putonghua Segmental Phonology Test (So & Zhou, 2000) were administered. Occurrences of phonological transfer, phonetic inventories, percentage accuracy of syllable component and accuracy by manner class were measured. The accuracies of shared and unshared sounds were compared in each group to examine if sound categorisation (Flege, 1981) is a systematic pattern of interaction. Results indicated interaction exists between the two phonological systems. In addition, sound categorisation was evident in bilingual phonological acquisition. A clearer picture of bilingual Cantonese-Putonghua phonological acquisition was provided, allowing speech pathologists to make appropriate diagnosis and plan intervention.

INTRODUCTION

Bilingualism is an increasingly common social phenomenon. More than half of the world's population is either bi- or even multi-lingual (Crystal, 1995). Bilingualism can be referred to as a continuum with different proportion of acquisition of the first language (L1) and the second language (L2) (Gass & Selinker, 2008). It can be classified as simultaneous (i.e. L1 and L2 acquisition starts at the same time) and successive bilingualism (i.e. L1 acquisition precedes L2 acquisition). Yavas (1998) suggested that it is common for children to grow up in their home environment with their L1 and start acquiring their L2 when school begins. In other words, most bilingual children are believed to be successive.

One of the most controversial issues in the study of bilingualism is whether bilingual children acquire one language system or two. There have been three hypotheses generated. First, the Unitary Language System Hypothesis, put forth by Volteera and Taeshnter (1978), proposed that bilingual children first acquire a single language system that combines words and grammatical rules of both languages. They then differentiate the single language system into two separate systems for the two languages. Second, the Dual Language System Hypothesis, proposed by Genesee (1989), posits that children exposed to two languages from birth begin the acquisition process with two individual language systems. Third, the Interactional Dual Systems Model, constructed by Paradis and Genesee (1996), suggests that the two language systems of bilingual children do interact with each other.

To illustrate the existence of interaction between two language systems, several interdependence hypotheses such as transfer, acceleration and deceleration were formulated (Paradis & Genesee, 1996). Transfer refers to the phenomenon in which features specific to one language transfer to the other language during production. In particular, segmental transfer refers to language-specific consonants/vowels being transferred to the other language. Many researchers believed that the existence of transfer is suggestive of linkage between the

two language systems. Apart from transfer, bilingual children demonstrate acceleration or deceleration in language development if the rate of acquisition is faster or slower compared to that of monolingual children. Deceleration (i.e. slower rate) is thought to be a result of interaction between the two systems that interferes with acquisition, whilst acceleration (i.e. faster rate) is believed to be a result of interaction that promotes acquisition.

Different researchers have provided evidence for the existence of interaction in phonological acquisition of bilingual children speaking English and another language. Fabiano-Smith and Goldstein (2005) reported occurrence of cross-linguistic effects in bilingual Spanish-English children, supporting the Interactional Dual Systems Model. This model was further manifested in another study by Fabiano-Smith and Barlow (2010) focusing on phonetic inventories. Fabiano-Smith and Goldstein (2010) reported that Spanish-English bilingual children demonstrated transfer and deceleration in phonological acquisition. Macleod and Stoel-Gammon (2005) investigated the phonemic contrasts in the production of the two languages in French-English bilingual children.

The abovementioned research on the Interactional Dual Systems Model focused on bilingual acquisition of Indo-European languages only. Other studies included one Chinese language, which is a tonal language. For instance, Lin and Johnson (2010) found a possible Putonghua influence on a number of English phonological processes in Putonghua-English bilinguals. However, it is not known whether and how interaction occurs in two tonal languages. In particular, interaction between the two tonal Chinese language systems, namely Cantonese and Putonghua, received limited attention. In Hong Kong, Cantonese is the most widely spoken Chinese dialect whilst the need for Putonghua, China's official language, is ever-increasing in the post-colonial era (Li, 2009).

Previous studies on the phonological development of bilingual Cantonese-Putonghua children had different foci. Law and So (2006) focused on one of the possible factors

affecting phonological acquisition, namely language dominance, and suggested it is not the only determining factor. So and Leung (2006) also studied the phonological development of bilingual Cantonese-Putonghua children and illustrated a few examples of phonological interference. However, there has been little work that dwelled on the phenomenon of interaction in bilingual Cantonese-Putonghua phonological acquisition. The first aim of the present study was to investigate whether interaction exists between these two phonological systems.

Another important issue is how the two phonological systems in bilingual Cantonese-Putonghua children interact. Flege (1981, 1987) proposed the theory of sound categorisation, which suggested that second language learners perceive L2 speech sounds in representation of their L1 phonemic categories. That is, new L2 speech sounds similar in nature to an L1 speech sound will be put under the same L1 category. There is controversy concerning the accuracy of similar and dissimilar sound acquisition under this theory. The first saying is that L2 speech sounds dissimilar to any L1 speech sounds are acquired with less difficulty compared to similar ones. This is because dissimilar L2 sounds involve a completely novel articulatory gesture which avoids confusion, hence resulting in a higher accuracy in acquisition.

The second saying about the notion of sound categorization (Flege, 1981) is that L2 learners produce phonetically similar or identical sounds more accurately as they can extend the production of already familiar speech sounds to new (i.e. L2) phonetic contexts.. In support of this, Fabiano-Smith and Goldstein (2010) reported that bilingual Spanish-English children performed better in phonetically similar sounds than phonetically dissimilar sounds. Kormos (2006) concluded that there was no unitary theory on how L2 phonology is acquired, and more research should be done in order to devise a model to illustrate how it is acquired. There is by far no research done in an attempt to examine the mechanism of interaction in

bilingual Cantonese-Putonghua phonological acquisition. Therefore, the second aim of the present study was to examine whether sound categorisation is a systematic interaction between the two phonological systems in bilingual Cantonese-Putonghua acquisition.

Clinical significance

The study of bilingualism is of major clinical significance. According to Broomfield and Dodd (2001), over 6% of otherwise normal children are referred to speech and language therapy clinics for suspected phonological deficits, whilst bilingual children are under-referred. Causes for this under-referral include parental belief that limited language and phonological difficulty are a result of bilingualism. More importantly, there is a lack of insight on the interaction in bilingual Cantonese-Putonghua phonological acquisition. Little is known about how it differs from typical phonological acquisition of the respective monolingual children.

