# Multidimensional tonal realization and prosodic variation in Choguita Rarámuri (Tarahumara)

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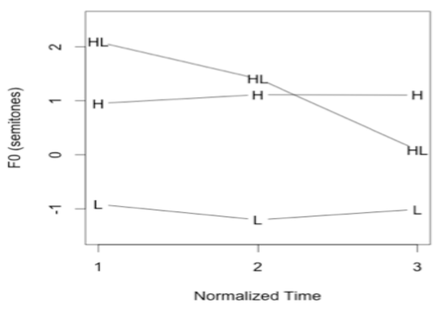
## LEXICAL TONES IN CHOGUITA RARÁMURI

Changes in F0 range and scaling common in strong phrasal positions and in focus contexts (Xu 1999, Pan 2007)

Other acoustic parameters can increase tonal dispersion *independently* of how these parameters influence pitch perception (Kuang 2017, Yu 2017)

**Choguita Rarámuri (Uto-Aztecan; Mexico):**

- 3 lexical tones (HL, H and L) exclusively realized in stressed syllables
- Low pitch target of HL tone may be realized in post-tonic syllable (if any)
- Preliminary results show high degree of speaker variability
- Interactions between lexical tones and H% at the end of declaratives





**Methodology:**

- Field research data from 4 speakers (2 female, 2 male)
- Tonal targets recorded in **phrase-medial** and **phrase-final** position
- We used classification and regression trees to classify tones based on acoustic parameters: F0, noise (HNR) and duration are most important

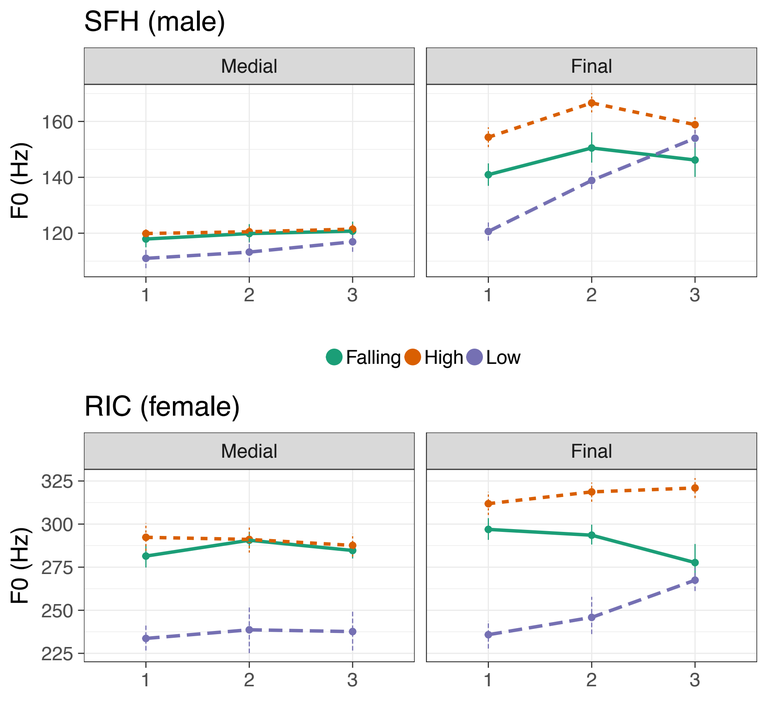
## F0 VARIATION BY POSITION IN UTTERANCE

- Are lexical tonal contrasts enhanced in specific prosodic positions in CR?
- What role for speaker-dependent variation?

## TONAL MULTIDIMENSIONALITY

- Do CR speakers also use duration and voice quality to enhance tones in these specific prosodic positions?
- What role for speaker-dependent variation?

