Asymmetry in the perceptual assimilation of the Korean laryngeal contrast by Indian listeners

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This study explores the naïve perception of word-initial Korean stops and affricates by native (L1) listeners of two Indian languages, Hindi and Paite. Whereas Korean stops and affricates are characterized by a three-way laryngeal contrast among tense, lax, and aspirated categories (e.g. /t*, t, tʰ/), all voiceless in word-initial position, Hindi has a four-way contrast of voicing and aspiration (e.g. /dʱ, d, t, tʰ/), and Paite has a three-way contrast, but different from Korean (e.g. /d, t, tʰ/). All of the Hindi and Paite laryngeal contrasts are homorganic with the exception of Paite affricates, which seem to be /ʤ, ʦ, ʧʰ/ [1]. Thus, although all three Korean categories are voiceless in word-initial position, both Hindi and Paite contain only two voiceless categories (/t/ and /tʰ/), raising the question of whether the existence of two extra voiced categories in Hindi and one extra voiced category in Paite would affect how Korean stops and affricates are perceived by naïve listeners. According to the Perceptual Assimilation Model [2], non-native segments should assimilate to the most gesturally similar L1 categories, which would be the Hindi and Paite voiceless unaspirated and aspirated categories (i.e. /p, t, k, ʦ, ʧ, pʰ, tʰ, kʰ, ʧʰ/). Nevertheless, this question resembles the subset problem in L2 perception [3], and is empirically important for the development of hypotheses about non-native speech perception involving such typologically marked contrasts.

The target stimuli consisted of 12 Korean consonants (/p*, t*, k*, p, t, k, pʰ, tʰ, kʰ, ʨ*, ʨ, ʨʰ) combined with three vowels (/a, i, u/) to form 36 CVs, which were produced by four female native speakers of Seoul Korean, resulting in a total of 144 unique target CV stimuli. Listeners completed a perceptual assimilation task using all 144 stimuli, in which they indicated which L1 sound the stimulus was most similar to, and rated the category goodness on a scale of 1 to 5.

The native Hindi listeners (n=15) were tested in Delhi. Most (n=10) also spoke English as a second language, as is common in India. The Paite listeners (n=15) were tested in Churachandpur, a town in Manipur state, India, and all reported speaking English as a second language. The experiment was presented in a quiet room using headphones and a notebook computer running OpenSesame version 3.2.4. Responses were recorded on paper.

An assimilation fit index (FI) was calculated for each Korean/L1 sound pair by multiplying the mean goodness rating by the percentage of trials of the Korean sound that were assimilated to the L1 sound. Thus, the FI can range from 0 (= the L1 sound was never chosen for a given Korean sound) to 5 (= it was always chosen and always given a goodness rating of 5). As another example, an FI of 3 could represent an assimilation rate of 75% and a mean goodness rating of 4 (75% × 4 = 3), an assimilation rate of 60% and a mean goodness rating of 5 (60% × 5 = 3), or one of many other combinations. Due to space limitations, the FIs presented here (shown in Table 1) are collapsed into Hindi and Paite voicing/aspiration categories, rather than showing each consonant and vowel context individually.

Korean tense stops strongly assimilated to Hindi and Paite voiceless unaspirated categories, with FIs ranging from 3 to 4. Korean lax and aspirated stops generally assimilated to Hindi and Paite voiceless aspirated categories, but the FIs were slightly lower, ranging mostly from 2 to 3, and with some Korean categories weakly assimilating to a voiceless unaspirated category as well. In terms of place of articulation (not shown in Table 1), bilabial and velar stops strongly assimilated to homorganic Hindi and Paite categories. Hindi listeners assimilated Korean alveolar stops to both Hindi dental and retroflex categories, whereas Paite listeners strongly assimilated them to Paite dental categories. In summary, the results for stops were roughly in line with what we expected based on the Perceptual Assimilation Model.

Although phonologically analogous to the stops, the assimilation of Korean affricates exhibited quite a different pattern. First, Paite listeners assimilated all three Korean affricates, including

unaspirated /tɕ*/, to a voiceless aspirated category. This result may be explained by the fact that Paite voiceless affricates consist of only /ʦ/ and /ʧʰ/. Korean /tɕ*/ may be more similar to /ʦ/ in terms of aspiration, but /ʧʰ/ in terms of place, suggesting that Paite listeners might have weighed the place cue more heavily than the aspiration cue.

In the case of Hindi, the highest FIs for the Korean affricates were found in the Hindi voiced affricate categories. Korean /tɕ*/ assimilated reasonably well to Hindi /ʤ/, but also to a lesser degree to Hindi /ʧ/. Korean /tɕ/ and /tɕʰ/, however, were split more between Hindi /ʤ/ and /ʤʰ/. These results were unexpected, as none of the Korean affricates are voiced, and none of the Korean stops assimilated even slightly to a Hindi voiced category. Thus, even though the Korean affricate contrast is usually described as laryngeally analogous to the well-studied three-way stop contrast, it does not perceptually map onto the Hindi four-way contrast in an analogous way.

These results suggest that although Hindi and Paite listeners may not differ in how they perceive Korean stops, they may differ in their perception of Korean affricates. We are currently analyzing discrimination data from these same listeners, and plan to extend this work into the production of these Korean contrasts by native Hindi and Paite L2 learners of Korean.

	Hindi				**Paite**		
Korean	**voiced aspirated**	**voiced unasp.**	**voiceless unasp.**	**voiceless aspirated**	**voiced unasp.**	**voiceless unasp.**	**voiceless aspirated**
/p*/ ㅃ			**3.73**			**3.57**	
/t*/ ㄸ			**3.47**			**3.57**	
/k*/ ㄲ			**3.70**			**3.51**	
/tɕ*/ ㅉ		**2.32**	**1.11**			0.87	**2.56**
/p/ ㅂ			**1.19**	**2.11**		0.98	**2.85**
/t/ ㄷ			0.86	**2.43**		0.85	**2.72**
/k/ ㄱ			**1.05**	**2.38**		0.64	**2.81**
/tɕ/ ㅈ	0.84	**1.04**	0.69	0.62	0.29	0.58	**2.59**
/pʰ/ ㅍ			**1.23**	**2.04**		0.74	**3.08**
/tʰ/ ㅌ			0.86	**2.69**		0.85	**2.99**
/kʰ/ ㅋ			0.85	**2.69**		0.79	**2.82**
/tɕʰ/ ㅊ	**1.33**	**1.13**	0.36	0.55	0.23	0.38	**2.91**

Table 1 Perceptual fit indices (FIs) for Korean stops and affricates for Hindi and Paite listeners. For clarity, FIs less than 0.2 were omitted, and FIs greater than 1.0 are in boldface.

References

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