Consonant F0 is not intrinsic perturbations: A case study of Nuosu Yi

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Introduction

- **Consonant F0 (CF0):** Low and rising after voiced ones, but high and falling after voiceless ones [1].
- **Articulatory basis:** larynx lowering for voicing [2] (lowering F0) or vocal folds stretching by the cricothyroid muscle for devoicing (raising F0) [3].
- **Classical phonological theories:** abstract consonant units + 'unintended and unplanned intrinsic phonetic by-product' [4].
- **Problems:** CF0 can vary across languages and depends on prosodic or lexical tone contexts [5].
- **The current study:** CF0 patterns in Nuosu Yi, a Tibeto-Burmese language of the Loloish branch [6]; coordination of consonant voicing gestures and lexical tones.

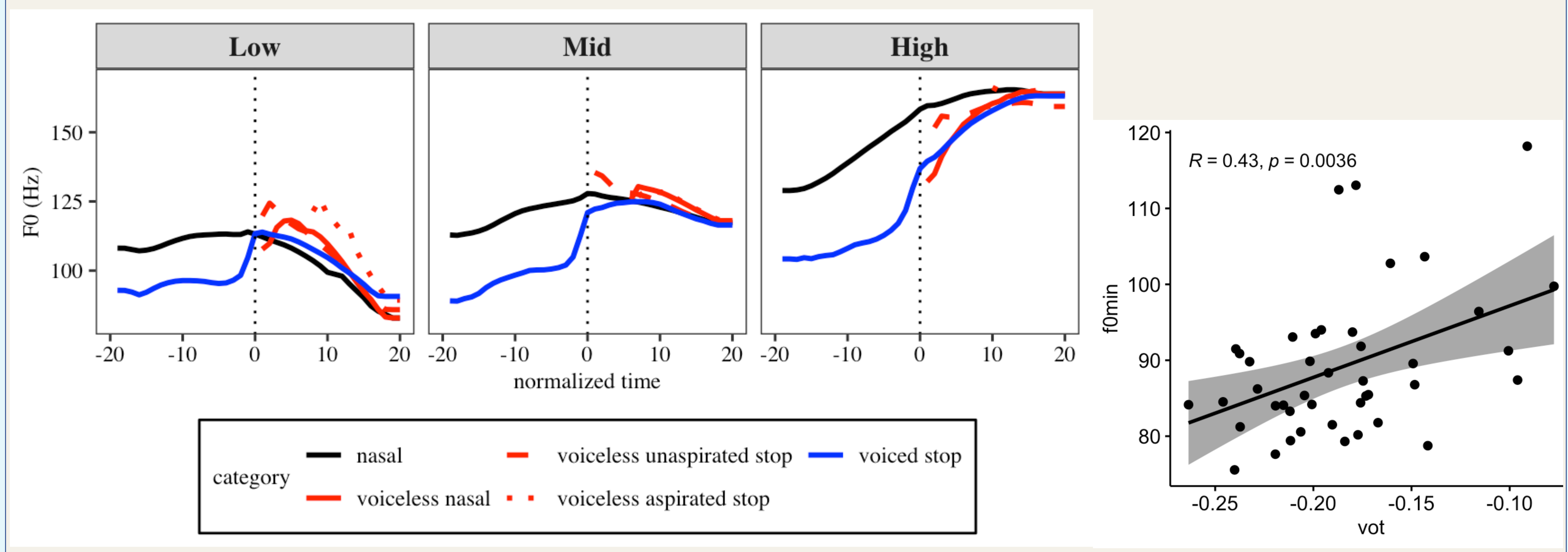
Methods

- **Main Variables of Interest:**

—voiced stops
—voiced nasals
—voiceless aspirated stops
—voiceless unaspirated stops
—voiceless nasals

- **Place:** Labial, Coronal, Dorsal
- **Tones:** Low, Mid, High
- **Vowels:** i, a, u
- **Total:** 136 monosyllabic words or morphemes (read twice).
- **Participants:** One Nuosu Yi speaker
- **Acoustic measurement:** F0 was extracted using the autocorrelation algorithm in Praat. VOT was also measured.

