Phonetic Convergence of Mandarin L2 English Speakers towards Australian English

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ABSTRACT

Speech convergence provides a good model on studying L2 accent change in a short-term conversation. The present study investigates Mandarin L2 English speakers accommodating towards an Australian speaker before and after a task-based conversation. Acoustic analysis and a perceptual AXB test on the vowels /ɐ:/, /æ/ and /o:/ were carried out to measure the convergence effect before and after the task. Both acoustic measurements and perceptual analysis showed that the Chinese participants only accommodated to Australian /ɐ:/, but not to /æ/ and /o:/. Results suggested that non-native English speakers were able to accommodate to native accent even only after 1 hour exposure. However, the convergence did not occur on the vowel which has the larger acoustic-phonetic distance between learners' L1 and L2. Perception predicted by PAM could not fully explain the production change.

Keywords: Phonetic convergence, native accent accommodation, Mandarin L2 English speakers.

1. INTRODUCTION

L2 learners usually contain non-native accent in their pronunciation. It has been shown that young L2 Mandarin L2 learners change their accent along with the increasing exposure to the native environment [16]. However, the role of short-term exposure to native input in learning native accent is not very clear. Speech convergence provides a good model to study this issue. Speech convergence or accommodation refers to speakers adjust their phonetic parameter(s) to those of another group of people or individual. Recent studies on short-term convergence showed that speakers accommodate the vowel formants, duration, intonation, and speech rate after communicating with another person [3-5, 22-23]. Limited research on convergence of non-native subjects restrains our understanding on whether and how L2 learners accommodate to native accent after a short period of communication with native speakers. The present study addresses convergence in conversations between native and non-native speakers, aiming to answer the question and to investigate the feasibility of Speech Learning Model (SLM) [10], Perceptual Assimilation Model (PAM) [6-7], and Native Language Magnets (NLM) [21] in convergence.

1.1 Perception models and production

L2 learners' foreign accent is shown to be affected by the age of L2 learning [14], the length of residence [11], motivation [23], language aptitude [13], the amount of L1 use [12] and the native input [15] [30]. L2 learners usually transfer L1 features in speaking L2, which contribute to their foreign accent in L2 pronunciation. It is also important to understand how accent changes in native-non-native conversation, and whether the perception change would lead to production change. There are three dominant theories on non-native speech perception. SLM [10] suggests that the greater the perceived dissimilarity between an L2 sound and the closest L1 sound, the more likely it is that phonetic differences between the sounds will be discerned. PAM [6-7] argues that if two non-native sounds fall into a single native category, the similarity between the novel sounds and the native sound determines how good the discrimination is between the two L2 sounds. NLM [21] claims that if a L2 sound is close to the best instance (prototype) of a native phonetic category, the non-native sound would be perceived as a representation of that native category. The closer it is to the prototype, the stronger 'magnet' effect it receives, making it indistinguishable from the L1 sound. SLM, PAM and NLM focus on the similarity between L1 and L2 sounds from different angels, but except SLM, the rest do not correlate perception with production.

1.2 Convergence

Convergence has been widely studied in sociolinguistics and psychology. Giles, Coupland and Coupland [16] propose in their Communication Accommodation Theory that convergence is motivated by the individual's subconscious motivation to attain communicational efficiency, to shorten social distance, and to maintain positive social identities in conversation. On the other hand, Goldinger [17] and Pickering and Garrod [29] suggest a more direct and automatic connection between perception and production. Goldinger [17] suggests that convergence relates to episodic trace in

short-term memory, and the more frequent the words are, the stronger imitation would be found. Pickering and Garrod [29] argue that the basic interactive alignment is automatic and unconscious, without intervention from the listener.

On the other hand, recent studies on short-term convergence argue against the automatic view, suggesting social factors such as attractiveness of the interlocutor [2, 4] and dominant role of the speaker [25] influence the effect of convergence. Pardo and her colleagues found the imbalanced accommodation effects on givers and receivers, or males and females [25-26, 28]. Babel found that women who rated their interlocutor more attractive accommodate more, whereas the men had a reverse pattern [2, 4]. Babel also found that New Zealand speakers who have a positive attitude towards the Australian accommodate more [3].