## F0 BY LEXICAL TONE AND POSITION IN UTTERANCE

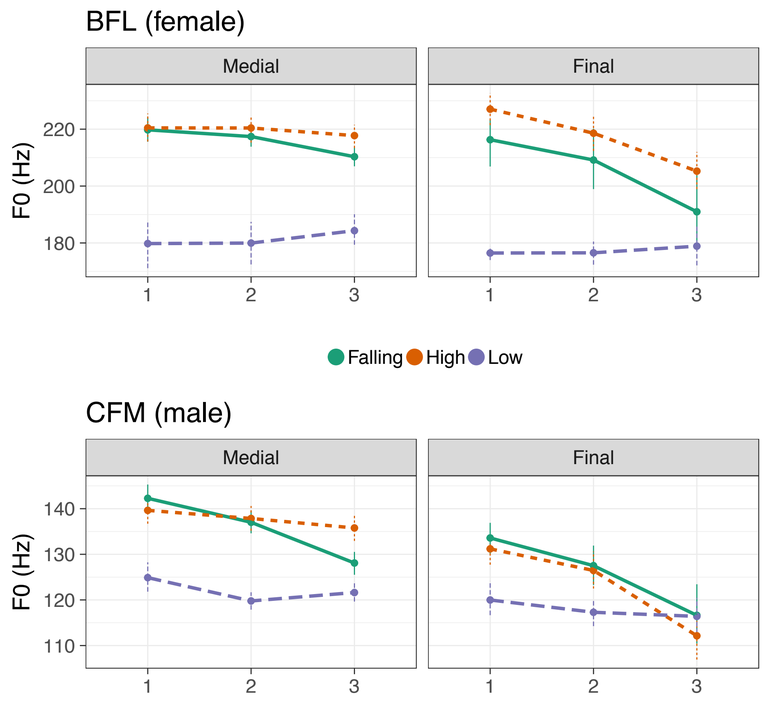



**Medial position:**

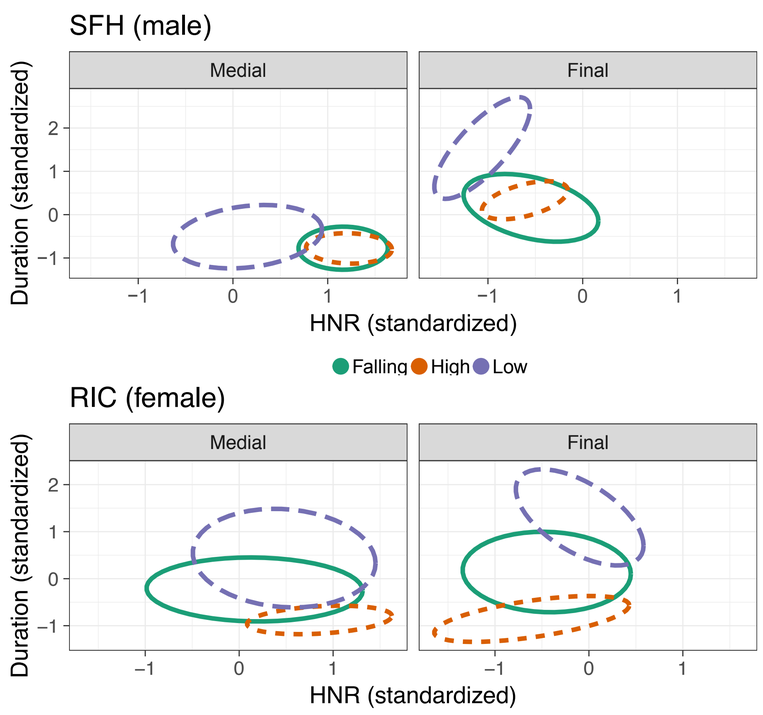
- L tones are generally lower in f0 than H, HL
  - One speaker shows small f0 differences (top left)
- H, HL tones can be poorly differentiated for some speakers (left)
  - Low target on HL tones occur only on post-tonic

**Final position:**

- Some speakers show H% boundary tone for sentences ending in L, H tones (left)
  - One speaker also shows clear pitch expansion
- Other speakers show Utt-final L% (right)
  - Both H and HL tones fall Utterance-finally




## TONAL MULTIDIMENSIONALITY

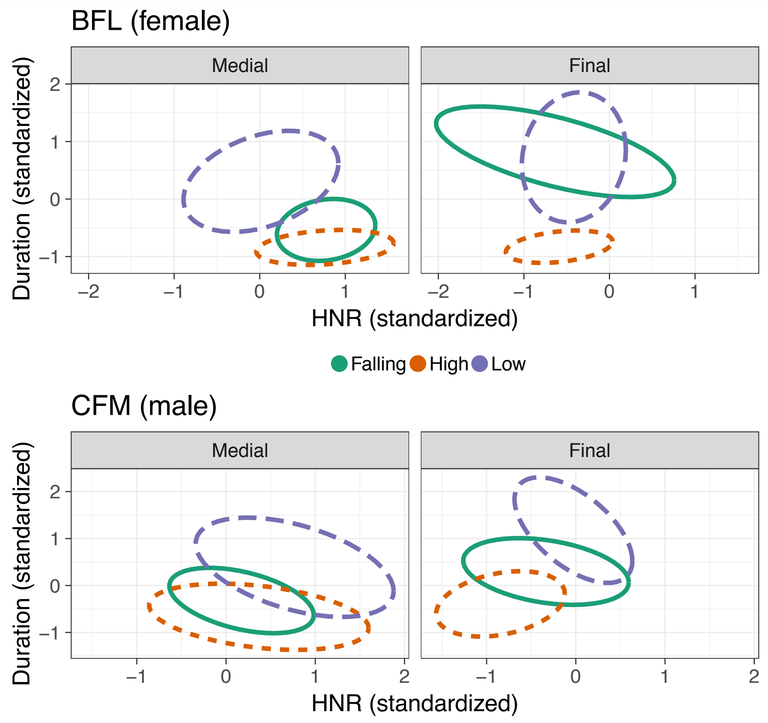



**Duration:**

- L tones are generally longest.
  - Effect found regardless of phrasal position.
  - But one speaker (top left) does **not** show a length difference in medial position.

**Harmonics-to-noise ratio** (noise/aperiodicity):

- The same speaker tends to have noisier L tones than H, HL.
  - Effect found regardless of phrasal position.
  - This was measured via low-frequency noise (below 500 Hz) → likely points to presence of creaky voice on L tones.




## CONCLUSIONS

- Tonal categories in CR are realized by a variety of acoustic dimensions that exhibit both **prosodic position-dependent** variation, as well as **speaker-dependent** variation. Some of this variation can be attributed to *tonal enhancement*.
- Speakers employ a variety of strategies for achieving a common goal: separation of three tonal categories.
  - Pitch-independent strategies: longer duration for L tones
  - Possibly pitch-dependent: creakier voicing for L tones
- Recent tonal complexity? Tonal systems of related Uto-Aztecan varieties are privative (H/∅) (e.g., Yaqui (Demers et al. 1999))
- Future directions: move beyond declaratives; interaction between lexical and grammatical tone.