Listeners compensate for asymmetric sound change distribution of /s/-retraction in American English
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Introduction: Researchers have proposed that perceptual compensation may be linked to sound change actuation, as a change begins when listeners do not compensate for extreme coarticulatory information (e.g. Ohala 1993). Instead, listeners encode a new speech target, which may influence later productions, even in environments where coarticulatory triggers are not present. Less work, however, has examined the role perceptual compensation plays in on-going sound changes. Notable exceptions, like Harrington et al. (2008), have focused on vowel shifts, finding apparent time support for Ohala’s hypothesis: as the sound change progresses to environments without coarticulatory triggers, younger listeners compensate less for coarticulatory effects.

The present study examines perceptual compensation for /s/-retraction, an American English sound change in progress in which /s/ approaches [ʃ] in /stʃ/ clusters (Shapiro 1995), but rarely in /s{p, k}ʃ/ clusters. Accounts of /s/-retraction propose that /ʃ/ exerts a coarticulatory influence on /s/ across the intervening /t/. However, while /t/ is shown to have a slight dampening effect on /s/ in /st/ clusters, and while /s{p, k}ʃ/ show some coarticulatory effects (Baker et al. 2011), there does not appear to be a definitive coarticulatory explanation for the asymmetric distribution of the phenomenon. Furthermore, for some individuals, the change appears to be phonologized, where /staʃ/ clusters can be said to be reanalyzed as /ʃtaʃ/ clusters, but this is never observed for /s{p, k}ʃ/ clusters. Finally, it is crucial to note that English phonotactics do not permit /ʃ/ preconsonantly, potentially encouraging more extreme coarticulation without the need to maintain a phonological contrast. This study seeks to examine listeners perception of /s/ and /ʃ/ in these environments to better understand the nature of this asymmetric distribution.

Methods: Due to the lack of contrast /s/ and /ʃ/ preconsonantly, this study utilizes nonce words to identify listeners’ phoneme category boundaries. Two model talkers (males, ages 19 and 21) recorded the nonce words s{p,t,c}rimble /s{p,t,k}mbal/ as well as the prevocalic equivalents simble /smbal/ and shimble /ʃmbal/.

Thirty-one participants completed a forced choice (non-)lexical decision task in a sound attenuated booth. Participants were presented with the orthographic nonce word choices and responded with a key selection. Each step was played a total of four times for both speakers.

Results/Discussion: Listeners’ responses (/s/ or /ʃ/) were modeled using a logistic mixed effects regression with TARGET (STR, SKR, SPR), STEP (1–7, scaled), and SPEAKER as independent variables. Additionally, random intercepts for listener and by-listener random slopes for TARGET, improved model likelihood, suggesting significant individual variability.

The results of the model find that /staʃ/ clusters are significantly more likely to receive an /s/ response at higher steps than /spʃ/ and skʃ/.

Figure 1: Percentage of /ʃ/ responses (y-axis) as a function of increased /ʃ/ mixing ratio (x-axis) by target cluster (COLOR: red = /staʃ/, green = /skʃ/, blue = /spʃ/).
Figure 2: Individual variation (panels) in percentage of /s/ responses (y-axis) as a function of increased /s/ mixing ratio (x-axis) by target cluster (color: red = /stɪ/, green = /skɪ/, blue = /spɪ/). Communities where /s/-retraction is not yet common, and thus /stɪ/ clusters only exhibit nominally more coartcutatory effects than /s{p, k}ɪ/ clusters. Similarly, speakers who exhibit compensation to the point of never perceiving /f/ preceding /tɪ/ clusters, may be speakers from communities that have advanced or phonologized retraction, not yet consciously represented as /f/ due to English orthography. Taken together, these different perception strategies for a sound change in progress demonstrate how one’s experiences shape their phonology, which in turn can influence their perception and future production, actuating and propagating novel sound changes.

Selected references