Other clinical issues to address include if phonological deficits always occur in both languages of bilingual children, and if so, whether the two phonological systems are similarly affected. By further exploring the issue of phonological interaction between Cantonese and Putonghua, educators and parents will better understand the characteristics of phonological acquisition in bilingual Cantonese-Putonghua children, and speech and language pathologists will make appropriate clinical diagnosis and plan intervention accordingly.

Cantonese and Putonghua phonologies

Putonghua is China's official language whilst Cantonese is a Chinese dialect. The two languages share a similar phonological system: both are tonal languages with a common syllabic structure. Among the 19 Cantonese and 21 Putonghua syllable-initial consonants, 13 are shared (i.e. phonetically identical). Putonghua differs from Cantonese in that it has retroflex consonants, more fricatives and more affricates. A detailed comparison between the two phonological systems is shown in Table 1.

Table 1.

Comparison of Cantonese and Putonghua phonology

	Cantonese	Putonghua
Tones	high level$_{(55)}$ high rise$_{(25)}$ mid level$_{(33)}$ low fall$_{(21)}$ low rise$_{(23)}$ low level$_{(22)}$ high entering$_{(5)}$ mid entering$_{(3)}$ low entering$_{(2)}$	high level$_{(55)}$ high rising$_{(35)}$ falling rising$_{(214)}$ high falling$_{(51)}$
Vowels	i, ɪ, y, ɛ, œ, ɵ, ɐ, a, ʊ, ɔ, u, iu, au, ɐu, ou, ɔi, ui, ai, ɐi, ei, ɵy, ɛu	i, u, y, o, ɤ, ʌ, ə, ɛ, ɚ, ae, ei, ao, oʊ, iʌ, iɛ, uʌ, uo, yɛ, iɑo, ioʊ, uae, uei
Syllable-initial consonants	p, p^h, t, t^h, k, k^h, kw, kw^h m, n, ŋ f, s, h ts, ts^h l, j, w	p, p^h, t, t^h, k, k^h m,n f, s, ʂ, ɕ, x, ʐ ts, ts^h, tʂ, tʂ^h, tɕ, tɕ^h l
Syllable-final consonants	p, t, k m, n, ŋ	n, ŋ
Syllable structures	(C)V(C)	(C)V(C)

Hypotheses

The aim of the present study is to 1) examine if interaction occurs between the two phonological systems in bilingual Cantonese-Putonghua children, and 2) investigate if sound categorisation (Flege, 1987) is a systematic interaction in bilingual phonological acquisition of two tonal languages (i.e. Cantonese and Putonghua). Two hypotheses are stated as follow:

1. There will be interaction (i.e. transfer, acceleration and/or deceleration) between the two phonological systems in bilingual Cantonese-Putonghua speaking children.
2. Sound categorisation will be a systematic interaction occurring in bilingual Cantonese-Putonghua phonological acquisition. In other words, bilingual Cantonese-Putonghua children will perform differently between the production of shared (i.e. phonetically identical) and unshared (i.e. phonetically different) speech sounds of Putonghua (i.e. L2), whilst monolingual Putonghua-speaking children will not demonstrate the same pattern.

METHOD

Participants

There were a total of 60 children aged between 3;00 to 4;00. They were recruited from kindergartens in Hong Kong and Shenzhen. Consent from school and parent was obtained for all participants (see Appendices 1 and 2 for consent forms). The children were categorised into three groups based on their language history: (a) 20 monolingual Cantonese-speaking children (mean age = 3;03; range = 3;02-4;00); (b) 20 monolingual Putonghua-speaking children (mean age = 3;04; range = 3;02-4;00); and (c) 20 bilingual Cantonese-Putonghua speaking children (mean age = 3;06; range = 3;00-4;00). There were equal number of boys and girls (i.e. 10 boys and 10 girls) in each group. Parent and teacher reports (Appendix 3) were used to determine each child's language status (i.e. whether they were monolingual or

bilingual) and obtain detailed information concerning their language use. All children were reported as typically developing with no speech, language, oro-motor, cognitive, or neurological deficits. Descriptive information of the participants is shown in Table 2.

Table 2.

Descriptive information of participants

Group	Male	Female	Age range (Mean age)
Monolingual Cantonese speakers	N = 10	N = 10	3;02-4;00 (3;03)
Monolingual Putonghua speakers	N = 10	N = 10	3;02-4;00 (3;04)
Bilingual speakers	N = 10	N = 10	3;00-4;00 (3;06)

Note: N-number of participants

Bilingual participants

The 20 bilingual children were recruited from kindergartens in Shenzhen. According to parent reports, all bilingual participants received at least 20% of total language input in both languages and produced at least 20% of total language output in both languages. This criterion was chosen from previous work (Pearson, Fernandaz, Lewedeg, & Oller, 1997) which suggested that children need at least 20% exposure of a language in order to use it. Parents also rated their children's proficiency in both Cantonese and Putonghua on a scale from '0' (child unable to speak that language) to '4' (child had native-like proficiency in that language). All bilingual participants in the present study were rated as either '3' or '4' in proficiency in both languages. This ensured native or native-like competency in the two languages. In addition, all bilingual participants were classified as 'successive bilinguals' who had mainly Cantonese input and output at home up to the age of three. After this age, they started to gain Putonghua exposure at preschool, in which Putonghua was the main language used in class. All participants were regarded as 'early bilinguals' (Genesee et al.,

2004).

Monolingual participants

The 20 Cantonese and 20 Putonghua monolingual children were recruited from kindergartens in Hong Kong and Shenzhen respectively. The monolingual participants had no input or output in any language other than their native language. They had a proficiency rating of either '3' or '4' in their language as obtained from parent reports.

Test materials

The research version of Cantonese Segmental Phonology Test (So, 1992) and the research version of Putonghua Segmental Phonology Test (So & Zhou, 2000) were employed (Appendices 4 and 5). The tests included all lexical tones, vowels, initial and final consonants in the respective language through a picture-naming task. All target words were names of common objects that a typical two-year-old child can produce spontaneously. High-quality photographs of real objects were used to elicit the target words spontaneously. The children's productions were recorded using Sony IC recorder ICD-MX20.

Procedures

Each child was individually assessed in a quiet room at the kindergarten following the standard administration procedures of the test in use. The first 10 minutes of each session were spent on rapport building with the child through free play or conversation. Each bilingual child was assessed on two separate occasions with two different testers. The tester for Cantonese sample only spoke Cantonese to the child whilst the tester for Putonghua sample only spoke Putonghua. This encouraged the child to speak only the target language. Both testers were Speech and Hearing Sciences final-year undergraduates who were Cantonese-Putonghua bilinguals having native or native-like language proficiency. Participants were engaged in the picture-naming task previously described. The tester offered semantic and contextual prompts when they failed to produce the target word spontaneously.

