Factors Affecting Accent of New and Similar Vowels in Hong Kong Cantonese Pronounced by Urdu Speakers from Secondary School

Yi Liu
The Hong Kong Polytechnic University
Department of Chinese and Bilingual Studies
Hung Hom, Hong Kong
yi.liu@polyu.edu.hk

Jinghong Ning
The Hong Kong Polytechnic University
Department of Chinese and Bilingual Studies
Hung Hom, Hong Kong
Chion.ning@polyu.edu.hk

Abstract

"Two literacies and three languages" are used by Hong Kong people. In Hong Kong non-Chinese speaking students are trilingual speakers: they speak their mother language, English and Chinese (Cantonese or Putonghua). Since Urdu speakers make up a large portion of the population among non-Chinese speaking students, the study chose Pakistani students from a local secondary school as subjects and examined the perceived accent of new and similar vowels in Hong Kong Cantonese produced by non-native speakers and rated by native listeners. The results show that language learners got much more accent in producing the new vowels than the similar vowels. It also demonstrated that the use of Cantonese (L3) correlated closest to the accent scores, followed by Urdu (L1) use and age-related factors.

1 Introduction

1.1 Introduction

Vowel distinction exists due to their being different vowel inventories and phonetic features across languages. There are new and similar vowels when comparing two vowel systems of languages. Similar vowels represent the vowels sharing certain phonetic features and phonology status within two vowel systems. While non-native speakers acquire similar vowels, they can get information from their mother tongue. New vowels refer to the ones that do not have counterparts in the mother vowel system, and language learners will develop a new category while perceiving the new vowels (Flege, 1987). In Speech Learning Model (SLM) Flege (1995) proposed that non-native speakers are likely to make equivalences between native (L1) and non-native (L2) systems. For instance, if the sounds in L2 have similar counterparts in learners' phonological system, the non-native sounds will be merged to the L1 category. Due to the impact of native pronunciation, language learners may produce L2 sounds with a strong foreign accent. If the L2 sound is totally new to learners, it is predicted to be easily acquired.

However, there is no agreement on whether the similarity between language systems can prevent or assist the acquisition of L2 phones. Bohn and Flege (1992) explored the influence of L1 experience upon the production of new and similar English vowels by German speakers. They reported that the similar English vowels produced by the experienced L2 speakers did not have stronger accent than the ones by inexperienced L2 speakers. This observation was in line with the hypothesis of SLM. However, the accent rating result for the new vowel /æ/ did not clearly support the model, and the acoustic results for new vowel demonstrated that the experienced learners could articulate /æ/ in the same way as English natives did, unlike the inexperienced learners.

With regard to the non-native sound acquisition, various factors influence the accent degree in the production of non-native speakers. For instance, it has been documented that age of learning (AOL, Piske et al., 2001; Uzal et al., 2015) and proficiency have a significant negative correlation in language acquisition. Moreover, a short length of residence (LOR; Flege and Fletcher, 1992) is also found to have more accent while articulating

new sounds. Other factor includes the amount or the use of L1 and L2 (Uzal et al., 2015).

In addition, previous researches have also unveiled the weightings of learning variables on the L2 sound acquisition by L2 learners. Uzal et al. (2015) examined the perceived accents of Turkish children born in Finnish and revealed that AOL interrelated with language use factors. AOL was found to be the major indicator of perceived accent, followed by home use of L1 and L2 use.

In terms of L2 acquisition, non-native learners may acquire more than one non-native languages. Generally, languages acquired after the first language (L1) are usually called second languages (L2). However, consensus has not yet been reached on the definition of the term 'the third language (L3)' (De Angelis, 2007). According to De Angelis (2007), L2 or L3 languages can be defined on the basis of the sequence of time when they are learned by non-native speakers. That means that L2 is learned prior to L3. Thus, the term L3 usually refers to the acquisition of any languages beyond L2. Hammarberg (2001) proposed that L2 refers to the language that has already been acquired, while L3 denotes languages that are currently being learned. Empirical researches on the cross-linguistic effects on L3 acquisition mainly focused on the following two dimensions: typology and L2 status (Cenoz, 2001). Typology refers to cross-language distance/similarity, whereas L2 status is relative to the second language that a person knows.

