

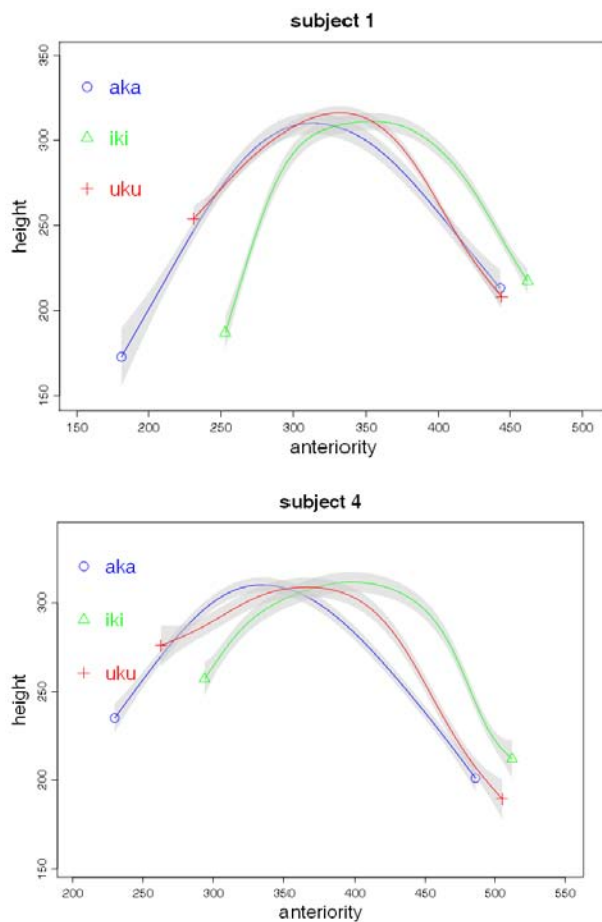
Distributed effects in coarticulation: an ultrasound study

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In this study of coarticulation, we introduce the dimension of distributedness, where coarticulatory effects range from localized within to distributed throughout the vocal tract. We use smoothing-spline regression (Wahba 1983, 1990, Wang 1998) of ultrasonic data to derive fitted polynomial curves, which allows comparison of tongue surface configurations.

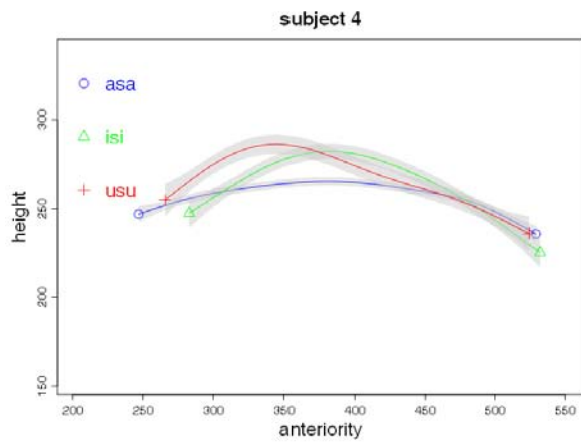
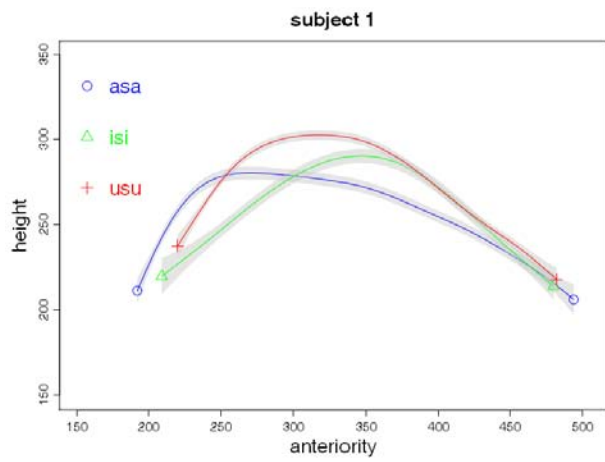
Distributedness is indicated by a lack of overlap in the configuration of the tongue for a target across conditions. For example, the dorsum in English velar sounds varies by surrounding vowels, leading to a difference in the locus of occlusion on the palate. Articulatory coupling then distributes this effect to the blade and root; fig (1) illustrates [k] in different vowel contexts.

(1)



Localized effects are indicated by some overlap across conditions. For example, the blade in English coronal sounds remains stable, though the dorsum varies with surrounding vowels. Figure (2) illustrates [s] in different vowel contexts. Moreover, even if the absolute position of the tongue blade changes across conditions, the effect remains localized if the region of occlusion along the alveolum is consistent.

(2)



Our data suggest that the directionality and extent of coarticulation follow from two parameters: competition for active articulators, and density of the perceptual and articulatory space that the target inhabits. Coarticulation is relatively more distributed if adjacent sounds compete for the use of an active articulator, and if target sounds occupy a relatively sparse perceptual space. We thus conclude by proposing a predictive model of coarticulation as an alternative to Recasens' Degree of Articulatory Constraint model.