

## Functional/ Phonology & Phonetics

“Acoustic study of Korean vowel devoicing depending on the preceding consonants and intrinsic/ extrinsic vowel durations”

A well-known characteristic of Japanese in many dialects is the devoicing of high vowels, /i, u/, between voiceless consonants. This paper investigates a similar phenomenon in Korean, which though less well-studied than Japanese devoicing, has also been described as resulting from undershoot of the laryngeal gesture (Jun & Beckman, 1994; Jun, Beckman & Lee; 1996). The phonetic basis of Korean devoicing is examined here through a comparison of vowels that differ in duration and in adjacent consonant. If devoicing results from undershoot of the voicing gesture, conditioned by the laryngeal setting of adjacent consonants, devoicing will be more likely to occur with vowels of short phonetic duration. Duration is manipulated by the factor of vowel height (high vs. non-high vowels, which differ in intrinsic duration), and also by speech rate (fast vs. slow). If Korean devoicing is phonetically-driven, we expect the instances of completely devoiced vowel to increase as the syllable duration decreases, for both high and non-high vowels alike. In contrast, if Korean devoicing is phonologically-based, similar to what is claimed for Japanese, we may expect devoicing in high vowels and no devoicing of non-high vowels, regardless of rate-dependent syllable duration.

The undershoot hypothesis is tested with acoustic vowel duration data from Korean. Durations of the voiced and voiceless intervals of vowels are taken from disyllabic nonsense words of the shape CVta, where C varies over 14 voiceless obstruents, and V varies over 7 monophthongs, including high and non-high vowels. Each target word, embedded in a carrier sentence, is produced at speaker-determined fast and slow rates. Five female participants speaking standard Seoul dialect produced six repetitions of each sentence.

The results show three conditioning effects on the occurrence of devoicing: i) preceding consonant, ii) rate-determined vowel duration, and iii) vowel height. First, devoicing is frequent following aspirated affricates and stops and lenis fricatives, sporadic following lenis stops, and entirely absent or extremely rare following fortis stops. Thus, aspiration is a trigger of devoicing while the fortis laryngeal gesture blocks devoicing. Second, the results show an interaction between intrinsic duration (V height) and extrinsic duration (speech rate) in conditioning devoicing. Duration measures for high and non-high vowels, pooled over fast and slow speech rates, overlap in the region of 58.6-238.6 ms. Of interest, whereas high vowels exhibit duration-dependent devoicing in this range, non-high vowels never devoice. Specifically, high vowels are reliably voiced at durations over 127.6 ms., and are reliably devoiced at durations under 58.6 ms. At duration between 58.6-127.6 ms., high vowels are variably devoiced, while non-high vowels at the same durations are never devoiced. Thus, while duration is a conditioning factor for devoicing of high vowels, the phonological vowel height feature is a primary factor for determining the potential for devoicing.

Taken together, these results support the view of vowel devoicing in Korean as a phonetically-driven phenomenon of gestural undershoot, conditioned by rate-dependent vowel duration, but strongly constrained by the phonological vowel height feature. We conclude that Korean devoicing is a phonetically conditioned but phonologically constrained phenomenon.

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