In a language environment like Hong Kong where people use "Two literacy and three languages", a multilingual acquisition study has significance and importance. According to the data from the census conducted by Census and Statistics Department of Hong Kong Special Administrative Government in 2011, the number of Indian and Pakistan students younger than 15 years old was 5767 and 7148, respectively. Indian-Pakistani students composed 54% of the Asian student (non-native) population of the same age. A majority of the primary and secondary schools (only the schools funded by the Government, not including international schools) at Hong Kong use Cantonese as the medium of instruction in teaching Chinese to non-native speakers. Although some research has been done on the accent analysis of vowel articulation by non-native speakers for other languages, there is still a lack of studies investigating the accent ratings of vowels in Hong Kong Cantonese by non-Chinese speaking (NCS) students. As Pakistani students make up a large portion of the NCS population at local schools, the present project chooses them as target subjects to reveal how Pakistani students produce new and similar vowels in Hong Kong Cantonese.

1.2 Comparison of the Vowels in Hong Kong Cantonese, English and Urdu

Syllable is the basic unit of Hong Kong Cantonese. Like Mandarin, Cantonese is a tonal language and each syllable consists of finals, tones and optional initials. In the phonological system of Hong Kong Cantonese, there are seven long vowels /a, i, u, y, ɛ, ɔ, œ/ (Shi et al., 2015). For Urdu (Oxford Urdu English Dictionary, 2013), there exist eight long vowels (/i, e, ɛ, æ, a, ɔ, o, u/) and 3 short vowels /ɪ, ə, ʊ/, and the universal short vowels mostly appear in checked syllables just like in Cantonese.

As introduced by Roach (2004), modern standard English contains a 12-vowel system, including 5 long vowels /i, ɛ, u, ɔ, ɑ/ and 7 short vowels /ɪ, e, æ, ə, ʌ, ʊ, ɒ/. Urdu and English vowel systems have no vowels /y/ and /œ/ like in Cantonese. The Cantonese long vowel /ɛ/ pertains to mid-high front vowels (Zee, 1999), whereas Urdu long vowel /ɛ/ belongs to mid-low front vowels (Ohala, 1999), and in English, /ɛ/ is a mid-central vowel. Likewise, the Cantonese long vowel /ɔ/ is pronounced as mid-high back vowels, while the Urdu long vowel /ɔ/ pertains to mid-low back vowels, and English also has a long vowel /ɔ/, which belongs to mid-back vowel. As there is no /y/ and /œ/ in Urdu or English; for Urdu speakers who were L3 learners of Hong Kong Cantonese, /y/ and /œ/ were still treated as new vowels in the current study.

Regarding the development of Hong Kong Cantonese vowels by native children, Cheung, (1990) indicated that native children mastered all vowels and diphthongs by age 3;0 (years;months). The ranked order of vowel accuracy was proposed as: /ɛ/ > /ɔ/ > /a/ = /i/ > /ɐ/> /œ/, /ɵ/ > /u /> /y/ for children aged 24 to 27 months (Stokes and Wong, 2002). Conducting a population study of 1,726 children ages 2;4 to12;4, To et al. (2013) found that /i, a, u, ɔ, ɛ/ were acquired by age 2;6, whereas /y/ and /œ/ were acquired by age 3;0 and age 4;0, respectively.

