Gemination as fortition? Articulatory data from Hungarian

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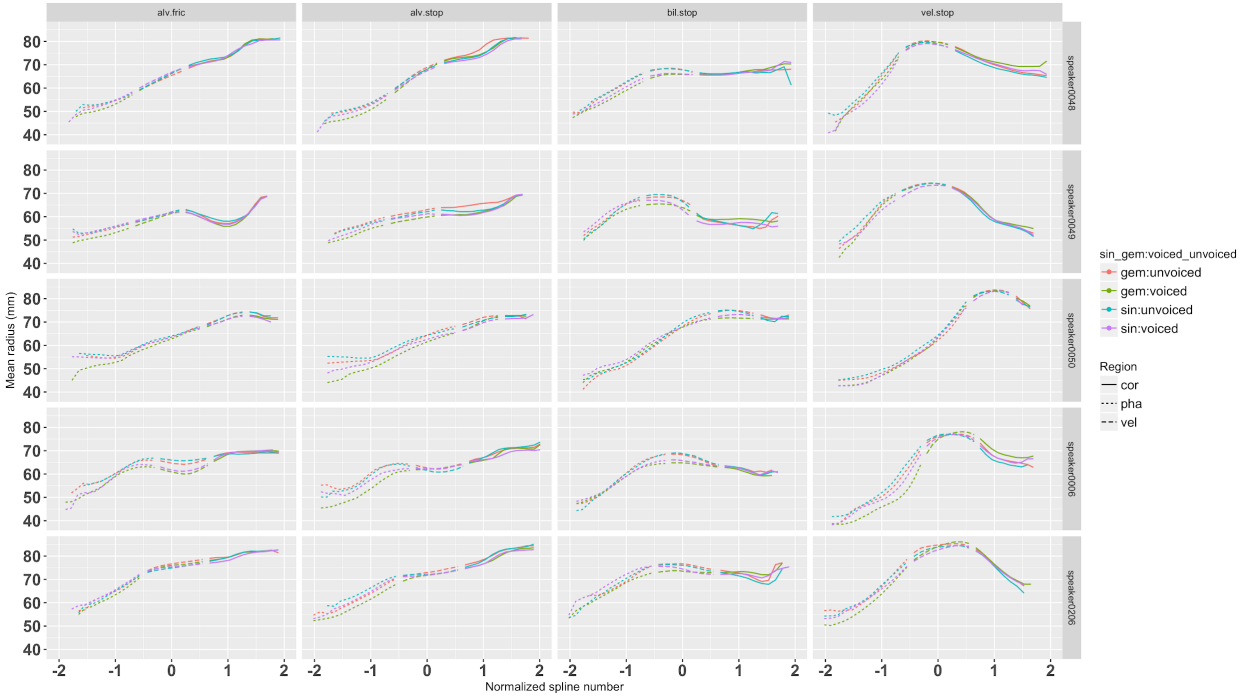
Introduction: This study uses ultrasound imaging to investigate how tongue position differs across singleton and geminate consonants in Hungarian. In previous research, coronal geminates were found to be produced with greater lingual-palatal contact and a higher and flatter tongue (Kochetov & Kang, 2017; Payne, 2006). In Eastern Oromo, ultrasound imaging found similarly results that the tongue was more advanced in the mouth for coronal geminates, suggesting that it was more fully reaching its targeted place of articulation than singletons (Percival et al., 2019). These findings liken gemination with fortition. We follow up on these studies by examining whether there is evidence of differences in lingual articulation in geminates compared to singletons in Hungarian. As previous studies concentrated on coronal stops, we additionally ask if similar patterns of tongue raising or fronting can be found for geminates at other places of articulation as this could indicate how closely the pattern is tied to gemination in general versus a tongue pull mechanism limited to coronals.

Methodology: Five native speakers of Hungarian (3 female, 2 male) were recorded with ultrasound and audio in Articulate Assistant Advanced (AAA). They read six repetitions of a word list containing geminate and singleton voiced and voiceless bilabial stops, alveolar stops, alveolar fricatives, and velar stops in intervocalic (post-tonic) position. Ultrasound frames at the point of maximum constriction were selected, and tongue contours were traced in AAA. The tongue contours were rotated to the speaker's bite plane and divided into three regions (coronal, velar, and pharyngeal) (c.f. Recasens & Rodríguez, 2016). For each region, the radial distance between the ultrasound probe and the surface of the tongue was submitted to linear mixed effects models in R to determine where the radius length differed across consonants (reflecting differences in tongue shape and position). The predictors were consonant type (alveolar stop, alveolar fricative, bilabial stop, velar stop), gemination (singleton, geminate), voicing (voiced, voiceless), and normalized spline number (a scaled version of the points along the tongue at which each radius was measured).

Results: There was no main effect of gemination on radius length in any tongue region. There were, however, interactions in the velar and pharyngeal regions of gemination with normalized spline number. Radii decreased in length the farther back along the tongue, and the interaction indicates that they decreased at a different rate for geminates. In general, geminates had slighter shorter radii in the velar and pharyngeal regions, but in the pharyngeal region, the opposite pattern held for bilabials. Shorter radii in these regions suggest a tongue that is more forward and lower. However, looking at the individual results (Figure 1), it can be seen that differences in tongue position for geminates vs. singletons are very subtle with a lot of overlap and not necessarily consistent across speakers. More evident in Figure 1 are the significant interactions of consonant type with the normalized spline number, indicating differences in tongue shape across place and manner of articulation, as well as the significant interactions of voicing and normalized spline number, suggesting advanced tongue root for voiced segments.

Discussion: The findings are not conclusive of tongue raising or fronting for geminates in Hungarian, regardless of place of articulation. This suggests that there are cross-linguistic differences in how closely the geminate - singleton contrast is linked with fortition. Languages such as Eastern Oromo may have more fortition in geminates and/or more lenition in singletons than Hungarian, or it may be that fortition in geminates is realized differently in Hungarian than Eastern Oromo and that additional articulatory measures would be better suited to capturing it.

Figure 1. Mean normalized tongue radii by speaker and consonant type in three tongue regions



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