They were then asked to imitate the tester's production when failing to respond to any prompts provided.

Reliability measures

The children's' productions in the naming tasks were transcribed online using the International Phonetic Alphabet (IPA) system. Ten percent of the recorded productions was transcribed by the same tester a week later to assess intra-rater reliabilities. In addition, 10% of the recorded productions was transcribed by another tester, who was also a Speech and Hearing Sciences final-year undergraduate, to assess inter-rater reliabilities. For Cantonese, the intra-rater reliability was found to be 98.52% whilst the inter-rater reliability was found to be 97.50%. For Putonghua, the intra-rater reliability was found to be 98.46% whilst the inter-rater reliability was found to be 98.70%.

Data analyses

Between-group comparison

1. Phonetic inventories: Phonetic inventories were constructed to determine what speech sounds each child had acquired. If a child produced a particular sound twice or more, regardless of whether it occurred as a correct production in a word or as a substitute in another word, he/she was considered to possess that sound in his/her inventory (Elbert & Gierut, 1986).
2. Percentage accuracy of syllable component and initial consonant accuracy by manner class: percentage accuracy of syllable components including initial consonants, final consonants, vowels and lexical tones were calculated for each language group (i.e. monolingual Cantonese productions, monolingual Putonghua productions, bilingual Cantonese productions and bilingual Putonghua productions). It is a percentage obtained by dividing the number of correct productions of a speech sound by the total number of occurrence of that sound in each test. The percentage accuracies of the bilingual

participants were compared against those of the monolingual participants to determine whether the bilingual group demonstrated deceleration or acceleration. In addition, the accuracy of initial consonants grouped by manner class was also calculated for each language group to determine if there was deceleration or acceleration in any specific manner class.

3. Transfer: When a bilingual child used language-specific speech sounds in one language in the production of the other language, those substitutions were not counted as errors but were regarded as phonological transfer. The quantity (i.e. frequency of occurrence) and quality (i.e. whether it was uni-directional or bi-directional) of each phonological transfer was recorded.

Within-group comparison

4. Accuracy of shared and unshared initial consonants: The productions of both the bilingual and monolingual participants were analysed in the same way to determine if differential accuracy between shared and unshared initial consonants was (a) a characteristic of phonological skills in bilingual children or (b) a characteristic of all children's phonological skills, regardless of whether they were monolingual or bilingual. All initial consonants of Cantonese and Putonghua were categorised as either shared or unshared as listed in Table 3.

RESULTS

Consonant inventories

Table 4 shows the analysis result of consonant inventories of both monolingual and bilingual children. For Cantonese inventories, 3 monolingual Cantonese-speaking children and 9 bilingual children did not complete their phonetic Cantonese phonetic inventories. For Putonghua inventories, 4 monolingual Putonghua-speaking children and 14 bilingual children

Table 3.

Shared and unshared initial consonants of Cantonese and Putonghua

Sound class	Shared sounds	Unshared sounds specific to Cantonese	Unshared sounds specific to Putonghua
Stop	/p/, /p^h/, /t/, /t^h/, /k/, /k^h/		
Nasal	/m/, /n/, /ŋ/		
Affricate	/ts/, /ts^h/		/tʂ/, /$tʂ^h$/, /tɕ/, /$tɕ^h$/
Fricative	/f/, /s/	/h/	/ʂ/, /ɕ/, /x/, /ʐ/
Approximant		/j/, /w/	
Lateral approximant	/l/		
Cluster*		/kw/, /kw^h/	

* Note: /kw/ and /kw^h/ are sometimes regarded as labio-velar stops rather than clusters.

did not complete their Putonghua inventories. Fifteen percent (3 out of the 20) of bilingual children did not possess the aspirated affricate /ts^h/ and aspirated cluster /kw^h/, which are regarded as later-developing sounds in Cantonese (So, 2006). Likewise, many of the bilingual children did not possess later-developing Putonghua sounds such as the fricative /ʂ/ and /ʐ/; and affricates /ts^h/ and /$tʂ^h$/ (Zhu, 2006). Overall, the bilingual children demonstrated age-appropriate phonetic inventories.

Percentage accuracy of syllable component

The mean overall percentage of correct initial consonants, final consonants, vowels and lexical tones was greater than 80% for all language groups. These results are summarised in Table 5. In particular, it is found that, among all syllable components (e.g. initial consonants,

final consonants, vowels and lexical tones), the bilingual children demonstrated the lowest accuracy (i.e. 83.03%) in initial consonants of Putonghua (L2), and achieved the highest accuracy in lexical tones (i.e. 98.84%) of Putonghua.

To determine if deceleration (i.e. slower rate) or acceleration (i.e. faster rate) in acquisition is demonstrated, Mann-Whitney U tests were performed with percentage accuracy being the dependent measure, whilst language group served as the independent variable. Significance level of *p* value was set at 0.05 to determine if there is significant difference. Results indicated that monolingual Cantonese-speaking children were significantly more accurate than bilingual children in (a) initial consonants ($z = -2.462$; $p = 0.01$), (b) final consonants ($z = -2.19$; $p = 0.03$), and (c) vowels ($z = -3.77$; $p < 0.01$) but not tones ($z = -1.78$; $p = 0.07$) in Cantonese productions. Likewise, monolingual Putonghua children were significantly more accurate than bilingual children in (a) initial consonants ($z = -4.206$; $p < 0.01$), (b) final consonants ($z = -3.61$; $p < 0.01$), and (c) vowels ($z = -3.25$; $p < 0.01$) but not tones ($z = -1.78$; $p = 0.08$) in Putonghua productions. These findings are suggestive of a general deceleration in the Cantonese and Putonghua productions of the bilingual children.

Initial consonant accuracy by manner class

The means and standard deviations of consonant percentage accuracy by manner class is summarised in Table 6. To determine if monolingual and bilingual children differed in the accuracy of initial consonants by different manner classes, a Mann-Whitney U test was performed for each manner class, comparing bilingual to monolingual productions. Significance level of *p* value was set at 0.05 to determine if there is statically significant difference.

