Underlying and derived tense stops in Seoul Korean

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Korean has the post-obstruent tensing rule which transforms lax stops into tense stops after another obstruent. For example, this rule changes underlying geminate sequence /at.ta/ into [a.**t***a]. This study aims to empirically examine whether the tense stop derived from underlying geminate lax stops is identical to an underlying tense stop. Specifically, we ask whether underlying geminate sequence (/at.ta/ → [a.**t***a]) and underlying tense stop (/a.**t***a/ → [a.**t***a]) exhibit articulatory and acoustic characteristics of geminates. Korean word-medial tense stops have previously been argued to be phonological geminates (e.g., [2]).

Geminates are defined as long consonants. Therefore, geminate stops are expected to have extended closure durations. Articulatorily, previous studies have suggested that geminates have a more advanced tongue position than singletons due to fortition (e.g., Eastern Oromo: [3]; Saudi Arabic: [1]). However, in Hungarian, no conclusive evidence was found for tongue fronting in geminates [4], indicating potential cross-linguistic variations in the articulatory realization of geminates.

To test whether underlying geminate sequence /a**t.t**a/ and underlying tense stop /a.**t***a/ have the characteristics of geminates and to investigate potential differences in their phonetic realizations, we compare (1) tongue configuration during closure and (2) closure duration (acoustically-measured) of coronal stops in /a.**t**a/, /a**t.t**a/, and /a.**t***a/, as well as labial stops in /a.**p**a/, /a**p.p**a/, and /a.**p***a/. We also include nasal stops /a.**n**a/, /a**n.n**a/, /a.**m**a/, and /a**m.m**a/, representing clear cases of geminate and singleton, in our investigation.

Eight adult self-identified native speakers of Seoul Korean (4M/4F) participated. Ultrasonic data (midsagittal tongue contours) were recorded using a transducer fixed relative to the speaker's head. Audio signals were simultaneously recorded. Ten target stimuli were presented as nonwords in the Korean alphabet embedded in a carrier sentence, along with disyllabic nonword fillers. Each nonword was repeated six times in random orders. To examine tongue positions, we extracted the ultrasound frames during the closure of the stop consonants. In this abstract we report preliminary results (4/8 speakers analyzed to date).

(1) Tong position during closure: No consistent tongue root advancement was observed for either derived or underlying tense stops compared to lax stops (Figure 1). Similarly, geminate nasals did not exhibit more advanced tongue root than singleton nasals (Figure 2). We include data from representative speakers in Figures 1-2, but four speakers exhibited similar patterns.

(2) Closure duration (Figure 3): Both derived and underlying tense stops had longer closure duration than lax stops [$\beta_{\text{derived-lax}} = 103.6$; $\beta_{\text{underlying-lax}} = 95.4$; both p's < 0.001], with no significant difference between derived and underlying tense stops [$\beta = 8.18$, $p = 0.27$]. Geminate nasals had significantly longer closure than singleton nasals [$\beta = 83.0$, $p < 0.001$].

Taken together, our preliminary data suggest that derived tense stops and underlying tense stops differ neither in closure duration nor tongue position during closure. Closure duration data indicates that derived and underlying tense stops are indistinguishable, and both are comparable to nasal geminates (Figure 3). As geminate nasals also do not differ from singleton nasals in their tongue shape (Figure 2), the lack of tongue position difference implies that Seoul Korean may not use fortition to realize geminate stops, akin to Hungarian [4]. This study contributes to the discussions on the categorization of Korean tense stops as geminates, by providing articulatory and acoustic evidence—or rather, the lack thereof.

