A Tale of Two Fricatives
Consonantal Contrast in Heritage Speakers of Mandarin

Charles B. Chang, Erin Haynes, Russell Rhodes, and Yao Yao
University of California, Berkeley

cbchang@berkeley.edu, hayneser@berkeley.edu, russell_rhodes@berkeley.edu, yaoyao@berkeley.edu
1. Background and research questions
2. Methods
3. Results
4. Discussion
5. Conclusions
This study compares fricative production in heritage speakers of Mandarin to that of native Mandarin speakers and that of native English speakers learning Mandarin as a foreign language.

Heritage speakers of Mandarin (narrow definition):

people who have had exposure to Mandarin in their family but have shifted to primarily using English
A few studies have examined the phonological competence of heritage speakers:

- Au et al. (2002) and Knightly et al. (2003): heritage speakers of Spanish have a phonological advantage over late learners (VOT, degree of lenition, and accent ratings).
- Godson (2003): heritage speakers of Armenian show influence in their Armenian vowels from English, but only for Armenian vowels close to English vowels.
Research Questions

- Only Godson (2003) has explored categorical neutralization, and only with respect to vowels.

- Do heritage speakers maintain consonantal contrasts of the heritage language?

- Do heritage speakers maintain contrasts between segments of the heritage language and similar segments of the dominant language?
Research Questions

- Realization of 3 fricatives compared:

  Mandarin /ʂ/  
  English /ʃ/  

  Mandarin /ɕ/
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Methods

- **Participants**
  - 12 speakers total
    - 3 native speakers of Mandarin
    - 6 heritage speakers of Mandarin
    - 3 late learners of Mandarin

- **Questionnaire**
  - Speakers’ status determined based on a language background questionnaire

- **Recordings**
  - All items recorded in a sound-proof booth (at 48 kHz, 16 bps)
  - Marantz PMD660, AKG C420 head-mounted condenser microphone
Methods

**Stimuli**

- 91 words total
  - 59 Mandarin words
  - 32 English words

**Presentation of stimuli**

- words read off of index cards
  - English words written in English orthography
  - Mandarin words written in Mandarin orthography (traditional and simplified characters) and romanization (pinyin and BoPoMoFo)
  - all words written and read in isolation

- words read in 8 blocks
  - 4 Mandarin blocks
  - 4 English blocks
  - block consisted of reading all of the words from a given language
  - words randomized before each block
Methods

- **Acoustic measurements**
  - All measurements were performed in Praat (Boersma & Weenink 2008).
  - Peak amplitude frequency and centroid frequency (Ladefoged 2005) were measured over a spectrum of the middle 100 ms of the fricative.
  - Average values of F1, F2, and F3 were measured over the first 20 ms of the vowel.

- **Analysis of data**
  - Statistical analysis was performed using the Wilcoxon matched pairs signed-rank test.
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Results

- Mean peak amplitude frequency, by speaker (L = female speakers, R = male speakers)
Results

- **Mean centroid** frequency, by speaker
  - (L = female speakers, R = male speakers)
Results

- Distinctions made between fricatives, by speaker: (1-3 = native, 4-9 = heritage, 10-12 = learners)

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The spectral data indicate:

- Almost all speakers clearly distinguish alveolo-palatal /ɕ/ from retroflex /ʂ/ and the English palato-alveolar /ʃ/.

- Realization of the contrast between /ʂ/ and /ʃ/ shows a great deal of variation among speakers.
Discussion

- Two of the three native speakers and two of the three late learners collapse /ʃ/ and /ʃ/.
- The most advanced heritage speaker and the least advanced heritage speaker pattern with native speakers and late learners, respectively.
The middle four heritage speakers keep /ʂ/ and /ʃ/ apart on one or both spectral measures. None of them merges the two sounds.
Conclusions

- Our results suggest that native speakers and late learners most likely collapse /ʃ/ and /ʂ/, while heritage speakers tend to keep the two sounds apart.

- Two possible explanations:
  - Early exposure to both languages makes heritage speakers better at hitting the two targets.
  - Early-acquired categories interact with each other and are dissimilated.
Our results also suggest that there is a correspondence in heritage speakers between linguistic performance and amount of exposure to the heritage language.
Thank you!

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Selected References


Results

- Mean F1 frequency
Results

- Mean F2 frequency
Results

- Mean F3 frequency