For Cantonese productions, results of Mann-Whitney U test showed no significant difference between bilingual and monolingual Cantonese-speaking children among all manner classes. The manner classes included stop ($z = -0.87$, $p = 0.38$) , nasal ($z = -0.59$, $p =$

Table 4.

Initial consonants missing from phonetic inventories

Child ID	Produced once only	Not produced at all
	Monolingual Cantonese-speaking children	
C04	/kw/	/kw^h/
C17		/kw^h/
C19		/ts^h/
	Monolingual Putonghua-speaking children	
P05		/ʐ/
P16	/ʂ/ , /ts^h/, /tʂ^h/	
P17		/ʐ/
P19	/s/	/ts^h/, /ʐ/
	Bilingual children : Cantonese (L1) productions	
B02	/ts/ , /ts^h/	
B04	/ts^h/	
B07	/kw^h/	
B08		/ts^h/
B09	/kw/	/kw^h/
B14	/ts^h/	
B15		/kw^h/
B17	/kw^h/	
B18	/ts^h/	
	Bilingual children: Putonghua (L2) productions	
B01		/ʂ/
B04	/ts^h/	/ʐ/
B06	/ʐ/	
B07	/ts^h/	/tʂ/ , /ʐ/
B08		/ʐ/
B09	/ʂ/	/ʐ/
B10	/ʂ/	/ʐ/
B11	/ʂ/ , /ts^h/, /tʂ^h/	/ʐ/
B12	/s/	/ʐ/
B13	/ʂ/ , /ts^h/ , /tʂ^h/	
B14	/tʂ^h/	
B15	/ʂ/	
B16	/ʂ/ , /ts^h/, /tʂ^h/	/ʐ/
B17	/ʂ/ , /tʂ^h/, /tʂ/	

Note: C-Monolingual Cantonese-speaking children; P-Monolingual Putonghua-speaking children; B-Bilingual Cantonese-Putonghua speaking children

Table 5.

Means and standard deviations of percentage accuracy of syllable component

Language Group	Initial consonants	Final consonants	Vowels	Tones
Monolingual Cantonese	97.89 (4.01)	97.59 (5.92)	99.79 (0.51)	100 (0)
Monolingual Putonghua	96.74 (4.15)	99.71 (0.88)	99.74 (0.58)	100 (0)
Bilingual Cantonese	94.30 (5.34)	94.44 (8.28)	92.50 (16.00)	99.79 (0.51)
Bilingual Putonghua	82.03 (11.43)	94.14 (8.91)	95.42 (6.76)	98.84 (2.75)

Key: Figures in brackets indicate standard deviation

0.55), fricative (z = -1.91, p = 0.06), affricate (z = -0.56, p = 0.58), approximant (z = -1.44, p = 0.15), lateral approximant (z = 0.00, p = 1.00) and cluster (z = -1.34, p = 0.18). For Putonghua productions, monolingual Putonghua-speaking children demonstrated a significantly higher accuracy than bilingual children in fricative (z = -4.67, p < 0.01) and affricate (z = -4.53, p < 0.01). There was no significant difference found between bilingual and monolingual children in stop (z = -0.72, p = 0.43), nasal (z = -1.37, p = 0.17) and lateral approximant (z = -0.79, p = 0.43). Overall speaking, some evidence was found for deceleration in the bilingual Putonghua-Cantonese speaking children in general and particularly in some of the manner classes in Putonghua (L2).

Transfer

There were 15% (3 out of 20 bilinguals) of bi-directional transfer and 65% (13 out of 20 bilinguals) of uni-directional transfer demonstrated by the bilingual children. Among the 13 children who demonstrated uni-directional transfer, only one child substituted Cantonese (L1) sounds with Putonghua (L2) sounds (e.g. /t^h/→[tʂ] in '檯' /t^hɔi_{35}/, /ts^h/→[tʂ^h] in '床' /ts^hɔŋ$_{21}$/) whilst the majority of them substituted Putonghua (L2) sounds with Cantonese (L1) sounds

(e.g. /tɕ^h/→[kw^h] in '裙' /tɕ^{h}yn$_2$/, /ɕ/→[h] in '虾' / ɕia$_1$/).

Table 6.

Means and standard deviations of consonant percentage accuracy by manner class

Language Group	Stop	Nasal	Fricative	Affricate	Approximant	Lateral approximant	Cluster
Monolingual Cantonese	98.89 (2.91)	99.38 (2.80)	97.83 (8.68)	95.83 (9.17)	99.17 (3.73)	100 (0)	91.25 (27.24)
Monolingual Putonghua	97.86 (3.62)	98.57 (6.39)	96.76 (5.22)	93.25 (9.22)	N/A	96.25 (12.23)	N/A
Bilingual Cantonese	97.22 (5.84)	98.75 (3.85)	91.15 (14.18)	88.33 (24.24)	95.83 (9.17)	100 (0)	86.25 (23.61)
Bilingual Putonghua	96.19 (5.26)	95.71 (10.47)	77.06 (15.61)	64.25 (24.99)	N/A	95 (10.26)	N/A

Key: Figures in brackets indicate standard deviation

Accuracy of shared and unshared consonants

To determine if the difference between accuracy of shared and unshared initial consonant production was significant within each language group, Wilcoxon signed ranks tests were performed for each of the four sets of data. For the monolingual Cantonese group, no significant difference was found between percentage accuracy of shared and unshared sounds ($z = -0.52$, $p = 0.60$). For the Cantonese production of the bilingual children, there was also no significant difference found between percentage accuracy of shared and unshared sounds ($z = -0.53$, $p = 0.59$). For the monolingual Putonghua group, a significant difference was found between percentage accuracy of shared and unshared sounds ($z = -0.81$, $p < 0.01$). For the Putonghua productions of the bilinguals, there was also a significant difference between percentage accuracy of shared and unshared ($z = -3.78$, $p < 0.01$). Overall, bilingual

children and monolingual Putonghua-speaking children demonstrated significantly higher accuracy on shared than on unshared sounds in Putonghua. The results were shown in Table 7.

Table 7.