1.3 Current Study

Based on vowel comparison in Hong Kong Cantonese, Urdu and English, SLM and L3 acquisition theories, the current project aims to investigate the acquisition of similar /ɛ, ɔ/ and new vowels /y, œ/ in Hong Kong Cantonese articulated by Urdu speakers from local secondary schools. This group of subjects was regarded as L3 learners at the time of experiment as they had learnt English prior to Cantonese. As an indicator of the accuracy of articulation by non-native speakers, accent rating results can be obtained by the auditory evaluation of native listeners. Moreover, the current study aims to how learning factors affect the degree of perceived accents in the vowels produced by non-native learners. Taking SLM and L3 acquisition as theoretical foundation, the current project adopts accent rating and statistical methods to explore how Pakistani students in secondary school acquire new and similar vowels in Hong Kong Cantonese after a certain amount of Cantonese learning. The hypothesis is that non-native speakers, may have different degrees of difficulties pronouncing different vowel types (such as similar and new) due to the effect of L1 and L2 vowel systems across languages. Moreover, learning variables also affect the accent of new and similar vowels in Hong Kong Cantonese produced by non-native speakers. Thus, this study explores the factors that influence the production of the new and similar vowels through having native speakers listen to the Pakistani children speak Cantonese and by the correlation of learning factors and accent ratings. The results of this project attests whether SLM could account for the sound acquisition of L3, which extends SLM to the field of L3/multilingual research. Thus, the findings from the study would contribute to L3/multilingual acquisition studies and serve as a reference point for Chinese language teaching targeted at NCS students at Hong Kong.

2 Experimental Design

2.1 Subjects

Twenty Urdu speakers participated in the production task. They were Grade 7 (10F, 10M; Mean age = 14.1 yrs, SD = 1.1) students from local secondary schools in Hong Kong. At the schools, the medium of instruction for Chinese courses is Cantonese, and they had already learned the pronunciation of Cantonese. All subjects are trilingual speakers: Urdu, English and Cantonese. They learned Hong Kong Cantonese (mean AOL= 7.5 yrs) later than English (mean AOL= 4.2 yrs), thus English and Hong Kong Cantonese are regarded as L2 and L3 respectively in the present experiment. For the individual learning variables of Cantonese learning, the average AOL is 7.5 years old: the earliest is 3 years old and the latest is 15 years old. The average AOA at Hong Kong is 3.7 years old: the earliest one is 1 year old and the latest one is 13 years old. The average LOR in Hong Kong is 10 years: the shortest is 1 year and the longest is 14 years. For other items, such as Cantonese use, L1 use and English use, ratings are given by the participants on a 9-point scale, where 1 is the lowest and 9 is the highest. Average Urdu use, Cantonese use and English use are 7, 5.3 and 5.5.

2.2 Material

In the production task, the reading list includes the monosyllables in isolated form with Jyutping (the romanization developed by Linguistics Society of Hong Kong to denote the phonological system of Hong Kong Cantonese) scripts and Chinese characters. The syllables are composed of non-nasal consonant and monophthong (/y, ɛ, ɔ, œ/) in CV sequence. Two frequently-used Chinese characters were selected through frequency check (on the website of Chinese University of Hong Kong) for each vowel type. There are a total of 320 (4 vowels x 2 sets x 20 subjects x 2 repetitions) tokens obtained as the output of the articulatory task for accent analysis.

2.3 Raters

For the sounds produced by non-native speakers, 4 (2F, 2M; Mean age = 24 yrs, SD = 3) native speakers of Hong Kong Cantonese without training in Cantonese phonology were recruited to rate the accent degree of the vowels on a 9-point scale (Piske et al., 2001), ranging from “strongest foreign accent” (1) to “no foreign accent” (9). A prior training trial was given to familiarize the native raters with the rating criterion.

2.4 Procedure

Prior to the commencement of formal recording, the participants were give instruction about the details and procedure of the task. The recording was done with CoolEdit 2.0 by a Lenovo Think Center desktop (i5 core, USB interface: 3.0) with Boom microphone in quiet classrooms at the local schools. The subjects were required to recite the reading list with the presentation of Jyutping scripts and Chinese characters. Each character was read twice with 3 second interval. The total duration of experimental task lasted approximately 10 minutes. The recordings were saved as wav. files, sampling in 44100 Hz.

3 Data Analysis and Results

A linear mixed effect model (LMM) was adopted to explore the degree of accent for new and similar vowels in Hong Kong Cantonese produced by Pakistani students, since it shows clear advantages over multiple regression in the accessing of hierarchical, nested data (Baayen et al., 2008). With the information collected from the questionnaire of non-native speakers, LMM was also used to examine the correlation among the perceived accents with learning variables.

