Phonetic Targets in the Clear Speech Vowel Productions of Native Chinese Learners of Korean

Shiyu Zhang[1] & Jeffrey J. Holliday[2]

[1]*Korea University (Korea),* [2]*Korea University (Korea)*
saeokzhang@gmail.com, holliday@korea.ac.kr

Most previous studies on L1 Chinese learners of Korean attribute errors in L2 Korean vowel production to differences in the phonological vowel inventories between Chinese and Korean. It is explained that errors occur because when L1 Chinese learners speak Korean, they simply substitute the Chinese vowel phonemes most similar to Korean vowels. However, a difference in phonological inventory does not always cause a problem in L2 vowel learning [1]. One question raised by these previous studies is what L1 Chinese learners' Korean vowel targets actually are: are their phonetic targets themselves non-native like, or merely implemented in a way such that the target is not fully realized (e.g. undershot)?

According to [2], it has been shown that the phonetic targets of vowels are hyperarticulated: that is, the phonetic target of a vowel in the mind of the speaker is more peripheral in the vowel space than what is typically produced. In the current study, we aim to characterize the phonetic targets by eliciting citation speech and clear speech, which is a form of hyper-articulation. The main question we aim to address is the following: When L1 Chinese speakers are asked to produce Korean vowels more clearly, do they get closer to native-like targets? We additionally looked at these speakers' native Chinese vowel productions, to confirm whether the clear speech enhancement strategy used in the L2 is the same as what they use in their L1.

The participants were 20 L1 speakers of Chinese and 20 L1 speakers of Korean. Speakers first read a list of 21 disyllabic Korean words in a carrier sentence, and then were asked to repeat the list but speaking as clearly as possible, as if to a child learning the word. Each word contained a target vowel in the first syllable. The Chinese speakers did the task again with a list of 15 Chinese words, too. The recordings were labeled in Praat and the mean F1 and F2 were measured over a 20 ms window in the steady state interval of each target vowel. The format values were normalized using the Lobanov method. Statistical significance between vowels was tested using separate linear mixed effects models of normalized F1 and F2.

The vowel spaces for both groups' Korean vowel productions are shown in Figure 1. The clear speech distributions are very similar for the vowels /ɑ/, /ɛ/, /i/, /ɨ/, and /ʌ/, with the only significant differences between groups being that L1 Chinese speakers' /i/ and /ʌ/ are slightly higher (i.e. lower F1; /i/, $p = .015$; /ʌ/, $p = .037$) than that of L1 Korean speakers. In the high back area of the vowel space, compared to native Korean speakers, L1 Chinese /o/ is lower and fronter (i.e. higher F1, $p = .011$; higher F2, $p = .027$), and /u/ is higher and backer (i.e. lower F1, $p = .013$; lower F2, $p = .003$). In terms of particular contrasts, it was found that the L1 Chinese speakers made the /o/-/u/ contrast using F1 alone, whereas L1 Korean speakers used both F1 and F2.

When the /o/ and /u/ targets are compared across speaking styles but within each L1 group, it was found that L1 Chinese speakers produce their clear targets by lowering and backing /o/, and backing /u/. In other words, for L1 Chinese speakers, both /o/ and /u/ should be in the back of the vowel space, and /o/ is lower than /u/. But for L1 Korean speakers, /u/ is already fronter than /o/ in citation speech, and in their clear speech both /o/ and /u/ are lowered. This result was unexpected, because the lowering of both /o/ and /u/ does not result in an overall expanded vowel space. But it demonstrates a pattern in which speakers of both languages use one dimension to make the /o/-/u/ contrast (F1 for L1 Chinese, primarily F2 for L1 Korean), but then use the other dimension to produce it more clearly (F2 for L1 Chinese, F1 for L1 Korean).

So why do L1 Chinese speakers move their /u/ target back in clear speech, when L1 Korean speakers' /u/ target is actually fronter? Comparing the clear speech phonetic targets of Chinese speakers' Korean /u/ and Chinese /u/, it was found that Chinese /u/ was both lower (i.e. higher F1; $p < .001$) and backer (i.e. lower F2; $p < .001$), suggesting that the backing of Korean /u/ in the clear speech of L1 Chinese speakers could be the result of their phonetic target being aligned with their

back Chinese /u/.

