Cross-linguistic perception of nasal coarticulation in an unfamiliar language

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Introduction: Many studies have shown that coarticulation is modulated in language-specific ways. For example, allophonic anticipatory nasal coarticulation is cross-linguistically common, but its degree varies across languages [1]. Listeners can use nasal coarticulation in auditory word recognition [2], and although its perception in an L2 is influenced by L1 experience [3], experienced L2 learners can still use coarticulatory cues in L2 word recognition [4] and production [5]. The current study explored how a group of L1 English listeners perceive nasal coarticulation in a language they have no experience with: Korean. Although both anticipatory ([CṼN]) and carryover ([NṼC]) nasalization occur in both languages, it has been proposed [5] that anticipatory nasalization is less extensive in Korean due to a smaller velum-lowering gesture, and that carryover nasalization is less extensive in Korean due to the denasalization of phrase-initial nasal onsets [6]. There is also evidence in English that listeners vary in their perceptual sensitivity to nasal coarticulation [7]. Thus, although languages may differ in their use of coarticulatory nasalization, does listeners' sensitivity to it also vary across languages even when the listeners have no L2 experience with it?

Method: Five speakers each of English and Korean recorded 6 CVN/CVC (FINAL) and 6 NVC/CVC (INITIAL) minimal pairs in three speech styles in a carrier sentence that included two repetitions of the target word. This resulted in 1440 productions, of which the usable tokens were split into lists of 130-144 tokens each, and then presented to L1 English listeners (n = 28), blocked by condition and language. In the FINAL condition, the final segment was replaced with white noise and listeners decided whether the original word was the CVN or CVC item; in the INITIAL condition, the initial segment was replaced with noise and listeners chose between NVC or CVC. Separate mixed effects logistic regression models predicting response (nasal vs. oral) were then built for each condition, with fixed effects of target nasality and language, random slopes for nasality by listener, and random intercepts for word. The model-predicted "nasal" response rates from each model are shown in Table 1.

Results*:* First, there was an overall oral bias. This is partly expected, as orality tends to be perceived more accurately, and nasal coarticulation itself is gradient across speakers [8]. Second, the perception of nasality differed across languages in nasal (CVN/NVC) targets, but not CVC targets. In other words, listeners were more sensitive to nasal coarticulation in English than in Korean, as illustrated in Figure 1.

Most relevant to our research question, the by-listener relationship between sensitivity to nasal coarticulation in English and Korean differed according to condition: in the INITIAL condition (carryover nasalization, the right half of Figure 2), listeners who perceived more stimuli as nasal, regardless of whether the original word was CVC or NVC, did so in response to both English and Korean stimuli (even though overall rates were low). But in the FINAL condition (the left half of Figure 2), while CVC stimuli were perceived similarly across languages, listeners perceived anticipatory nasalization in CVN stimuli differently in English and Korean: listeners who did perceive nasality in English CVNs did not necessarily perceive it in Korean CVNs (separately from Korean CVNs being perceived as less nasal overall than English CVNs, a result in line with post-hoc acoustic analyses of the stimuli).

Conclusion: Thus, we find that L1-English/Korean-naïve listeners show similar perceptual use of coarticulation as a cue to nasal onset identity in carryover contexts for both languages. Yet, listeners who use coarticulation to predict coda nasality in English do not show similar use of anticipatory coarticulation in Korean. These results are relevant for understanding language-specific vs. universal use of coarticulatory cues during speech perception.

Table 1. Model-predicted nasal responses (%) in both conditions.

	FINAL		INITIAL	
Language	**CVC**	**CVN**	**CVC**	**NVC**
English	24.0	**59.3**	15.1	**43.3**
Korean		**33.7**		**29.8**

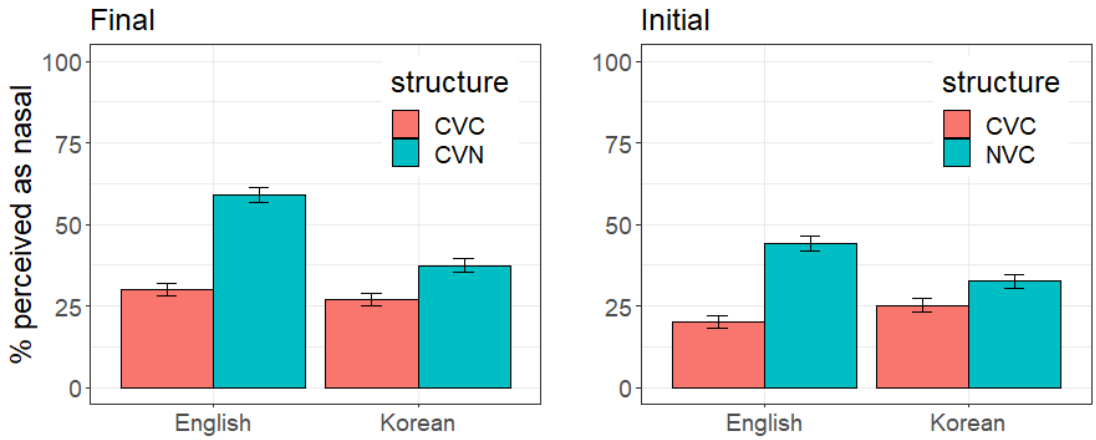

Fig. 1. Percentage of trials in each condition receiving a response of "nasal".

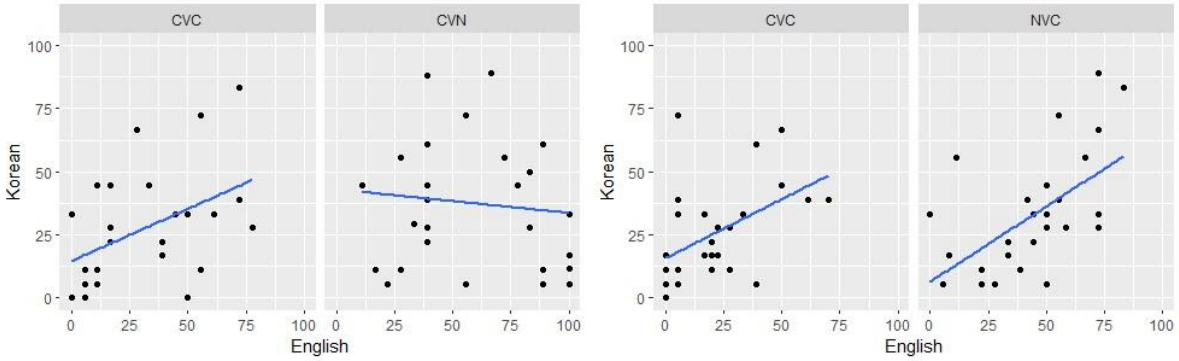

Fig. 2. Individual rates of "nasal" response for Korean vs. English stimuli in the FINAL condition (left panels, CVC vs. CVN) and INITIAL condition (right panels, CVC vs. NVC).

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