Revisiting the register contrast in Shanghai Chinese

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Introduction

- Shanghai Chinese (SC)
  - Spoken in Shanghai, one of the largest cities in China.
  - Northern Wu dialect.
  - Five tones (Xu and Tang 1988).
  - Tones in SC (Yip, 1980):
    Register Tones (Cho numbers)
    [+Upper] 53 34 5
    [-Upper] 23 12

- Tonal registers
  - Related to pitch difference: Pitch range is divided into 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:

Recent studies:

- Studies Subjects Measures Findings
  - Cao and Maddieson 1992 Speakers born in 1956 and 1960s. HI-RE, HI-AI, Airflow-pressure ratio (APAP) HI-RE, HI-AI, the [-Upper] register is breathier.
  - Ren 1992

Research Questions

- Do speakers from different age groups (older vs. younger) differ in making the register contrast?
  - What are the phonetic correlates of the register contrast made by different speakers?

Methods

- Participants: 20 native speakers of SC, Two age groups: 10 older (mean age 55) vs. 10 younger speakers (mean age 24): 10 male vs. 10 female.
  - Speech Materials: 5 onset types (stop, fricative, affricate, nasal, etc) * 2 registers ([+Upper], [-Upper]) * 3 different tokens * 2 repetitions.
  - Measures:
    - Pitch: F0, Spectral: H1+H2*, H1+H3*, H1+H2**, H1+H3**.
    - Noise: Central Peak Pronunciation (CPP), Harmonic-to-Noise Ratio (HNR), Subharmonic to Harmonic Ratio (SRH).
    - Electroglotthographic: Contact Quotient (CQ).
  - Within-speaker normalization to minimize differences across speakers and recording conditions.
  - Statistics analysis:
    - Multiple mixed-effects models, one model for each onset type in each speaker group.
    - Equation: measure ~ Register + (1|Speaker) + (1|item).

Results

- Significant age differences.

<table>
<thead>
<tr>
<th>All groups</th>
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<th>Younger speakers</th>
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<tbody>
<tr>
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- Clear F0 differences in all groups.

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- obvious differences at p < 0.05 level in all onset types.

- Close H1+*H2* and reversed trends in all groups.

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Conclusions

- Significant age differences:
  - Older speakers use pitch, spectral slope, noise ratios, periodicity, contact quotient.
  - Younger speakers use pitch, noise ratios and periodicity only.

- The phonetic correlates of the register contrast for older speakers: The [-Upper] register has
  - Lower pitch
  - Breather phonation:
    - Steep spectral slope (higher H1-An values)
    - Higher noise ratios and less periodicity
  - Smaller Contact Quotient
  - However, H1 * H2* is not significant. Probably a special variant of breathy voice.
  - Similar to Jiashan Wu (Jiang and Kuang, 2016).

- Shanghai Chinese has phonation contrast
  - Across all onset types
  - With onset variations

References and Acknowledgements


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