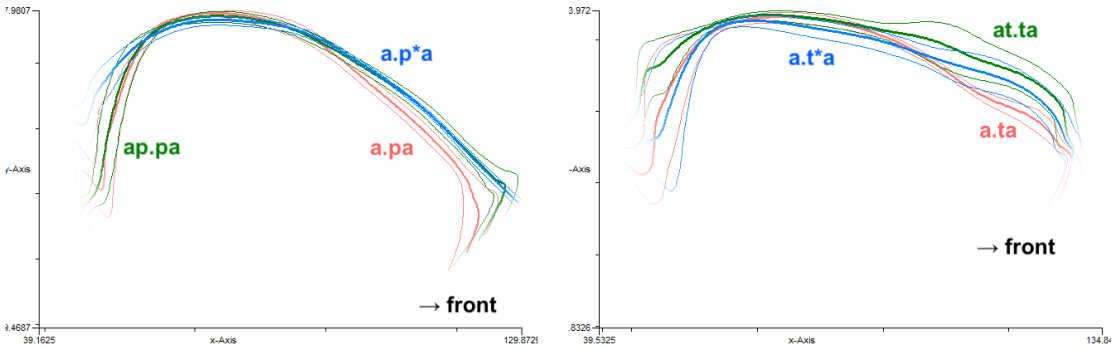

Figure 1. Average tongue contour (thick lines) during oral stop closure: labial stops (left, F1) and coronal stops (right, M1). Thin lines represent 95% confidence intervals.

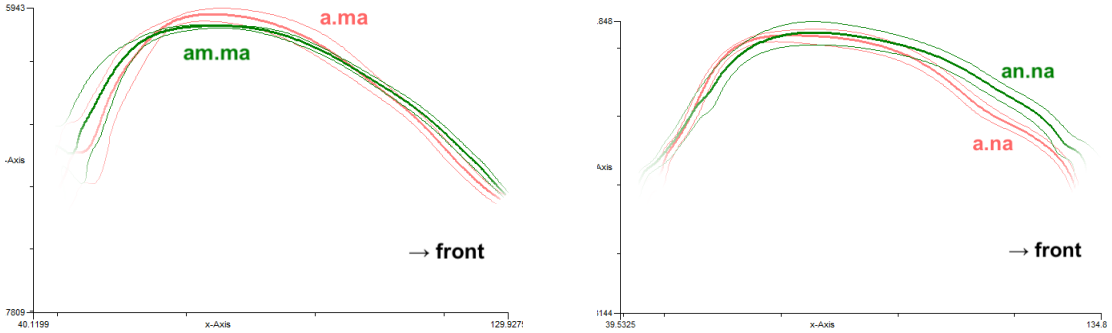

Figure 2. Average tongue contour (thick lines) during nasal stop closure: labial stops (left, F1) and coronal stops (right, F2). Thin lines represent 95% confidence intervals.

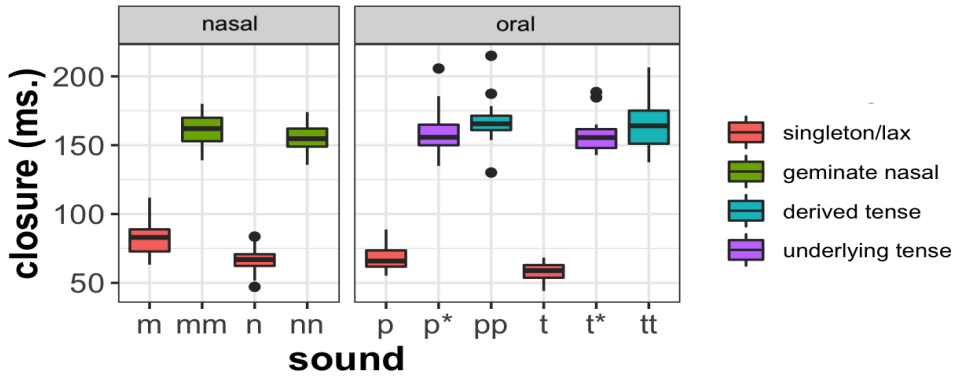

Figure 3. Closure duration (ms.) by consonant types

Selected references

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[4] Percival, M., Csapó, T. G., Bartók, M., Deme, A., Gráczi, T. E., & Markó, A. 2020. Ultrasound imaging of Hungarian geminates. *UltraFest IX*.