Previous research on spontaneous speech imitation has demonstrated that speakers shift their productions in the direction of the model speech that they have just heard in their native language. For instance, English speakers, after hearing English model speech containing voiceless stops with extended voice onset time (VOT), produced voiceless stops with longer VOTs (e.g., Nielsen, 2011). Furthermore, Kwon (2015) finds that native speakers of Seoul Korean produced aspirated stops with higher post-stop f0 after being exposed to Korean aspirated stops with extended VOT as well as those with raised post-stop f0. She claims that the imitative changes are mediated by language-specific cue primacy, because post-stop f0 is the primary cue for aspirated stops in Seoul Korean although both VOT and f0 are required to differentiate aspirated stops from other phonation types (e.g., Kang, 2014). Arguably, Seoul Korean speakers imitate an exaggerated non-primary cue (long VOT) by enhancing the primary cue (post-stop f0) for the relevant phonological contrast (aspirated stops) (Kwon, 2015).

The current study investigates whether bilingual speakers employ the same imitation strategy in their second language when it differs substantially from their native language in terms of the association of phonetic cues with corresponding phonological categories. Specifically, this study tests spontaneous imitation of English by bilingual speakers of Seoul Korean and English, and examines how the two cues for aspirated stops in their native language (Seoul Korean), namely high post-stop f0 and long VOT, operate in the process of imitating English voiceless stops. Unlike Seoul Korean, the primary cue for English stop voicing contrast is long VOT (e.g., Abramson & Lisker, 1985). However, post-stop f0 still plays a non-negligible role in perceiving English voicing contrast, at least for native listeners, even if it is phonologically redundant (Whalen et al., 1993). If Seoul Korean-English bilingual speakers rely on their native Seoul Korean phonology in imitating English voiceless stops with extended VOT or raised post-stop f0, it is predicted that they would imitate enhancement in both cues by raising post-voiceless-stop f0, in line with Kwon’s (2015) findings. If the bilingual speakers do not associate high post-stop f0 with phonological voicelessness in English in the same way as they do in their native language, then they would not imitate voiceless stops with longer VOTs by raising post-stop f0.

**Manipulated VOT:** In Experiment 1, 19 bilingual speakers of Seoul Korean and English (mean age = 25.2; mean duration of residence in US = 5.0 years) were tested. All participants were self-identified as native speakers of Seoul Korean, proficient in both Korean and English, but dominant in Korean. Participants (1) read English /t, d/-initial words (baseline), (2) heard and shadowed English model speech containing /t/-initial words whose VOTs were extended by 60ms (shadowing), and (3) read baseline words again (test). The original English model speech was recorded by a male native speaker of American English. Participants’ own VOTs and post-stop f0s of /t, d/ in baseline, shadowing, and test productions were measured and statistically analyzed using a series of linear mixed effects models. Results showed that English /t/ with extended VOT induced imitation in both shadowing and test productions. Both in shadowing and test blocks, VOTs of participants’ own /t/ were significantly longer than their baseline counterparts (β = 5.99, p = 0.015 and β = 5.11, p < 0.01, respectively). Post-/t/ f0 in shadowing production was significantly lower than its baseline counterpart (β = -5.34, p < 0.05), while the post-/t/ f0 difference between baseline and test productions was not significant (p = 0.55).

**Manipulated f0:** Experiment 2 used the same design as Experiment 1 except that, rather than manipulating VOT, the manipulation for target /t/-initial words was to raise f0 of the post-/t/ vowels by 20%. The same 19 speakers participated. Preliminary results (12/19 speakers analyzed to date) show that the bilingual speakers adjusted neither VOT nor post-stop f0 for their own /t/ productions after hearing and shadowing English /t/ with artificially raised post-stop f0: both in shadowing and test blocks, VOT of /t/ was not significantly different from baseline VOT of /t/ (p = 0.15 and p = 0.49, respectively). Also, post-/t/ f0 was not significantly different between baseline and shadowing (p = 0.30) nor between baseline and test productions (p = 0.18).
Figure 1: Mean VOT and post-stop f0 of /t/ in baseline, shadowing and test productions. f0 is presented in z- scores to plot male and female speakers together. Error bars represent 95% confidence intervals.

Figure 1 summarizes the changes in VOT (left panel) and post-stop f0 (right panel) of English /t/ produced by Seoul Korean-English bilingual participants throughout different production blocks in the two imitation experiments. Taken together, these findings provide evidence that proficient bilingual speakers do not draw on their native cue primacy in performing imitation tasks in their second language, and adjust the phonetic properties that are relevant to the second language.

More crucially, the current findings arguably suggest that even proficient bilinguals might not use the non-primary cue in the same way as native speakers. Kwon (2015) shows that Korean native listeners imitated an enhanced non-primary cue by exaggerating the primary cue for the relevant contrast. But the bilingual speakers in the present study did not imitate English stops with high post-stop f0 (a non-primary cue for English voicing contrast – e.g., Whalen et al., 1993) by enhancing the primary cue. Moreover, Heath (2014) finds that when native English speakers imitate voiceless stops with lengthened VOT, they did not imitate post-stop f0 of the stimuli independently from imitation of stop VOT, but post-stop f0 changes accordingly with changes in VOT. The decrease in post-/t/ f0 in the shadowing block of Experiment 1 seems contrary to Heath’s (2014) finding, suggesting that the role a non-primary cue plays in a second language imitation is potentially different from that in native language imitation. Alternatively, stop VOT in Seoul Korean, although it is a non-primary cue for aspirated stops, may have a different status from post-stop f0 for English voicing contrast, because long VOT in Korean is still the primary cue for the aspirated stop in other regional dialects (e.g., Lee & Jongman, 2012) and in speech of older generation (Kang, 2014). In order to verify these two possibilities, a future study would therefore need to examine English native speakers’ imitation of voiceless stops with raised post-stop f0.

References