Means and standard deviations of percentage accuracy of shared and unshared initial consonants

	Overall PCC	PCC shared	PCC unshared
Monolingual Cantonese	97.89 (4.01)	98.18 (4.27)	96.92 (8.43)
Monolingual Putonghua	96.74 (4.15)	98.63 (3.09)	94.14 (6.91)
Bilingual Cantonese	94.30 (5.34)	94.66 (6.05)	93.08 (8.24)
Bilingual Putonghua	82.03 (11.43)	93.75 (5.76)	64.66 (21.83)

Key: Figures in brackets indicate standard deviation

DISCUSSION

Interaction in bilingual children

The first hypothesis of the present study was that there is interaction (i.e. transfer, acceleration and/or deceleration) between the two phonological systems in bilingual Cantonese-Putonghua speaking children. Firstly, interaction was evident by examining the occurrence of transfer. Fifteen percent of the bilingual participants demonstrated bi-directional transfer. This is consistent with the finding obtained in a research studying bilingual phonological acquisition of Spanish and English (Fabiano-Smith & Goldstein, 2010), in which a low frequency (25%) of bi-directional transfer was found. Bi-directional transfer provides a piece of evidence for the existence of interaction.

When this transfer is further analysed by descriptive statistics, a 65% occurrence of uni-directional transfer was demonstrated by the bilingual participants. This indicates that

there is separation between the two phonological systems of Cantonese and Putonghua. Among those children who demonstrated uni-directional transfer, all but one of them used Cantonese (L1)-specific sounds in the production of Putonghua (L2). First-language influence on children's second language acquisition was observed. This agrees with Genesee et al. (2004) who suggested that the phonology of L1 can act as scaffolding for L2 development, and that L1 phonology is heavily relied on at the beginning of L2 acquisition. This is regarded as a positive learning strategy.

The second piece of evidence for interaction (i.e. deceleration) was illustrated by the percentage accuracy of syllable component and initial consonant accuracy by manner class. Deceleration was illustrated by comparing the percentage accuracy of initial consonants, final consonants and vowels between monolingual and bilingual children. Monolingual children were found to be significantly more accurate in initial consonants, final consonants and vowels in both Cantonese and Putonghua than bilingual children. In general, there was a deceleration in both Cantonese and Putonghua productions in bilingual children. This suggests that interaction between the two phonological systems in Cantonese-Putonghua bilinguals interferes with phonological acquisition, thus hindering the rate of phonological acquisition of both L1 and L2 (Paradis & Genesee, 1996).

Furthermore, the deceleration pattern observed in the two languages was not identical. In the analysis of initial consonant accuracy by manner class, monolingual children were found to perform with a significantly higher accuracy than bilingual children in a few manner classes in Putonghua. Specifically, monolingual Putonghua-speaking children were significantly more accurate than bilingual children in the production of fricatives and affricates. However, unlike Putonghua, there was no significant discrepancy in consonant accuracy among different manner classes when the Cantonese productions of monolingual children and bilingual children were compared. As a matter of fact, many of the fricatives and

affricates in Putonghua do not exist in Cantonese (i.e. /ʂ/, /ɕ/, /x/, /ʐ/, /tʂ/, /tʂʰ/, /tɕ/, and /tɕʰ/). It is therefore not surprising to learn that Cantonese(L1)-Putonghua(L2) successive bilingual children lack available resources in their L1 reservoir for building new knowledge in their L2, resulting in a significantly lower accuracy in particular manner classes.

In the study of Spanish-English bilingual acquisition by Fabiano-Smith and Goldstein (2010), bilingual children demonstrated deceleration in particular manner classes in Spanish (L1) (e.g. trills, fricatives and glides) as well as particular manner classes in English (L2) (e.g. stops and fricatives). This is similar to the findings of the present study. It appears that deceleration in bilingual phonological acquisition was found not only in Indo-European languages, but also in two tonal Chinese languages. Deceleration in specific manner classes was found in L2 (Putonghua) in Cantonese-Putonghua acquisition whilst deceleration in specific manner classes was found in both L1 (Spanish) and L2 (English) in Spanish-English acquisition. Further investigation of the deceleration pattern in different language pairs could be carried out to explain this phenomenon. However, it is not the focus of the present study.

There was yet another piece of evidence for deceleration in terms of consonant inventories. More bilinguals, when compared to their monolingual counterparts, had not completed their phonetic inventories in either phonology system. This indicates that the bilinguals had a lower rate of acquisition in both phonologies.

The phonetic inventories (refer to Table 4.) was further investigated. Consonants missing from the bilinguals' inventories were mostly later-developing speech sounds among monolingual counterparts. For example, /ts/, /tsʰ/, /kw/ and /kwʰ/ in Cantonese were acquired by 90% of monolingual Cantonese-speaking children aged from 4;00 to 5;00 (So, 2006). Using the 90% criterion, /tʂʰ/ in Putonghua was acquired by monolingual Putonghua-speaking children at the age of 3;01 to 3;06, whilst /ʂ/, /ʐ/ and /tsʰ/ in Putonghua were acquired at the age of 3;07 to 4;00 (So, 2006; Zhu, 2006). The bilingual participants in

the present study aged 3;00 to 4;00. Hence, their inventories still lie within the normal range of age-matched monolinguals. Though most of the bilingual participants completed their phonetic inventories later than the monolingual counterparts, they still performed within the normal range. It is important to notice that a slower rate of acquisition does not indicate any delay or disorder in acquisition. Bilingual children may show a slower rate in phonological acquisition but it still falls within the normal range.

In addition, the fact the both monolingual and bilingual children followed the same trend in acquisition of phonemes is consistent with the theory of 'developmental universals' (Jakobson, 1941), which suggested that there is a universal tendency in the order of phonological acquisition. This tendency could be governed by the phonological complexity and saliency of each phoneme. In Cantonese, affricates (/ts/, /ts^{h}/) and clusters (/kw/ and /kw^{h}/) are relatively more difficult to produce when compared with other phonemes. Similarly, /tʂ^{h}/ /ʂ/ and /zʐ/ require a retroflex gesture which is also relatively more difficult to produce when compared with other phonemes.

Apart from consonants and vowels, lexical tones were examined. Interestingly, there was no significant difference found between monolingual and bilingual children in the acquisition rate of lexical tones of both languages. This finding is consistent with the concept of phonological saliency put forth in Zhu and Dodd's (2000) research. Cantonese and Putonghua are both tonal languages, in which a change in tone alters lexical meaning. Since lexical tones in Cantonese and Putonghua possess the highest saliency among the syllable structure, bilingual children acquire lexical tones more accurately than initial consonants, final consonants and vowels. This further supports the 'developmental universals' theory.