1.3 Convergence of non-native English speakers

Research on convergence has focused on different subject groups including university students [27, 9], bilingual children [19], and non-native speakers of English [20, 24]. The effect of convergence of non-native speakers towards native speakers is not very salient. Kim et al. [20] studied convergence on pairs who either shared the same language/dialects, or between native English speakers and Korean/Mandarin L2 English speakers. Results showed that only the participants who shared similar language backgrounds accommodated. Non-native speakers did not accommodate towards the native accent.

However, Kim et al. [18] only tested the perceived production difference using naïve listeners, but they did not examine in detail the acoustic-phonetic differences. Accommodation may occur on the acoustic level but the change might not be large enough to be perceived. Moreover, the samples used in their perceptual test were sentence-length utterances which contained different words. Listeners may not be able to detect the convergence accurately due to the different content in comparison.

1.4 Vowels convergence

The vowels which have larger differences between interlocutors are more likely to accommodate for native speakers. Babel [2, 4] found that vowels did not demonstrate an equal accommodation effect whereas vowels /æ ɑ/ accommodated more than /i o u/. Babel explains that the larger difference on /æ ɑ/ between speakers and the stimuli giver's dialectal background provided sufficient acoustic-phonetic space for accommodation. This explanation was supported by another example in Babel [3]. New Zealand English speakers who pronounce *dress* as [dɹịs] accommodated to the Australian English *dress*- [dɹẹs] more than the other vowels in the shadowing task. On the other hand, Kim et al. [20] found that convergence did not occur between Korean English speakers and American English speakers, but it did occur when they talked to another Korean people speaking a different dialect. Non-native speakers seem to demonstrate a different pattern from native speakers on convergence. We do not know whether the larger distance between interlocutors' vowels would facilitate or inhibit accommodation of non-native speakers.

In summary, the present study aims to answer the question of whether the non-native speaker be able to accommodate native accent in a conversational setting, and of whether the cross-language similarities affect the degree of accommodation.

2 STUDY DESIGN

The present research studies convergence of Mandarin speakers towards Australian English (AusE) using a Map Task [1]. Chinese participants studying in the UK were exposed to an Australian accent, which is less familiar to them than UK accents. Their productions were analysed by perceptual AXB test and acoustic measurements.

Three Australian vowels were chosen: /ɐ:/ as in *path*, /æ/ as in *lab*, and /o:/ as in *cause*. Mandarin learners' perception changes are predicted by PAM which compares the similarities between Australian vowels and Mandarin vowels. If perceptual change leads to production difference, the larger perceptual change predicts, the greater production will gain.

For /o:/, a small accommodation effect is expected. Mandarin has six monophthongs /i y a ə u ɤ/ [22]. Though /o/ is not a monophthong in Mandarin, it appears in diphthong /uo/ and /ou/. Mandarin learners may gain some experiences on the [o] sound from Mandarin diphthongs. Based on PAM, Mandarin speakers should perceive Australian /o:/ the same as the [o] sound in Mandarin diphthong /uo/ and /ou/. Since no perception change would occur, no production change is predicted.

For /ɐ:/, a stronger accommodation effect is expected comparing to /o:/. Mandarin has a front-open vowel /a/ which is very similar to Australian /ɐ:/. It is hard to predict whether Mandarin speakers are able to distinguish /ɐ:/ from /a/, but compared to the /o:/ which is identical in Australian and Mandarin, more production change is expected on Australian /ɐ:/.

At last, /æ/ is expected to show the strongest accommodation effect. Since Mandarin does not have /æ/, native Mandarin speaker should

distinguish /æ/ from the other sounds easily. Therefore, the greatest production change among the three vowels should be found on /æ/.

In summary, Mandarin speakers are expected to accommodate to Australian /æ/ the most, following by /ɐ:/ and /o:/.

2.1. Participants

16 female Mandarin learners of English participated in the study. All participants were Masters students from the University of Edinburgh with English proficiency varying from IELTS 6 to 7.5.

The stimulus giver was a 26 year-old female AusE speaker from Melbourne who had just arrived in the UK at the time of the experiment.

