

Investigating the effects of laryngeal contrasts on vowel fundamental frequency in Central Swedish stop consonants.

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The effects of laryngeal contrasts in obstruents on the fundamental frequency (F0) of the following vowel remains a question of deep interest to phoneticians and phonologists particularly for its potential to explain the emergence of new phonological contrasts. It is empirically well established that vowels following phonologically voiceless stops have a higher mean F0 than vowels following phonologically voiced stops. Its cause is a matter of debate although phonological and physiologically-based accounts have been proposed.

The feature enhancement hypothesis (e.g. Kingston and Diehl 1994) holds that F0-perturbations serve to perceptually enhance active laryngeal features. Languages with an active [voice] feature should exhibit F0 lowering – relative to a baseline – while languages with an active [spread glottis] feature should exhibit F0 raising. Physiologically driven hypotheses propose that articulatory gestures that support and counteract voicing are themselves the cause of the F0 perturbations. (e.g. Jessen 2001; Kirby and Ladd 2018).

Central Standard Swedish (CSS) provides a unique case for investigating this question given claims that its stop contrasts are phonologically over-specified – possibly featuring closure voicing in /b d g/ and aspiration in /p t k/ (Beckman et al., 2011; Helgason & Ringen 2008). This implicates an active [voice] feature in /b d g/ and an active [spread glottis] feature in /p t k/ (but see: Lindqvist, 1972; Keating et al., 1983).

We analysed the main acoustic cues to stop contrasts and focus on its effects on vowel F0 with a new database of isolated /b d p t/-initial words by adult speakers of the CSS dialect (n = 44, female = 24). We measure duration of voicing lead and lag, and F0 trajectories in the following vowel. The latter are compared to vowel F0 in corresponding nasal contexts (/m n/) which serve as a baseline for unperturbed F0 trajectories (Hanson 2009).

Our analysis of the distributions and statistical correlations of the acoustic cues describe the characteristics and structure of CSS word-initial stop contrasts at two places of articulation. We find considerably more variation in how speakers implement the voicing contrast than previously reported. Some speakers consistently prevoice /b d/, others consistently devoice them, and many adopt both patterns. F0 trajectories following nasals, /m n/ are indistinguishable from /b d/ regardless of phonetic voicing status but differ significantly from those following /p t/ wherein we find F0-raising. We discuss how these patterns might inform our theoretical understanding of the F0 differences that arise from laryngeal contrasts in Swedish and beyond, as well as its implications for perception.

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