Sound categorisation

The second hypothesis of the present study was that sound categorisation is a systematic interaction in bilingual Cantonese-Putonghua phonological acquisition. In the Cantonese

production of the monolingual and bilingual groups, there was no significant difference found between the accuracy of shared and unshared consonants. However, there was a significantly higher accuracy on shared than unshared consonants in the Putonghua productions of both monolingual and bilingual children. A significantly different performance between shared and unshared sounds in monolingual Putonghua children would first appear unexpected, and could act as an argument against the hypothesis of the present study concerning sound categorisation. But a more detailed analysis of this difference in performance would suggest otherwise.

When the accuracy of shared and unshared consonants in Putonghua is examined further, a larger difference in accuracy between shared and unshared consonants (i.e. 93.75% and 64.66% respectively) was found in bilingual children, whilst the difference in accuracy between shared and unshared consonants (i.e. 98.63% and 94.14% respectively) in monolingual children was relatively smaller. Moreover, the low accuracy of unshared sounds in the Putonghua production of monolingual Putonghua-speaking children is chiefly caused by the low accuracy in production of one specific speech sound (i.e. fricative /ʐ/). Three of the twenty monolingual Putonghua-speaking children even did not possess fricative /ʐ/ in their inventories. As aforementioned, the fricative /ʐ/ in Putonghua involves a retroflex gesture which is a more complex articulatory gesture and is acquired by 90% of children aged from 4;01 to 4;06 (Zhu, 2006). In fact, bilingual children demonstrated a large discrepancy in accuracy between shared and unshared consonants, whilst monolingual children did not. Therefore, a higher accuracy in shared than unshared consonants is still believed to be a characteristic of L2 phonological acquisition in bilingual children.

In other words, sound categorisation is shown to be a systematic interaction pattern evident in bilingual Cantonese-Putonghua phonological acquisition. This is consistent with the findings concluded by Fabiano-Smith and Goldstein (2010) studying Spanish and English

interaction. Bilingual children may perceive shared speech sounds as common between the two languages and categorise them into the same phonological representations. As a result, shared sounds are more quickly accessed on the basis of L1 phonology, which helps in extending into the production of L2. Also, bilingual children would have more experience in producing shared sounds than unshared sounds that are only specific to L2, leading to a higher accuracy in shared sounds.

Conclusion

From the findings of the present study, there was interaction (i.e. transfer and deceleration) observed between the two phonological systems in bilingual Cantonese-Putonghua children. Even though bilingual children demonstrated deceleration in phonological acquisition in terms of percentage accuracy of syllable component, consonant accuracy by manner class and phonetic inventories, they still performed within the normal limits of monolingual children in both Cantonese (L1) and Putonghua (L2). Meanwhile, 'developmental universals' (Jaksobson, 1941) still applies. Besides, sound categorisation was found to be a systematic interaction pattern in bilingual phonological acquisition in two tonal languages (i.e. Cantonese and Putonghua). The phonology of L1 provides a phonemic reservoir for the establishment of L2 speech sounds. The phenomenon in which L2 learners acquired phonemes based on the knowledge of L1 is considered as a positive learning strategy.

Clinical implications

The findings of the present study allow us to gain a better understanding of the interaction between the two tonal systems in bilingual children speaking two Chinese languages (i.e. Cantonese and Putonghua). This gives us more ideas of the usual pattern of phonological development in bilingual Cantonese-Putonghua children, hence allowing for more accurate prediction of possible difficulties faced by this group of children during the

acquisition of the two languages.

Limitations and directions of further studies

In the present study, it is found that there is deceleration in both Cantonese (L1) and Putonghua (L2) in bilingual phonological acquisition. It is hypothesised that the interaction between two separate phonological systems hinders the rate of acquisition. However, the interaction is also viewed as a positive learning process as bilingual children can build L2 phonology with the use of L1 phonology. There is only one age group (3;00-4;00) of children in the present study. A longitudinal study design can be considered to investigate the outcome of phonological interaction in bilingual phonological acquisition.

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APPENDICES

APPENDIX 1 *School consent form*

香港大學
教育學院
言語及聽覺科學部
兒童語音發展研究
學校同意書

___校長：

本人是香港大學教育學院言語及聽覺科學部四年級學生，現邀請　貴園參與一項關於雙語兒童語音發展研究，對象為三至四歲的兒童。研究旨在探討雙語學習對兒童語音發展的影響。是項研究將有助了解雙語兒童的語音發展，並讓老師及家長更清楚雙語兒童的語音能力。

兒童只需參與一次廣東話和普通話的語音評估，是次評估會將會進行錄音。是次評估將不會對參加者構成任何身體或精神上的傷害。評估完成後，兒童會收到一份語音評估報告，讓老師及家長了解兒童的語音發展。

參與純屬自願性質，參加者可在任何時候要求檢閱錄音，亦可於任何時候退出是次研究，而不會附帶任何後果，相關的錄音亦會被刪除。所收集的資料只作研究用途，而不會外漏。請填妥以下回條，表明是否同意貴園參與是項研究。

如閣下對是項研究有任何查詢，請與張苑琳小姐聯絡 (電話：9866-0876 或電郵：twinky@hku.hk)，或與蘇周簡開博士聯絡 (電郵: lydiaso@hkucc.hku.hk)。如閣下想知道更多有關研究參與者的權益，請聯絡香港大學非臨床研究操守委員會(+852-2241-5267)

此致
校長

香港大學教育學院
言語及聽覺科學部
四年級學生
張苑琳謹啟

二零一零年十二月二十日

本人同意協助上述由張苑琳主理的學術研究。

_____
校長簽署 (校長姓名)

_____
幼兒園名稱

_____
日期

APPENDIX 2 *Parent consent form*

香港大學
教育學院
言語及聽覺科學部
兒童雙語語音發展研究
父母/監護人同意書

敬啓者：

本人是香港大學教育學院言語及聽覺科學部本科生。現在<<廣州話語音測試>>及<<普通話語音測試>>的作者—蘇周簡開博士監督下，進行一項關於兒童雙語語音發展的研究。研究對象為三至四歲的兒童，研究旨在探討雙語學習對兒童語音發展的影響。是項研究將有助了解雙語兒童的語音發展，並讓老師及家長更清楚雙語兒童的語音能力。