2.2 The Map task

The participants and the AusE speaker were separated by a divider during the conversation, so that they would not see each other. This ensured that participants replied on linguistic cues rather than gestures. The Chinese participants were given 6 maps on which some landmarks are missing, whereas the stimulus giver had the complete maps with a route. Each participant worked with the one Australian speaker, and was asked to draw the route with her help. The landmarks and the street name on the maps contained three target words path, lab and cause, which ensured the interlocutors repeated the words as often as possible.

Before and after the Map Task the Chinese participants read a list of sentences which contained the same words as well as fillers. The words produced in pre- and post-task were extracted for acoustic analysis and a perceptual test.

2.3. AXB Perceptual test

20 native English speakers listened to 96 tokens of AXB comparison where the Chinese participants' pre- and post-task production were put in either A or B position, and the Australian's productions in X position. They were asked to judge whether the pre- or post-task item sounded more similar to the Australian one. The AXB perceptual test was conducted in a booth and all tokens were repeated twice.

3. RESULTS

3.1 Vowel formants

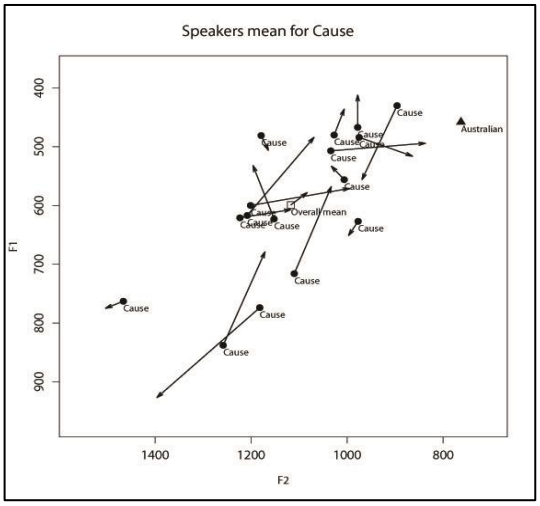
First and second formants were measured manually in Praat [8], by calculating the average over the middle 50% of the vowels. The overall mean values for three vowels in pre- and post-task are shown in Table 1. The Australian values are also shown in the table, which were used as a baseline for calculating Euclidean distances. A series of t-tests were conducted to compare formant changes between pre- and post-task, and significant p values are provided in Table 1. The mean value was calculated in Hertz.

Table 1: The overall mean value for three vowels of Chinese participants and Australian speaker. "ns" stands for "not significant"

	Cause		Path		Lab	
	F1	F2	F1	F2	F1	F2
AusE	458	763	815	1316	769	1655
Pre	599	1117	931	1660	914	1768
Post	578	1083	925	1545	910	1803
Sig	ns	ns	ns	.001	ns	.058

The formant changes from pre-task to post-task for each participant are shown in Figure 1, 2 and 3. Each black dot represents one participant. The start point of an arrow stands for the vowel position before the task, and the end point of arrow stands for the post-task position. Each arrow indicates the direction of formant change. The blank square represents the overall mean of the vowel, and the filled triangle indicates the Australian vowel.

Figure 1: The formant plot for *cause.*



In order to display the differences between pre- and post-test, the Euclidean distance was calculated between each token of the L2 vowels and the AusE vowels as shown in Figure 4. Convergence can be observed when the post-task distance is smaller than the pre-task distance.

Figure 2: The formant plot for *lab*.