3.1 Accent Rating Results

Four raters were invited to evaluate the accent of the 320 recordings on a 9-point scale. All the data were within the range of mean ± 2 standard deviations (Flege, 1995), and 640 ratings were obtained (average rating for two repetitions of a syllable). One-way intraclass correlation analysis was carried to detect consistency across raters, demonstrating a high degree of inter-rater consistency for all results (α = .978, F (3, 639) = 3.44, p = .17).

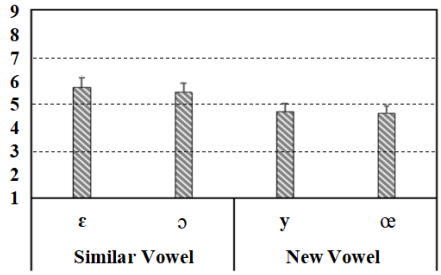

Figure 1. Mean accent scores of Cantonese vowels produced by Urdu learners (9-point scale). Mean standard errors across subjects are shown in error bars.

As exhibited in Figure 1, averaged scores of vowels produced by Urdu students ranged from a little above half of 9 points (4.79) to 6.45, with average standard deviation from 2.19 to 2.56. The accent result of /œ/ was the lowest, followed by /y/ and /ɔ/, while /ɛ/ got the highest accent rating. To observe vowel difference and subject variability, LMM was run in R software with lme4 package (Baayen et al., 2008). The vowel type as fixed variable and the accent scores served as dependent variable. Character and subject intercept as well as subject slope for vowel type were included as random effects. As a result, it showed a significant vowel effect (β = -.41, SE = .1, t (59) = -3.95, p= .0002) on the accent scores of Urdu students. Tukey comparisons showed significant differences between similar and new vowels (/œ/-/ɔ/: p<.001, /œ/-/ɛ/: p <.001, /y/-/ɔ/: p = .042, /y/-/ɛ/: p<.001, Bonferroni-adjusted), indicating that students got much less accent when producing similar vowels (mean for /ɔ/ = 5.49, mean for /ɛ/ = 5.71) than new vowels (mean for /y/ = 4.68, mean for /œ/ = 4.6). However, no distinctions were found within similar (/ɔ/-/ɛ/: p = 2.29, Bonferroni-adjusted) or new vowels (/œ/-/y/: p = 4.74, Bonferroni-adjusted). In addition, subject effect (intercept) showed variance of 4.25, SD of 2.1, and subject slope effect (variance = .9, SD = .95) was also detected in terms of different vowel types. In comparison, character intercept obtained much smaller variance of .046, SD of .214.

3.2 Individual Influence on the Production

Correlation models were carried out with Pearson test, with accent scores as the dependent variable, and individual characteristics as well as vowel type as independent factors. The vowel type was considered as a nominal variable, while the individual factors were measured in scale. An initial model was tested with all the factors entered, then the confounding variables were removed stepwise in partial models (Flege et al, 1999; Uzal et al., 2015). As shown in Table 1, the amount of Cantonese use and Urdu use was prominently correlated with accent ratings in all models, with the Pearson coefficients varying from .689 to .784 for Cantonese use, and from -.532 to -.325 for Urdu use. However, English use exerted no significant effect in both the simple (χ^2 (159) = -.062, p = .434) and the 7-removed (χ^2 (152) = -

.092, p = .254) models, indicating that the English use was the least influential variable among the three language use factors. As to age-related factors, AOA (χ^2 (159) = -.496, p < .001) and LOR (χ^2 (159) = .469, p < .001) showed a correlation to accent scores in a simple model, but lost this significance when it was operated as a single factor (AOA: χ^2 (152) = -.069, p = .397; LOR: χ^2 (152) = .12, p = .139). Significant but much weaker effect was shown by AOL (χ^2 (159) = -.158, p = .045) in a simple model, while this significance disappeared by singling out the effect of Cantonese use.