兒童只需參與一次廣東話及普通話語音評估，需時約十五至三十分鐘，是次評估將會進行錄音。評估完成後，本人會向參與的兒童提供一份語音評估報告，讓家長了解兒童的語音發展。參與純屬自願性質，所收集的資料只作研究用途，而不會公開。請閣下填妥以下回條，表明是否同意　貴子弟參與是項研究。參加者可在任何時候要求檢閱錄音，亦可於任何時候退出是次研究，相關的資料亦會被刪除。

是次研究對雙語語音發展的研究工作有莫大的幫助，希望閣下支持此研究，讓　貴子弟參與其中。如閣下對是項研究有任何查詢，請與張苑琳小姐聯絡(twinky@hku.hk 或 9866-0876)。如閣下想知道更多有關研究參與者的權益，請聯絡香港大學非臨床研究操守委員會(2241-5267)。

此致
各位家長

香港大學教育學院
言語及聽覺科學部
四年級生
張苑琳謹啟

二零一零年十二月十日

家 長 回 條

學生姓名：_____　　班別：_____　　學號：_____

本人　** 同意 / 不同意　子弟參與是項研究。
(**請刪去不適用者)

家長姓名：_____

家長簽署：_____

日期：_____

APPENDIX 3 *Parent report on children's language status*

香港大學
教育學院
言語及聽覺科學部
兒童雙語語音發展問卷調查

以下問題是有關兒童的語言能力，沒有對或錯，請家長/監護人如實作答，在適當的❑上加✓，謝謝。

基本資料

兒童姓名：_____ 出生日期：20____年____月____日

性別 ：❑男 ❑女 健康狀況： ❑健康 ，出世至今沒有任何病症

❑現在/曾患某病症，註明_____

兒童有否做過智力評估/測試？ ❑有 ❑沒有

如有，智力評估/測試的結果是怎樣？ ❑正常 ❑不正常，請註明_____

兒童有否做過聽力評估/測試？ ❑有 ❑沒有

如有，聽力評估/測試的結果是怎樣？ ❑正常 ❑不正常，請註明_____

語言背景/能力

兒童懂得什麼語言？ ❑廣東話 ❑普通話 ❑其他，如:_____

兒童平日用什麼語言與人溝通？ ❑廣東話 ❑普通話 ❑其他，如:_____

兒童在學校大部份時間用什麼語言？ ❑廣東話 ❑普通話 ❑其他，如:_____

兒童在學校以外大部份時間用什麼語言？❑廣東話 ❑普通話 ❑其他，如:_____

兒童何時開始接觸**廣東話**？ ❑從未 ❑自出世 ❑1 歲 ❑2 歲 ❑3 歲以後

兒童何時開始接觸**普通話**？ ❑從未 ❑自出世 ❑1 歲 ❑2 歲 ❑3 歲以後

父母/監護人用什麼語言跟兒童溝通？ ❑廣東話 ❑普通話 ❑其他，如:_____

父母/監護人認為兒童的**廣東話**語言能力 ('1'為完全不懂，'4'為表達及理解良好)：

❑1 ❑2 ❑3 ❑4

父母/監護人認為兒童的**普通話**語言能力 ('1'為完全不懂，'4'為表達及理解良好)：

❑1 ❑2 ❑3 ❑4

星期一至五中，兒童平均每日***聽***廣東話的時間有多長？ _____小時

星期一至五中，兒童平均每日***講***廣東話的時間有多長？ _____小時

星期六及日中，兒童平均每日***聽***廣東話的時間有多長？ _____小時

星期六及日中，兒童平均每日***講***廣東話的時間有多長？ _____小時

星期一至五中，兒童平均每日***聽***普通話的時間有多長？ _____小時

星期一至五中，兒童平均每日***講***普通話的時間有多長？ _____小時

星期**六及日**中，兒童平均每日***聽*普通話**的時間有多長？ _____小時
星期**六及日**中，兒童平均每日***講*普通話**的時間有多長？ _____小時

星期**一至五**中，兒童平均每日***聽*其他語言**的時間有多長？ _____小時
星期**一至五**中，兒童平均每日***講*其他語言**的時間有多長？ _____小時
星期**六及日**中，兒童平均每日***聽*其他語言**的時間有多長？ _____小時
星期**六及日**中，兒童平均每日***講*其他語言**的時間有多長？ _____小時

家長/監護人簽署(姓名)：_____( )
受訪日期：_____

APPENDIX 4 *Items in Cantonese Segmental Phonology Test (So, 1993)*

No.	Stimuli	IPA	Word meaning	No.	Stimuli	IPA	Word meaning
1	眼	/ŋan$_{23}$/	Eye	29	洗面	/sɐi$_{35}$ min$_{22}$/	Wash face
2	襪	/mɐt$_{2}$/	Sock	30	粥	/tsʊk$_{5}$/	Porridge
3	腩	/lei$_{22/}$	Tongue	31	耳	/ji$_{23}$/	Ear
4	鈕	/nɐu$_{35}$/	Button	32	梨	/lei$_{35}$/	Pear
5	餅	/pɛŋ$_{35}$/	Biscuit	33	手	/sɐu$_{35}$/	Hand
6	水	/sɵi$_{35}$/	Water	34	瓜	/kwa$_{55}$/	Melon
7	琴	/k^{h}ɐm$_{21}$/	Piano	35	韆鞦	/ts^{h}in$_{55}$ ts^{h}ɐu$_{55}$/	Swing
8	碗	/wun$_{35}$/	Bowl	36	麵包	/min$_{22}$ pau$_{55}$/	Bread
9	蕉	/tsiu$_{55}$/	Banana	37	牛奶	/ŋɐu$_{21}$ nai$_{23}$/	Milk
10	雞	/kɐi$_{55}$/	Chicken	38	腳	/kœk$_{3}$/	Leg
11	檯	/t^{h}ɔi$_{35}$/	Table	39	狗	/kɐu$_{35}$/	Dog
12	裙	/kw^{h}ɐn$_{21}$/	Dress	40	燈	/taŋ$_{55}$/	Lamp
13	花	/fa$_{55}$/	Flower	41	奶	/nai$_{23}$/	Milk
14	蘋果	/p^{h}iŋ$_{21}$ kwɔ$_{35}$/	Apple	42	錶	/piu$_{55}$/	Watch
15	西瓜	/sɐi$_{55}$ kwa$_{55}$/	Watermelon	43	企	/k^{h}ei$_{23}$/	Stand
16	刀	/tou$_{55}$/	Knife	44	海	/hɔi$_{35}$/	Sea
17	貓	/mau$_{55}$/	Cat	45	牙	/ŋa$_{21}$/	Teeth
18	魚	/jy$_{35}$/	Fish	46	盆	/p^{h}un$_{21}$/	Basin
19	床	/ts^{h}ɔŋ$_{21}$/	Bed	47	褲	/fu$_{33}$/	Trousers
20	巴士	/pa$_{55}$ si$_{35}$/	Bus	48	吹	/ts^{h}ɵy$_{55}$/	Blow
21	鴨	/ap$_{3}$/	Duck	49	葉	/jip$_{3}$/	Leaf
22	龜	/kwɐi$_{55}$/	Tortoise	50	黃	/wɔŋ$_{21}$/	Yellow
23	筷子	/fai$_{33}$ tsi$_{35}$/	Chopsticks	51	車	/ts^{h}ɛ$_{55}$/	Car
24	鞋	/hai$_{21}$/	Shoe	52	樹	/sy$_{22}$/	Tress
25	電話	/tin$_{22}$ wa$_{35}$/	Telephone	53	飲	/jɐm$_{35}$/	Drink
26	糖	/t^{h}ɔŋ$_{35}$/	Sweet	54	雪糕	/syt$_{3}$ kou$_{55}$/	Ice-cream
27	腳板	/kœk$_{3}$ pan$_{35}$/	Sole	55	電視	/tin$_{22}$ si$_{22}$/	Television
28	杯	/pui$_{55}$/	Cup	56	水壺	/sɵy$_{35}$ wu$_{35}$/	Bottle