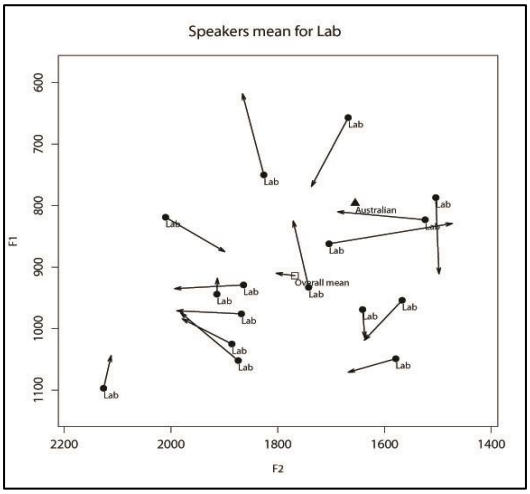
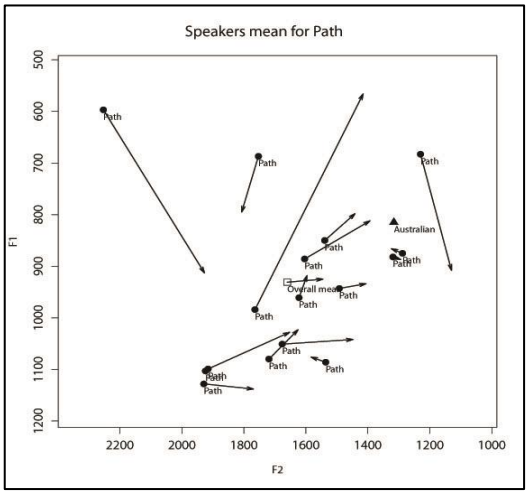
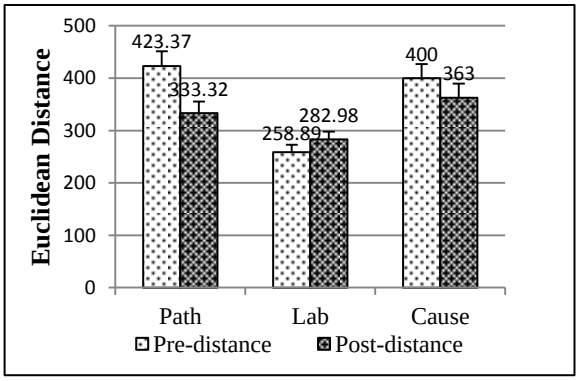


Figure 3: The formant plot for *cause*.



Pair-wise t-test for *path* showed that the pre-task distance was significantly larger than the post-task distance ($t(1,79) = .402$, $p < .001$). No significant result was found on *lab*, $t(1,79) = -1.811$, $p = .074$; or on *cause*, $t(1,63) = 1.491$, $p = .141$).

Figure 4: The distance between L2 learners and speaker in pre- and post-task across three vowels.



3.2 Perceptual AXB test

The words produced by Chinese speakers in pre- and post-task were compared to the words of the AusE. Convergence can be observed when post-task items are judged more similar to the Australian word than pre-task items are. Therefore, the proportion of selecting post-task items out of 1920 tokens was calculated.

The overall post-task items were selected at 52.3%. For vowels, post-task of *path* were selected at 62.2%, *lab* at 46.4% and *cause* at 49.1% (only the overall percentage and percentage of *path* differed from chance by 50%). Therefore, only *path* was perceived to be more Australian after the Map task.

4. DISCUSSION

The study investigates the convergence of Mandarin L2 English speakers in a conversation with an AusE speaker, and whether production change could be predicted by perceptual similarity of native and L2 vowels. First of all, Mandarin L2 learners are able to accommodate Australian accent in the present study, but the accommodate effect is influenced by the similarity between Mandarin vowels and Australian vowels. As predicted, no convergence is found on /o:/, and stronger effect is found on /ɐ:/. However, the result of /æ/ contradicts our prediction that /æ/ would receive the strongest effect of convergence; by contraries, it diverged from Australian /æ/ after the exposure. Such selectivity of vowel convergence is also found in Babel [2, 4], but the difference is in Babel's studies larger distance between speakers actually facilitated the accommodation. The reason could be that in present study the actual perception of L2 vowels differs from the predictions derived from PAM. No perceptual tasks are conducted to test learner's actual changes in perceiving Australian vowels before and after the conversation. Also, unlike native speakers who have established stable vowel categories already, the Mandarin learners of English may develop an interlanguage based on British English. They may start the convergence from an interlanguage mixed by British accent and Mandarin accent rather than their native language.

More distinct vowels between Mandarin and AusE could be used to elicit stronger effects.

5. CONCLUSION

The Mandarin learners of English accommodated to AusE after a short-term conversation. The production change can only be partly predicted by the similarities between learners' native language and L2.

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