Results

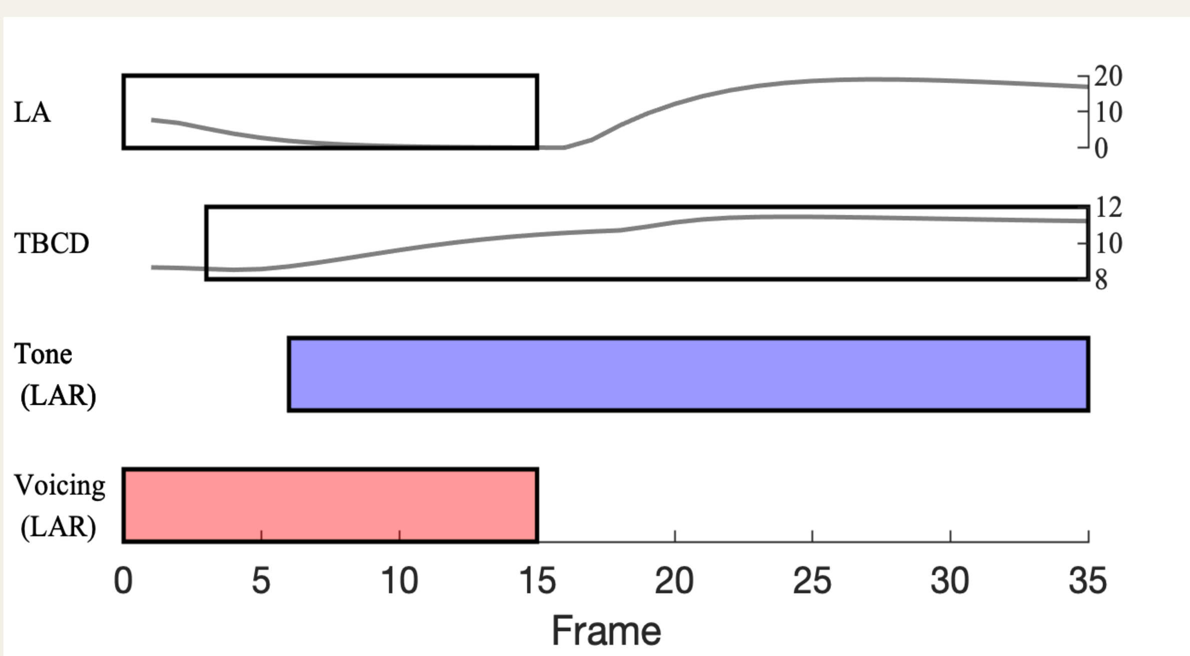


CF0 patterns in Nuosu Yi (left, vertical line: consonantal release) and VOT-CF0 covariance for voiced stops (right)

- **Voiced-voiceless consonants:** Voiced—H contexts show larger CF0 (degree of f0 rising after release); Voiceless—Rising CF0 in H contexts; Falling in others; L contexts show larger CF0;
- **VOT-CF0 covariance in voiced stops:** More negative VOT—lower CF0 (F0min in the closure interval); Planning longer voicing—more larynx lowering and lower CF0.

Discussion

- The lack of invariant CF0 effect across lexical tones can be explained by hypothesizing overlap between laryngeal gesture(s) for consonant voicing and laryngeal gesture(s) for lexical tones.



Gestural scores illustrating the coordination (ba/pa in High)
LA—lip aperture; TBCD—tongue body constriction degree
Voicing (LAR): voicing/devoicing goals that recruit laryngeal articulators;
Tone (LAR): pitch goals that recruit laryngeal articulators.

- **VOT-CF0 covariance:** laryngeal articulators are actively controlled by voicing gesture goal.
- **Possible consonant laryngeal articulators for voicing goals:** Larynx lowering for voicing [2] or vocal folds stretching by the cricothyroid muscle for devoicing [3]
- **Possible laryngeal articulators for lexical tone goals:** Larynx lowering for L tone targets and vocal folds stretching for H [8].
- **Timing patterns:** C centering—consonant constriction gesture + vowel gesture + lexical tone gesture [9]; Consonant laryngeal gestures in-phase with consonant constriction gesture [10].
- **Temporal overlap:** between these two gestures; Blending at the articulator levels

Conclusion

- CF0 is not intrinsic biomechanical by-product outside of phonology, but acoustic consequences of the coordination of consonant laryngeal gestures for voicing and prosodic gestures like lexical tone.
- Consonant laryngeal gestures are governed by voicing goals; laryngeal gestures for lexical tones can overlap with consonant laryngeal gestures and further shape the surface CF0 patterns.
- The details of the coordination remain to be worked out by articulatory studies of the larynx and computational simulations. Coordination could be found to differ across languages, and this could explain the varying CF0 results found in different languages.

References

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