APPENDIX 5 *Items in Putonghua Segmental Phonology Test (So & Zhou, 2000)*

No.	Stimuli	IPA	Word Meaning	No.	Stimuli	IPA	Word Meaning
1	花	/xua$_1$/	Flower	41	草	/ts^h au$_1$/	Grass
2	奶	/nai$_3$/	Milk	42	脚	/tɕiau$_3$/	Sole
3	门	/mən$_2$/	Door	43	裙	/tɕ^{h}yn$_2$/	Dress
4	苹果	/p^{h}iŋ$_2$ kuo$_3$/	Apple	44	香蕉	/ɕiaŋ$_1$ tɕau$_1$/	Banana
5	桶	/t^{h}uŋ$_3$/	Bucket	45	坐	/tsuo$_4$/	Sit
6	菜	/ts^{h}ai$_4$/	Vegetables	46	夹子	/tɕia$_1$ tsi/	Clip
7	桌	/tʂuo$_1$/	Table	47	枴杖	/kuai$_3$ tʂaŋ$_4$/	Stick
8	狗	/kou$_3$/	Dog	48	二	/ɚ$_4$/	Two
9	绿	/ly$_4$/	Green	49	爬	/p^{h}a$_2$/	Crawl
10	圆	/yan$_2$/	Circle	50	球	/tɕ^{h}iou$_2$/	Ball
11	铅笔	/tɕ^{h}iɛn$_1$ pi$_3$/	Pencil	51	虫	/tʂ^{h}uŋ$_2$/	Bug
12	摩托车	/mo$_2$ t^{h}uo$_1$ tʂ^{h}e$_1$/	Motorbike	52	山	/ʂan$_1$/	Mountain
13	杯	/pei$_1$/	Cup	53	游泳	/ioŋ$_2$ uŋ$_3$/	Swim
14	飞机	/fei$_1$ tɕi$_1$/	Plane	54	发	/fa$_1$/	Hair
15	吃	/tʂ^{h}l$_1$/	Eat	55	床	/tʂ^{h}uaŋ$_2$/	Bed
16	猫	/mau$_1$/	Cat	56	豆	/tou$_4$/	Bean
17	熊	/ɕyŋ$_2$/	Bear	57	脸	/liɛn$_3$/	Face
18	袜	/ua$_4$/	Sock	58	粥	/tʂou$_1$/	Porridge
19	书	/ʂu$_1$/	Book	59	鱼	/y$_2$/	Fish
20	月	/ye$_4$/	Moon	60	太阳	/t^{h}ai$_4$ iaŋ$_2$/	Sun
21	鸡	/tɕi$_1$/	Chicken	61	圈	/tɕ^{h}yan$_1$/	Circle
22	牛	/niou$_2$/	Cow	62	眼	/ian$_3$/	Eye
23	嘴	/tsuei$_3$/	Mouth	63	枪	/tɕ^{h}iaŋ$_1$/	Gun
24	猪	/tʂu$_1$/	Pig	64	狮	/ʂi$_1$/	Lion
25	梨	/li$_2$/	Pear	65	云	/yn$_2$/	Cloud
26	虾	/ɕia$_1$/	Prawn	66	腿	/t^{h}uei$_3$/	Leg
27	刀	/tau$_1$/	Knife	67	饼	/piŋ$_3$/	Biscuit
28	碗	/uan$_3$/	Bowl	68	翁	/uəŋ$_1$/	Old man
29	窗	/tʂ^{h}uaŋ$_1$/	Window	69	瓜	/kua$_1$/	Melon
30	筷子	/k^{h}uai$_4$ tsi/	Chopsticks	70	雪	/ɕye$_3$/	Snow
31	裤	/k^{h}u$_4$/	Trousers	71	凳	/təŋ$_4$/	Chair

32	糖	/$t^{h}aŋ_{2}$/	Sweet	72	草	/ts^{h} au_{1}/	Grass
33	轮	/$luən_{2}$/	Wheel	73	脚	/$tɕiau_{3}$/	Sole
34	鞋	/$ɕie_{2}$/	Shoe	74	裙	/$tɕ^{h}yn_{2}$/	Dress
35	人	/$zʐən_{2}$/	Men	75	香蕉	/$ɕiaŋ_{1}$ /$tɕau_{1}$/	Banana
36	冰	/$piŋ_{1}$/	Ice	76	坐	/$tsuo_{4}$/	Sit
37	伞	/san_{3}/	Umbrella	77	夹子	/$tɕia_{1}$ tsi/	Clip
38	灯	/$təŋ_{1}$/	Lamp	78	枴杖	/$kuai_{3}$ /$tʂaŋ_{4}$/	Stick
39	耳	/$ɚ_{3}$/	Ear	79	二	/$ɚ_{4}$/	Two
40	面包	/$miɛn_{4}$ pau_{1}/	Bread	80	爬	/$p^{h}a_{2}$/	Crawl