			Partial		
	variable	**Simple**	**1 removed**	**3 removed**	**7 removed**
Scale	**(A) Urdu use**	-.325	-.441(C)	-.498(CDF)	-.517
		*<.001***	*<.001***	*<.001***	*<.001***
	(B) English use	-.062	-.342(C)	-.151(CDF)	-.092
		.434	*<.001***	*.059*	*.254*
	(C) Cantonese use	.748	.689(D)	.728(ADF)	.723
		*<.001***	*<.001***	*<.001***	*<.001***
	(D) AOA	-.496	-.315(C)	-.078(ACF)	-.069
		*<.001***	*<.001***	*.332*	*.397*
	(E) AOL	-.158	-.258(C)	-.033(CDF)	-.051
		*.045**	*.001***	*.683*	*.532*
	(F) LOR	.469	.055(D)	.149(ACD)	.12
		*<.001***	*.489*	*.062*	*.139*
Nominal	**(G)Vowel types**	.205	.309(C)	.337(CDF)	.39
		*.009***	*<.001***	*<.001***	*<.001***

Table 1. Correlation (Pearson coefficients and p-values) of the simple and partial models. Signif. codes: *** < .001, ** < .01, * < .05.

In addition, vowel type exerted large impact in all models, with the Pearson coefficients ranging from .205 to .39. Cantonese use (χ^2 = .689 ~ .748) contributed most to the model, followed by the negative effect from Urdu use (χ^2 = -.532 ~ -.325) and age-related factors (negative effect of AOA: χ^2 = -.496 ~ -.069; positive effect of LOR: χ^2 = .055 ~ .469). Vowel type showed consistent influence (χ^2 = .205 ~ .39) in the results. In contrast, AOL was hardly (χ^2 = -.158 ~ -.033) linked to learners' accent scores in most cases and English use was also detected to be an insignificant (-.164 ~ -.062) contributor to most models. The results unveiled that increasing the use of target language (Cantonese), reducing the use of mother language (Urdu), and immersion in the target language-speaking country would be the most likely to improve the vowel articulation. Nevertheless, the impact exerted by the specific vowels was not negligible.

With respect to vowel effect, accent ratings were further reanalyzed by vowel type. LMMs were computed with accent scores as the dependent variable within each vowel type (Table 2). As mentioned earlier, the age-related individual factors (AOA, LOR and AOL) were pairwise correlated, which shows multicollinearity for regression models, hence only one individual factor (AOA, LOR, AOL, Cantonese use, English use, Urdu use) was included in a single LMM for the production results for each vowel (Uzal et al., 2015). Besides, subject intercept was considered as random effect in the models. It was detected that accent result was positively affected by Cantonese use for both similar and new vowels (similar vowels: β = .923, SE = .159, t = 5.807, p < .0001; new vowels: β = .817, SE = .118, t = 6.927, p < .0001), while the production of similar vowels also negatively correlated to the use of learners' native language (β = -.664, SE = .279, t = -2.382, p = .028). This revealed that, in the acquisition of new Cantonese vowels, the use of Urdu language hindered the Cantonese-like production of the target language for Urdu students, and the use the target language facilitated in the acquisition of both similar and new Cantonese vowels. With respect to age-related factors (AOA, LOR, AOL), the accent ratings of both the similar and new vowels showed negative correlation to AOA, with β = -.291, SE = .132, t = -2.202, p =.041 for the similar vowels and β = -.346, SE = .094, t = -3.676, p = .002 for the new vowels. Positive correlation (β = .319, SE = .094, t = 3.384, p = .003) to LOR was detected in the accent ratings of the new vowels as well. This indicated that early learning age and long residence in the target-speaking region assisted in the acquisition of certain Cantonese vowels, but could not be applied to all the vowels. Besides, the subject difference could not be ignored across variables with the variances from .838 to 5.738.

