

Perceptual equivalence between prevoicing and pitch: implications for sound change
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Coarticulation constitutes one source of variation in speech which may give rise to sound change. One prominent sound change model postulates that at least some sound changes, such as the phonologization of contrastive vowel nasalization, arise from the reinterpretation of an acoustic cue as being associated with its coarticulatory effect (Beddor, 2009). By hypothesis, this reinterpretation is possible only when at a previous stage, the source and the effect are *perceived as equivalent*. For example, when hearing a $\tilde{V}N$ sequence, listeners are more sensitive to the acoustic consequences of a lowered velum gesture than its precise temporal alignment: that is, they may perceive the occurrence of nasality in the same way, regardless of whether it occurs during the \tilde{V} or the N. Perceptual equivalence may provide the basis for a listener to reinterpret the intended signal, potentially giving rise to sound change.

While nasalization can be characterized by a single gesture of velum lowering giving rise to a constellation of acoustic cues over a stable temporal interval, changes such as the transphonologization of onset voicing and f_0 involve more complex gestural constellations and multiple acoustic cues in successive temporal intervals. In this study, we examine whether these differences affect the applicability of perceptual equivalence as an explanation of sound change. Specifically, we examine two cues to the perception of voicing (VOT and onset f_0) in French, a language with the kind of “true voicing” laryngeal contrast found in languages like Afrikaans prior to phonologization of onset f_0 taking place (Coetzee et al., 2018). Previous work has shown that VOT and f_0 trade perceptually in at least some regions of the stimulus space; however, if source and effect are perceptually equivalent, we might expect them to trade *across* the stimulus space.

We test this idea using an AX discrimination task. 92 French listeners were asked to discriminate between stimuli differing in the way the two cues varied: congruent variation, incongruent variation, and variation of only one cue with the other held constant. To mitigate participant fatigue, we restricted the VOT continuum to the critical continuum steps: half of the stimuli pairs were unambiguously within the voiced category, while for the other half, one stimulus was at the voiced-voiceless boundary. Following Beddor (2009), if perceptual equivalence obtains, we expected that stimuli varying congruently should be better discriminated than those varying incongruently. However, we found evidence for perceptual equivalence only when VOT was ambiguous. We suggest this is because the so-called trading relation observed between VOT and f_0 is not solely a function of gestural alignment in the way that nasalization is, and that within-category perceptual equivalence may not be a precondition for cue reweighting in all sound changes. In the specific case of the phonologization of onset f_0 , prior ambiguity in terms of the primary cue/coarticulatory source appears necessary for cue reweighting to occur.

Beddor, P. S. (2009). A coarticulatory path to sound change. *Language*, 85(4), 785–821.

Coetzee, A. W., Beddor, P. S., Shedden, K., Styler, W., & Wissing, D. (2018). Plosive voicing in Afrikaans: Differential cue weighting and tonogenesis. *Journal of Phonetics*, 66, 185–216.