Perception of English voiceless alveolar and postalveolar fricatives before /i/ by Korean speakers

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1. Anterior and posterior fricatives before high front vowels

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<tr>
<th>Anterior fricatives</th>
<th>Posterior fricatives</th>
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<tbody>
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<td>English</td>
<td>Korean</td>
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2. /s/ and /ʃ/ in borrowings from English to Korean

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<th>English</th>
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3. Articulatory factors affecting fricative noise spectra

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<tr>
<th>Articulatory factors</th>
<th>Spectral analyses</th>
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<tbody>
<tr>
<td>Anterior and posterior fricatives</td>
<td>English</td>
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<td>Movable back articulators</td>
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<td>Posterior cavity size</td>
<td>English</td>
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<td>Glottal tension</td>
<td>Korean</td>
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4. Hypothesis

Cross-linguistic mapping patterns in 2 arise from acoustic and perceptual similarity between the L1 and L2 fricative contrasts.

5. Production experiment

**RECORDING**

- English
  - 9 female and 9 male speakers
  - Monosyllabic or initially stressed bisyllabic words, beginning with /s/ or /ʃ/
- Korean
  - 7 female and 6 male speakers
  - Bisyllabic words beginning with [aɪ], [ai] or [aɪ]

**SPECTRAL ANALYSIS**

- 30 ms windows centered at the fricative midpoint
- Filtered through Hann band pass 500-10000 Hz

**MEASUREMENTS**

- Center of gravity (COG) and Peak location

**LANGUAGE-INTERNAL COMPARISON** (Repeated measures ANOVA)

- Main effect of fricative in both COG and Peak location
- Post hoc: The three Korean fricatives are significantly different from one another.

**CROSS-LANGUAGE COMPARISON** (Multivariate ANOVA)

- All 5 categories are distinguished, except English /ʃ/ and Korean [aɪ] in Peak location

6. Perception experiment

**STIMULI**

- Eight-step /s/-/ʃ/ friction continuum, with the 6 intermediate steps created by mixing /s/ and /ʃ/ with different proportions (Kraljic and Samuel 2007)
- Duration and intensity controlled
- Appendix to the /i/ vowel excided from the original /si/ token

**PARTICIPANTS**

- 14 Korean speakers and 14 English speakers

**A. 4IAX Discrimination test**

**REPEATED MEASURES ANOVA**

- Main effect of stimulus pair (F(1,6)=2.825, p=0.001)
- Discrimination score was the highest at 4-5.
- Language * stimulus pair interaction (F(1,6)=2.825, p=0.018)
- English listeners are better than Korean listeners at discriminating stimuli in lower frequency range.

**B. Forced choice identification test**

**Percentage of each answer**

- A sharp rise of [aɪ] answers from 4% to 64% between steps 4 and 5.
- No single predominant answer in steps 3 and 4.

7. Discussion

- Frictional spectral cues play a role in both English and Korean fricative perception.
  - Korean listeners were better at hearing differences between stimuli close to /ʃ/.
  - Expected, as there are more posterior fricative categories in Korean.
- Korean listeners’ perception of English /s/ and /ʃ/ matches with the loanword adaptation patterns. (/s/ → /s/ [s], /ʃ/ → /w/ [w])
- Categorical shift from plain to labialized fricative
- Gradual shift from frictus to frictus, though natural /s/ and /ʃ/ perception still tends to be assimilated to the fortis [ʃ].
  - May be attributed to the complex nature of laryngeal feature contrast in fricatives – frication/apposition duration and vowel pitch cues as well as noise spectral cues (Cho et al. 2002; Yoon 1999)
- L2 contrast substituted by an L1 contrast sharing acoustic correlates in cross-linguistic perception.
  - e.g. English /ʃ/ contrast mapped to vowel length contrast in Japanese. (Ingram and Park 1997; Morrison 2002)
- A case of loanword adaptation based on perceptual similarity.
  - e.g. Peperkamp and Dupoux 2003

8. References


9. Acknowledgement

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