Spatial and Temporal Properties of Gestures in North American English /ɹ/

Fiona Campbell[1], Bryan Gick[1,2], Ian Wilson[3], Eric Vatikiotis-Bateson[1,2]

[1] *University of British Columbia, Vancouver, BC, Canada*
[2] *Haskins Laboratories, New Haven, Conneticut, U.S.A*
[3] *University of Aizu, Japan*

Key words

articulatory gestures

articulatory timing

English /ɹ/

Optotrak

ultrasound

Abstract

Systematic syllable-based variation has been observed in the relative spatial and temporal properties of supralaryngeal gestures in a number of complex segments. Generally, more anterior gestures tend to appear at syllable peripheries while less anterior gestures occur closer to syllable peaks. Because previous studies compared only two gestures, it is not clear how to characterize the gestures, nor whether timing offsets are categorical or gradient. North American English /r/ is an unusually complex segment, having three supralaryngeal constrictions, but technological limitations have hindered simultaneous study of all three. A novel combination of M-mode ultrasound and optical tracking was used to measure gestural relations in productions of /r/ by nine speakers of Canadian English.

Results show a front-to-back timing pattern in syllable-initial position: Lip then tongue blade (TB), then tongue root (TR). In syllable-final position TR and Lip are followed by TB. There was also a reduction in magnitude affecting Lip and TB gestures in syllable-final position and TR in syllable-initial position. These findings are not wholly consistent with any theory advanced thus far to explain syllable-based allophonic variation. It is proposed that the relative magnitude of gestures is a better predictor of timing than relative anteriority or an assigned phonological classification.

Language and Speech