		Fixed effect				Subject effect	
		Estimate	SE	t(df = 18)	Pr(> |t|)	Variance	SD
Similar Vowels	AOA	-.291	.132	-2.202*	*.041*	4.482	2.117
	AOL	-.077	.137	-.567	*.578*	5.638	2.374
	LOR	.263	.131	2.024	*.058*	4.641	2.154
	Urdu use	-.664	.279	-2.382*	*.028*	4.318	2.078
	English use	-.031	.264	.121	*.905*	5.738	2.395
	Cantonese use	.923	.159	5.807***	*< .0001*	1.869	1.367
New Vowels	AOA	-.346	.094	-3.676**	*.002*	2.084	1.443
	AOL	-.111	.112	-.987	*.337*	3.658	1.913
	LOR	.319	.094	3.384	*.003*	2.25	1.5
	Urdu use	-.232	.262	-.88	*.386*	3.698	1.923
	English use	-.11	.22	-.501	*.622*	3.815	1.953
	Cantonese use	.817	.118	6.927***	*< .0001*	.838	.915

Table 2. Single LMM results for the new and similar vowels. Signif. codes: *** < .001, ** < .01, * < .05.

4 Discussion

4.1 Accent Ratings of the Vowels

So far few studies have examined the sound acquisition of multilingual speakers, especially for NCS children in Hong Kong. Regarding the impact of language learning experience imposed on L3 sound acquisition, there are mainly two aspects: typological similarity and L2 status (Cenoz, 2001). The results of accent ratings obtained from the present study demonstrate that new vowels are more difficult to produce than similar vowels for non-native learners (refer to Figure 1), which fail to support SLM. However, the findings are in line with the observation of Bonhn and Flege (1992), in which accent rating method was also adopted to explore the German speakers' articulatory accuracy of English new and similar vowels, and their accent rating results of the vowels challenged the SLM theory. Flege (1992) proposed that the methodology could be partially accounted for these discrepancies, since the counterexamples mostly appeared when accent rating method was utilized, while the acoustical data might majorly support the theory of SLM. In our study, Pakistani students with an average of 6.6-year Cantonese learning experience participated in the experiment, accent rating was adopted as experimental method. Furthermore, distinct from prior studies, all of the subjects in the current project were L3 learners who had learned English prior to Cantonese at the time of task. Therefore, the phonological similarity among Cantonese, English and Urdu typologies could also explain the accent results. By investigating 1,726 participants, To et al. (2013) reported that native children acquire the articulatory of vowels /y/ and /œ/ when they are 3 and 4 years old. Vowels /ɛ/ and /ɔ/ can be correctly produce by native children at age of 2.6 years old. Taken together with the aforementioned results, it was observed that vowels /y/ and /œ/ are difficult to articulate for both native and non-native children, compared to vowels /ɛ/ and /ɔ/, although the difficult ranking of vowels /y/ and /œ/ for native children is different for Urdu children as L3 learners.

4.2 Correlation of Learning Variables and L3 Accent Ratings

Previous studies found that various learning factors affect the perceived accents in the production of L2 learners (Flege, and Liu, 2001; Piske et al., 2001). In the present study, all the participants were L3 learners of Hong Kong Cantonese. Pearson and repeated single LMMs were applied to explore the correlation between learning variables and the perceived accent of vowels articulated by Urdu speakers. The results (see Table 1) indicate that Cantonese use is the most dominate factor, with a strong positive interrelation with accent ratings, i.e., the more frequently the non-native learners use Cantonese, the less accent their Cantonese pronunciation have. Besides, Urdu use shows secondary importance following Cantonese use, as it is negatively related with the accent ratings. It is proposed that, after living in the target language-speaking country, the less learners rely on their mother tongue, the weaker accent they will have while speaking Cantonese words. The results of language use are consistent with the conclusions of Flege et al. (1999), Piske et al. (2001), etc., suggesting that the use of native and target language correlates closely with the degree of perceived accent of non-native speakers. Moreover, the amount of English use, which is regarded a second language to Urdu speakers, does not dramatically impact the learners' pronunciation of their Cantonese, unlike the other two factors of language use. This may be partly due to the fact that the non-native speakers are less likely to adopt English as a daily spoken language in Hong Kong Cantonese speaking environment.