In conclusion, although there are differences in the Chinese and Korean vowel inventories, these results suggest that L1 Chinese speakers are not merely substituting a Chinese /u/ for a Korean /u/: they do produce a difference in /u/ between the two languages. But rather, their phonetic target for Korean /u/ remains tied to their Chinese /u/, leading them to move /u/ further back in the vowel space in clear speech, despite the fact that Korean /u/ is actually fronter. These results further demonstrate that both native and non-native speakers can make enhancement adjustments by recruiting non-primary acoustic cues. L1 Korean speakers signal the /o/-/u/ contrast primarily using F2, but increased their reliance on F1 to produce it more clearly. L1 Chinese speakers, on the other hand, rely primarily on F1 to signal the /o/-u/, but used both F1 and F2 to enhance the contrast in clear speech.

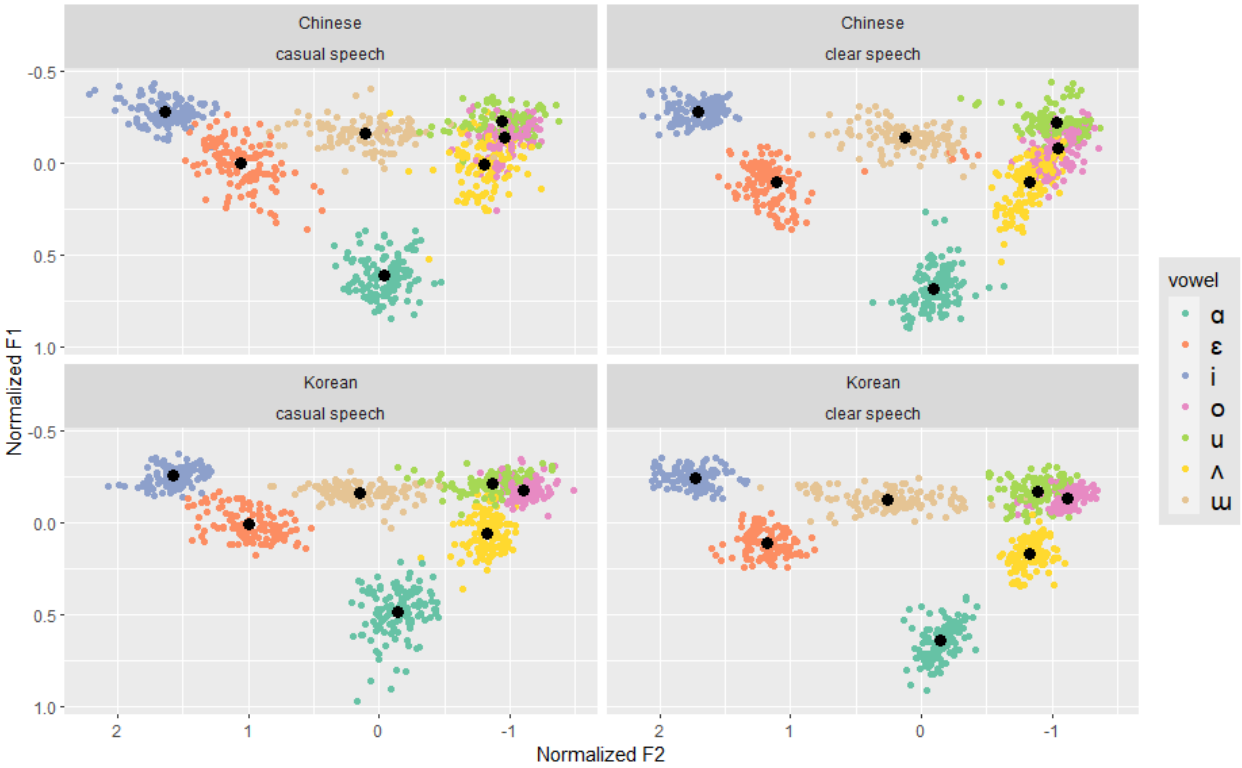

Figure 1. L1 Chinese and L1 Korean speakers' vowel spaces

References

[1] Flege, J. E., & Bohn, O.-S. (2021). The revised speech learning model (SLM-r). In R. Wayland (Ed.) *Second language speech learning: Theoretical and empirical progress* (pp. 3-83). Cambridge University Press.

[2] Johnson, K., Flemming, E., & Wright, R. (1993). The hyperspace effect: Phonetic targets are hyperarticulated. *Language, 69(3)*, 505–528.