Coarticulation of non-modal phonation

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Background

• Non-modal phonation coarticulation is found adjacent to sounds with laryngeal articulations, e.g. breathy onset of English vowel after aspirated stop in a word like *cat* (Ladefoged 1983).

• Non-modal vowels can be adjacent to segments with different types of non-modal phonation, as in White Hmong [hə̰]'to solder'.

• Previous work has shown that contrastive non-modal phonation lasts longer than allophonic non-modal phonation (Blankenship 2002).

Goals and Hypotheses

• To describe the acoustics of breathy-to-creaky phonation coarticulation in vowels in three unrelated languages by comparing the contours with a modal baseline.

• To account for cross-linguistic differences in the timing of the breathy and creaky portions using current understanding of the timing of non-modal phonation and coarticulation.

• Hypothesis: According to previous findings, if the breathy portion in a breathy-creaky contour is contrastive, then it should last longer than the creaky portion (and vice versa).

Method

• 12 speakers of English, Hmong, and Korean were recorded saying monosyllables in carrier phrases.

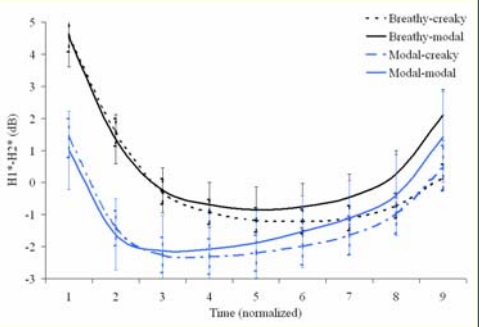
• The non-modal phonation in the breathy-creaky contours in English are allophonic; in Hmong the creak is phonemic; in Korean the breathiness (from lenis stops) is arguably phonemic, the creak from unreleased stops is allophonic.

	Breathy-Creaky (B-C)	Breathy-Modal (B-M)	Modal-Creaky (M-C)	Modal-Modal (M-M) *baseline*
English	pʰæʔtˀ	pʰæs	bæʔtˀ	bæs
Hmong	pʰə̰	pʰà	pə̰	pà
Korean	pa̰tˀ	pal	latˀ	lal

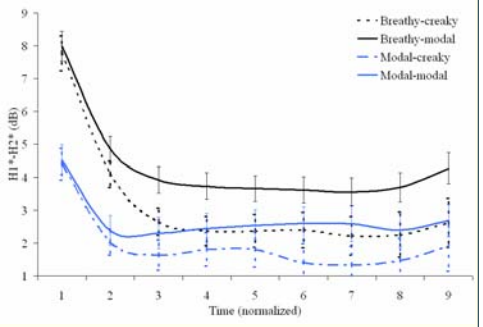
• Voice measures were obtained using VoiceSauce (Shue et al. 2009). The following focuses on two measures: H1*-H2* and HNR.

Results: H1*-H2*

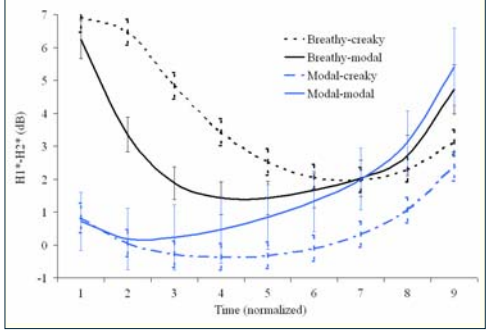
• English shows higher values for breathy than for modal parts of the contours. E.g. B-C and B-M are distinct from M-M for first 2 ninths.



• Hmong shows good differentiation between breathy and modal parts of the contours. B-C is distinct from M-M for first 2 ninths, B-M for entire duration. M-C is distinct from M-M in latter third.

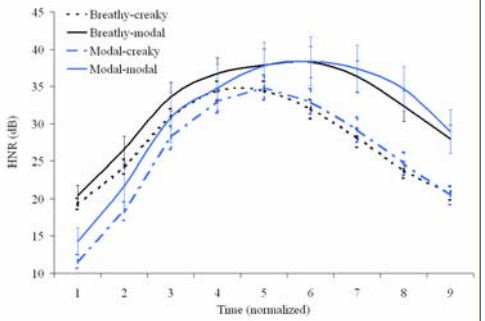


• Korean shows differences from modal phonation for both breathy and creaky portions. B-C is distinct from M-M in first and final 3rd.

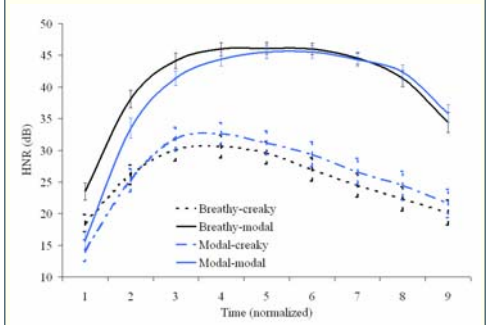


Results: Harmonics-to-noise ratio (HNR)

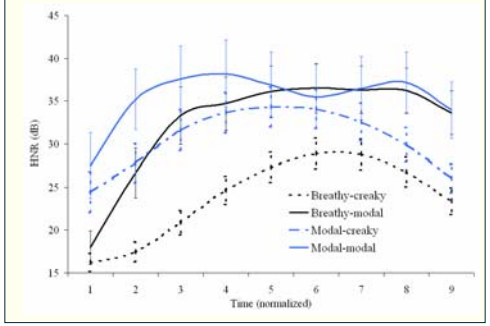
• English shows lower HNR values for creaky phonation than for modal phonation. B-C is distinct from M-M for final 3rd.



• Hmong patterns similarly to English, with lower HNR values for the B-C and M-C contours for most of the vowel duration.

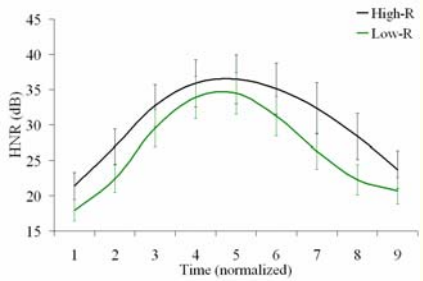


• Korean shows lower HNR values for the B-C contour compared to the M-M contour for the entire duration.



Relative frequency effects in English

• English B-C words show lower HNR values if their relative frequency (R) is lower (cf. Scarborough 2004). This is statistically significant in final 3rd (= more creak).



• In this way, creaky phonation behaves like nasalization coarticulation in English, which has been found by Scarborough to be greater in words with low relative frequency.

Discussion

• Non-modal phonation coarticulation is subject to whether the breathiness or creakiness is contrastive in the language. The phonemic creak in Hmong and the phonemic-like breathiness in Korean show longer and greater differentiation from modal.

• Breathy-creaky contours in Hmong and Korean never have H1*-H2*/HNR values equal to modal contours.

• Creakiness in English is influenced by the relative frequency/neighborhood density of the word. "Harder" words show greater creak, suggesting that creaky coarticulation aids listeners, following Scarborough's interpretation.

References

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