/r/-allophony and gemination: an ultrasound study of gestural blending in Dutch

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Standard Dutch increasingly displays an /r/ allophony pattern in which coda /r/ (e.g. *paar* 'couple') is realised as a post-alveolar approximant (bunched or retroflex), whereas onset /r/ (e.g. *raden* 'guesses') is typically a uvular fricative or trill (Scobbie and Sebregts 2010). In this paper, we investigate the spatial and temporal characteristics of coarticulation between these distinct allophones in a "fake geminate" context (*paar raden*). Fake geminates tend to undergo gradient degemination in Dutch (Martens and Quené 1994). However, while the /r#r/ sequence consists of phonemically identical consonants, they are phonetically strongly disparate. This invites the question of whether degemination also applies here, and in case it does, what it entails in gestural terms.

We present articulatory data from 4 speakers of Standard Dutch (3 females), collected with a high-speed ultrasound system (121 fps). The test materials included /r/ in canonical onset, canonical coda and fake geminate contexts, in a controlled prosodic and segmental environment (10 tokens per context per speaker). The ultrasound data were analysed using two methods: i) dynamic analysis of principal components of pixel intensity data in the ultrasound image (TRACTUS, Carignan 2014), and ii) SS-ANOVA (Davidson 2006) comparison of tongue contours at the point of maximal constriction for the /r/ and at the acoustic onset of the vowel. We used the principal components (PCs) obtained using TRACTUS in a Linear Discriminant Analysis trained to distinguish /aː#rV/ (*pa raden*) from /aːr#C/ (*paar baden*). We then used the algorithm to classify /r/ tokens in the fake geminate context, /aːr#r/, (*paar raden*). The average discriminant values for an example speaker, DF2, are plotted in Figure 1.

Figure 1

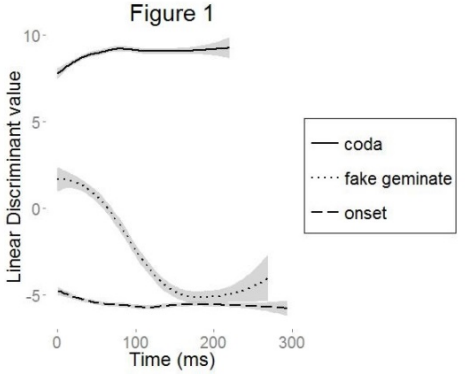
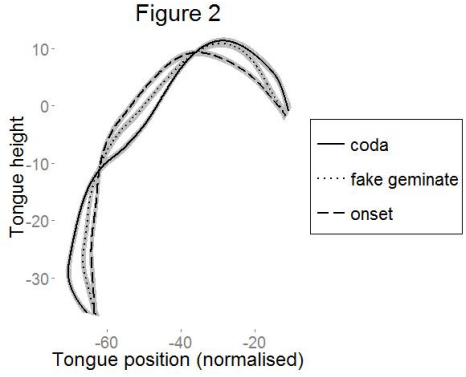


Figure 2



For most of the /aːr/ duration, the fake geminate context shows values that are in between the two baselines, suggesting an intermediate articulation between coda and onset /r/. This is confirmed by results of SS-ANOVA at the /r/-constriction: there is a simultaneous bunching gesture (as in canonical codas) and dorsal raising (as in canonical onsets) in *paar raden*, although both gestures are spatially reduced compared to those in non-geminate onsets and codas (Figure 2). In temporal terms, however, the fake geminate context shows no increase in duration compared to singleton onset /r/. In other words, the effect of degemination is strongest in the temporal domain. This situation is reminiscent of that of /l#l/ fake geminates in English (e.g. *peel lemurs*, Scobbie and Pouplier 2010), although these

show incomplete overlap and less temporal reduction. The Dutch facts can be captured in Articulatory Phonology (AP) as a blending of two gestures that overlap completely in time. We discuss such an interpretation in the context of the restrictive view AP takes towards allophony (two allophones are considered to consist of the same gestures, with possible differences in magnitude and timing), which is problematised by the Dutch allophonic [ʁ]~[ɻ] pattern.

References

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