Phonetic properties of the non-modal phonation in Shanghaiese register contrast

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Introduction

- **Shanghaiese (SH)**
  - Spoken in Shanghai, one of the largest cities in China.
  - Northern Wu dialect.
  - Five tones (Xu and Tang 1988).

- **Tones in SH (Yip, 1980):**
  - Register: Tone (Shao numbers)
    - [+Upper] 53 34 13 22
    - [-Upper] 98 34 13 22
  - Undoubtedly there are differences with glottal stop.

- **Tonal registers:**
  - Related to pitch difference: Pitch range is up to register tone.
  - Two halves (Yip, 1980): [+Upper] vs. [-Upper].
  - Related to phonation difference: Non-modal phonation is associated with the [-Upper] register (Chao, 1928; Sherard, 1972; Qian, 1992, etc.).
  - Instrumental studies in the early 1990s found non-modal phonation:

  - More recent studies found the loss of non-modal phonation:

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- **Goals of the study:**
  - Examine the acoustic and articulatory properties of the non-modal phonation in Shanghaiese.
  - Make comparison with other languages.

Methods

- **Participants:** 107 native speakers of SH in total. Those born before 1980 (N = 52) still maintain phonation contrast.

- **Methods:**
  - Participants: 107 native speakers of SH in total. Those born before 1980 (N = 52) still maintain phonation contrast.
  - **Measures:**
    - Noise: Cepstral Peak Prominence (CPP), Formant and bandwidth: F1, B1: Electroglottograph: Contact Quotient (CQ), Peak Increase in Contact (PIC), Sped Quotient (SQ).
  - Within-speaker score normalization was done on each measure.
  - **Statistics analysis:**
    - Multiple linear mixed-effects models to determine which measures differ significantly between registers. (Based on measures taken from the third interval where the contrast is the strongest)
    - Fixed effects: Reduced model. Gender + Register. Full model. Gender x Register. Random intercepts: item, speaker. Random slopes: gender by item random slope when it improves the model.
    - Logistic regression models on acoustic and F0/G quotients measures separately to determine which of the measures are most useful. (Based on measures taken from the entire syllable)

Results

- **Selected individual measures:**
  - F0:
  - H1-H2*:
  - H1-A1*:
  - H1-A2*:
  - H1-A3*:
  - CPP:

- **Cross-linguistic comparison:**
  - Relative importance of acoustic measures

Conclusions

- The phonetic properties of the non-modal phonation in Shanghaiese:
  - Lower pitch.
  - Breather phonation:
    - Steeper spectral slope (higher H1-An values). However, H1-A2* and H2-A* makes very little contribution to the contrast.
  - Higher noise ratio and less periodicity (smaller CPP).
  - Expanded bandwidth (B1).
  - Smaller Contact Quotient.
  - CPP is the most important acoustic correlate of the non-modal phonation.
  - Variations of non-modal phonation are found in different dialects.

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