# All paths lead to [ʃ]:
## Varying sibilant articulation and *s*-retraction in Manchester English

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In this paper we use ultrasound and acoustic data to investigate *s*-retraction in the clusters /stɹ/ and /stj/ in Manchester English (McrE). Our results uncover inter-speaker variation, not only with respect to the categoricity and gradience of retraction, but also the articulatory means employed to achieve the same or similar acoustic outputs.

*S*-retraction is somewhat under-studied in British English and past work is based solely on acoustic data (e.g. Altendorf 2003, Bass 2009, Sollgan 2013). In American English (AmE), however, *s*-retraction is relatively well-studied (e.g. Durian 2007, Gylfadottir 2015, Wilbanks 2017). It has been argued that retraction in AmE is triggered directly and non-locally by /ɹ/ (e.g. Shapiro 1995), though this has been rejected by others (e.g. Lawrence 2000, Rutter 2011) who claim that it is indirect, with retraction of /s/ coming from the affrication of /t/ by a following /ɹ/.

Our results suggest that, in McrE, /ɹ/ is not the direct cause of retraction, nor is it the only indirect source as we see comparable behaviour in /stj/. Although we find inter-speaker variation with respect to the gradience or categoricity of retraction, /stɹ/ and /stj/ pattern together.

Taking into account both the acoustic and articulatory data, results from 8 subjects (3M, 5F; aged 18–26) reveal inter-speaker variation. In terms of articulation, there are three groups of speakers: those with categorical retraction, those with gradient retraction and those with no apparent lingual difference between all contexts (even underlying /s/ and /ʃ/). Crucially, we see that all speakers still show an acoustic difference between /s/ and /ʃ/, even those with no visible differentiation in tongue shape.

In addition to varying degrees of *s*-retraction, *t*-affrication is found in all speakers. For most speakers, the fricated portions of pre-/ɹ/ affricated /t/ and instances of /tj/-coalescence are identical both to each other and to underlying /tʃ/.

The fact that all speakers, produce retraction for /stɹ/ and /stj/ shows that certain explanations for *s*-retraction in AmE are not applicable to McrE. That is, rather than /ɹ/ being the direct trigger (see Baker et al. 2011), we instead suggest that both /ɹ/ and /j/ trigger affrication of the preceding /t/, which in turn causes retraction of /s/ (cf. Lawrence 2000, Rutter 2011 inter alia; contra Magloughlin & Wilbanks 2016). Furthermore, the results suggest that speakers are hitting an acoustic rather than articulatory target in order to produce acoustic "retraction". That is, speakers resort to different articulatory means to achieve the same or similar acoustic signals on the /s/–/ʃ/ continuum, such as lip-rounding, tongue grooving or finely-controlled tongue tip movement (see Rutter 2011:31).

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