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Introduction: English approximant /ɹ/ is famously subject to extensive articulatory variation, with tongue shapes traditionally grouped under two broad labels, ‘bunched’ and ‘retroflex’ [1]. These variants are often claimed to be indistinguishable perceptually [2] and acoustically [3]—though tongue shape appears to be socially salient in Scottish English [4]. It has been suggested that at least in American English, bunched and retroflex rhotics differ in the higher formants: for instance, bunching results in higher F4 than retroflexion [5]. This finding, however, is based on relatively few speakers. Given the complex, speaker-specific articulatory trading relationships which have been observed in English /ɹ/ [3], which are argued to reduce acoustic variability between observations, it is unclear how well this result generalizes across speakers or across varieties of English. Indeed, the possibility of inter-dialect differences in /ɹ/ articulation and acoustics was first raised long ago (cf. [1]), but has since received little attention.In this study, we investigate how the dynamics of F1–F4 in approximant syllabic/post-vocalic /ɹ/ vary (1) as a function of tongue shape and (2) across dialects of English.Data and methods: Audio and ultrasound recordings of 23 speakers (11 American, 9 Scottish, 3 Irish) reading target words in carrier sentences were made in a sound-attenuated booth. Utterances were automatically segmented using the Montreal Forced Aligner, and 525 tokens of syllabic /ɹ/ or vowel + tautosyllabic /ɹ/ sequences in word-final syllables were extracted from 49 target words. Tongue shapes were classified from the ultrasound data as mid-bunched, front-bunched, front up (retroflex) or tip up (retroflex), following [4]. Formant tracks were obtained automatically (with manual correction) using the FastTrack [6] plugin for Praat, and Nearey2-normalized. For each formant, a generalized additive model of frequency over relative time was fitted, with terms for the effects of tongue shape and dialect (including their interaction) and appropriate by-speaker and by-item random smooths.Preliminary results: All four tongue shapes were observed in each dialect, albeit in different proportions: the two bunched articulations were favoured in American (70%) and Irish English (67%), whereas a majority of Scottish tokens were retroflex (64%). Controlling for the effect of tongue shape, significant differences between American and Scottish English are observed in F1 (American > Scottish), F3 (Scottish > American), and F4 (American > Scottish) over large portions of the trajectory. This suggests on average greater pharyngeal and/or palatal-velar constriction in

American than in Scottish English (cf. [1,3]). The patterns for Irish English are unclear due to the small sample size, but may more closely resemble those of American English. The effect of tongue shape is not significant for any formant, both when controlling for dialect and within dialect groups: as this may partly be due to considerable inter-speaker variability and a lack of statistical power, analysis of data from a further 10 speakers is underway.References[1] Delattre & Freeman (1968) [2] Twist et al. (2007)[3] Guenther et al. (1999)[4] Lawson et al. (2011)[5] Zhou et al. (2008)[6] Barreda (2021)

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Title

Acoustic and articulatory variation across dialects in English approximant /ɹ/