Language-specific production and perceptual compensation in V-to-V coarticulatory patterns: Evidence from Korean and Japanese

The goal of the present study is to test whether production and perception in V-to-V carryover coarticulatory effects differ between Korean and Japanese. Based on two experimental findings that the amount and the pattern of coarticulation are affected by language-specific phonological structure, namely vowel contrast (Manuel and Krakow 1984; Manuel 1987, 1990; Magen 1984; Beddor et al. 2002), and that listeners compensate coarticulatory information from an adjacent segment (Fowler 1981; Fowler and Smith 1986; Dahan et al. 2001; Beddor et al. 2002), we expect that Japanese speakers with a less crowded vowel space are expected to show larger V-to-V coarticulation than Korean speakers in production; and also when presenting the English non-words with a VCV structure to two different language listeners, Japanese listeners are expected to show greater compensation effects in perception of the vowel target than Korean listeners.

In Experiment 1 (production), the V-to-V carryover coarticulation was examined between Korean and Japanese in terms of the F2 changes over time course of a vowel trajectory in the structure of $V_1CV_2$, where $V_1 = \{i, o, a\}$, $V_2 = \{i, o, a\}$, and the C is a bilabial stop (Magen 1997). The preliminary results (Figure 1) showed that when the target vowel was /a/, both language speakers showed considerable coarticulatory effects, because in the low vowel region, both Korean and Japanese has only one vowel and thus they rarely run a risk of losing contrasts due to coarticulation. However, when the target vowel was /i/ or /o/, namely, it was from non-low regions, Korean speakers showed less coarticulation from the first vowel to the second in VCV context, due to the crowdedness of vowel space. These results clearly show that Japanese speakers with less crowded vowel space showed stronger carryover coarticulatory effects than Korean, largely compatible with the previous claim on language-specific coarticulation.

In Experiment 2 (perception), a 4IAX discrimination task was given to these two language listeners (Fowler 1981). For this, English coarticulatory effects were spliced into different coarticulatory contexts, namely, two pair types, one pair with acoustically distinct target vowels both embedded in coarticulatorily appropriate contexts, and the other pair with acoustically identical target vowels, one of these being embedded in an inappropriate coarticulatory context. Perceptual compensation for coarticulation was measured by whether listeners judged vowel similarity based on the vowels’ acoustic identity or on the appropriateness of the vowels’ coarticulatory context. The preliminary results (Figure 2) showed that both Korean and Japanese listeners showed similar compensatory responses to the stimuli, and their performance consistently fell below 50% correct.

The results of the present study indicate that even though systematic language-specific differences were observed in the carryover V-to-V coarticulatory patterns for Korean and Japanese speakers, these differences were not directly linked to their patterns of perceptual compensation, suggesting that perceptual compensation is not “complete” (Beddor et al. 2002; Pierrehumbert 2001).
Figure 1. F2 values in Hz for Korean (dashed line) and Japanese (solid line) speakers’ production of the target vowel from the vowel onset (0 ms) to its onset of steady state (40 ms) when /i/ is preceded by /i/ or /o/ (a); when /a/ is preceded by /i/ or /a/ (b); and when /o/ is preceded by /i/ or /o/ (c).

Figure 2. Pooled percent correct responses of the Korean and Japanese listeners to the English 4LAX tests of discrimination of carryover coarticulatory effects at each type of vowel pairings for the experimental condition.