It is interesting to note that the accent degree of Cantonese vowels is also affected by the vowel type. Non-native children show different degrees of perceived accent while articulating different vowels, and this interrelates with various learning

factors (see Table 2). The non-native speakers' accent score of the new vowels (/œ/ and /y/) is mainly affected by Cantonese use, indicating that the more frequent the use of the Hong Kong Cantonese, the closer the learners' articulation is to the native-like level. Concerning the similar vowels, since learner' s native language also has vowels /ɛ/ and /ɔ/, the accent rating of the similar vowels is not only positively related to Cantonese use, but also negatively interrelated with Urdu use. It is predicted that if learners make use more of the Hong Kong Cantonese or less of Urdu, their production of the similar vowels will be obviously improved. Also, it is observed that the current results found no significant association between Cantonese accent ratings and the amount of English use. Thus, new vowels and similar vowels play different roles in acquiring non-native sounds for L3 learners; the accent rating of new vowels is solely influenced by the use of Cantonese, whereas the pronunciation of similar vowels is affected by both L1 and L3.

The current results unveiled significant effect of age-related factors confounding with both language use and vowel type (see Table 2), but the significance disappeared while certain variables were partialled out. Based on the single LMMs' results for different vowel types, AOA effect was found for both the similar and the new vowels, whereas the influence of LOR only detected for the new vowels. This suggested that the non-native speakers who came to Hong Kong at a late age usually got high accent in the articulation of both the similar and new vowels, and the length of learners' residence in Hong Kong could also facilitate the production of the new vowels, but it could not necessarily improve the pronunciation of similar vowels. In addition, AOL did not significantly correlate with the articulation of Cantonese vowels for Urdu children. Here arise the two questions: Why was significance only revealed for AOA but not for AOL? And why was LOR only associated with the accent ratings of new vowels but not with the similar vowels? One explanation for the results of AOA and AOL might be that age-related variables are usually related to the critical period (DeKeyser, 2000), during which a non-native child' s brain develops and becomes sensitive to the learning of new languages. Children who start learning a non-native language within the critical period might have a good chance of approximating a more native-like production than late language learners (DeKeyser, 2000). However, Flege and Liu (2001) did not totally agree with this view because there are still adult learners who learn a new language late but gain a native-like articulation without a detectable accent. Flege and Liu (2001) also revealed the important roles that motivation and L2 input played beyond the critical period impact in the process of non-native language learning. The participants in the current study were learners with Urdu as L1, aged between 13 to 17, who arrived in Hong Kong at 1 to 13 years old. They started to learn Cantonese at 3 to 15 years old, that means, once the learners arrived in Hong Kong they had already been exposed to Cantonese prior to receiving formal instruction. Thus, though AOA and AOL are both important variables of the critical period, AOA denotes the commencement of large non-native language input, whereas AOL emphasizes more on the beginning of formal language instruction. In the current results, it is the early language exposure, not the early formal instruction, that facilitated the pronunciation of Cantonese vowels for Urdu-speaking students. With respect to the results of LOR, the fact that many studies did not detect LOR to have an influence on L2 production might be attributed to the narrow range of LOR (Flege and Fletcher, 1992). In the current project LOR was ranged from 1 year to 14 years, and LOR effect was found for the new vowels, but not for the similar ones. Since LOR is treated as an important indicator of the amount of L2 input for most individuals (Flege and Liu, 2001), an intensive non-native input seems more likely to assist the acquisition of the new phonemes rather than the similar ones, which are more familiar to the non-native speakers.

5 Conclusion

The results from the current study suggest that the new vowels are harder to acquire than the similar vowels by Urdu speakers. The finding obtained from the project challenged SLM theory, but are in line with Bohn and Flege (1992) and Flege's (1997) conclusion. Regarding the relationship of accent ratings and learning factors, the amount of Cantonese use is proven to be the most determinant indictor for learners' perceived accent, followed by AOA, LOR and Urdu use. English use and AOL

impose the least effect on the L3 accent. The weighting of various variables related with accent ratings varies with vowel types. On the basis of the findings obtained from the study, we propose that non-native students ought to make more use of the Hong Kong Cantonese and less use of Urdu at school and after school. Doing so would definitely improve the pronunciation accuracy of non-native students' Hong Kong Cantonese.

Acknowledgments

This work is funded by the Language Fund under Research and Development Projects 2015-16 of the Standing Committee on Language Education and Research (SCOLAR), Hong Kong SAR.

References

Baayen R. H., Davidson D. J., Bates D. M. 2008. Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language.* 59(4): 390–412.

Bohn O. S., Flege J. E. 1992. The production of new and similar vowels by adult German learners of English. *Studies in Second Language Acquisition.* 14(2): 131–158.

Cenoz J. 2001. The effect of linguistic distance, L2 status and age on cross-linguistic influence in third language acquisition. In J. Cenoz, B. Hufeisen, & U. Jessner (Eds.), Cross-linguistic influence in third language acquisition: Psycholinguistic perspectives. Clevedon: Multilingual Matters: 8–19.

Cheung P. 1990. The acquisition of Cantonese phonology in Hong Kong: A cross-sectional study. Unpublished undergraduate thesis, University College London.

Census and Statistics Department, HKSAR government. 2012. Ethnic Minorities by Ethnicity and Age group, 2011(F401). Retrieved from: http:/www.census2011.gov.hk/en/maintable/F401.html.

De Angelis G. 2007. Third or additional language acquisition. Clevedon: Multilingual Matters.

DeKeyser RM (2000): The robustness of critical period effects in second language acquisition. *Studies in Second Language Acquisition*. 22(4): 499–533.

Flege J. E. 1987. The production of "new" and "similar" phones in a foreign language: Evidence for the effect of equivalence classification. *Journal of Phonetics*. 15(1): 47–65.

Flege J. E. 1995. Second-language speech learning: Theory, findings, and problems. In Strange, W. (Eds.), Speech Perception and Linguistic Experience: Issues in Cross-Language Research. Timonium: York Press: 233-277.

Flege J. E., Fletcher K. L. 1992. Talker and listener effects on degree of perceived accents. *Journal of the Acoustic Society of America*. 91: 370–389.

Flege J.E., Liu S. 2001. The effect of experience on adults' acquisition of a second language. *Studies in second language acquisition*. 23(4): 527–552.

Hammarberg B. 2001. Roles of L1 and L2 in L3 production and acquisition: Cross-linguistic influence in third language acquisition. *Psycholinguistic perspectives*. 31: 21–41.

Ohala M. 1999. Hindi. Handbook of the International Phonetic Association: A guide to the use of the International Phonetic Alphabet. Cambridge: Cambridge University Press

Piske T., Mackay I., Flege J. M. 2001. Factors affecting degree of foreign accent in an L2: a review. *Journal of Phonetics*. 29: 191–215.

Roach P. 2004. British English: Received Pronunciation. *Journal of the International Phonetic Association*. 34(2): 239–245.

Shi F., Peng G., Liu Y. 2015. Vowel distribution in isolated and continuous speech: The case of Cantonese and Mandarin. In Wang, S-Y & Sun, C. (Eds.), Oxford Handbook of Chinese Linguistics. Oxford University Press: 459–473.

Stokes S.F., Wong I.M. 2002. Vowel and diphthong development in Cantonese-speaking children. *Clinical Linguistics and Phonetics*. 16: 597–617.

To C.K., Cheung P.S., McLeod S. 2013. A population study of children's acquisition of Hong Kong Cantonese consonants, vowels, and tones. *Journal of Speech, Language, and Hearing Research*. 56(1): 103–122.

Uzal M., Peltonen T., Huotilainen M., Aaltonen O. 2015. Degree of perceived accent in Finnish as a second language for Turkish children born in Finland. *Language Learning*. 65(3): 477–503.

Zee E. 1999. Chinese (Hong Kong Cantonese). Handbook of the International Phonetic Association: A guide to the use of the International Phonetic Alphabet, Cambridge: Cambridge University Press: 59.