Comparing Heritage Language Learners and L2 Learners of Korean: Phonology of Stops
Introduction

• Properties of stop sounds
  – are found in all human languages.
  – occur early in the language acquisition process
  – Common features: [voicing] & [aspiration]

• Universal order of acquisition
  – Unaspirated voiceless stops < voiced/aspirated stops
  – Bilabials < alveolars < velars
• Korean stops
  – Three-way contrast, all realized as voiceless in the word-initial position.
  – Tense (Fortis): pp: *ppang* ‘bread’
  – Lax (Lenis): p: *pang* ‘room’
  – Aspirated: pʰ: *pʰang* ‘bang sound’
• Korean stop sounds: what are the parameters that distinguish stop sounds?
  – Acoustic parameters: voiced onset time (VOT), fundamental frequency ($f_0$) of the vowel, stop closure duration, relative burst energy, $H1-H2$ and $H1-F2$.
  – Aerodynamic parameters
VOT

- the length of time that passes between when a stop consonant is released and when the vibration of the vocal folds begins
  - Zero VOT: the onset of vocal fold vibration coincides (approximately) with the plosive release
  - Positive VOT: there is a delay in the onset of vocal fold vibration after the plosive release
  - Negative VOT: the onset of vocal fold vibration precedes the plosive release
• Korean stops
  – VOT: interval between stop release and the onset of laryngeal vibration. (Figure 1, Cho et al., 2002)
• Korean stops
  – $f_0 \sim$ pitch difference (Figure 2, Cho et al., 2002)
• L1 acquisition and Korean stops: A case study of production (Jun 2006)
  – Tense stops were acquired first (18 mos)
  – Lenis & aspirated stops: $f_0$ was mastered first (18 mos), VOT was established later (20 mos)
• L2 acquisition and Korean stops: Kim & Lotto (2002)
  – 12 L2s learned Korean for two semesters
  – L2s acquired VOT differences, but not $f_0$ differences (production only)
• Alveolar stops in heritage language learners and L2 learners: Oh et al. (2003)
  – 31 participants, learned Korean for 4 mos
  – 12 native speakers (controls)
  – Consider only VOT differences
  – Neither L2s nor heritage speakers showed VOT differences in production or comprehension
L1 and L2 learners of Korean show different order of acquisition. How are they different exactly? Heritage language learners are not able to use VOT differences to distinguish stop sounds. How about $F0$?
Yun 2010

- examines the phonological development of Korean stop sounds by comparing two groups: heritage language learners and Korean L2’s

- Hypotheses:
  - VOT: HLLs and L2 are the same
  - $f_0$: HLL may have an advantage
• Subjects—low proficiency
  – total four speakers (two in each group)
  – All taking Korean 1 at UCLA
  – Similar listening skills, reading skills, and grammatical knowledge

• Data
  – Total 72 words (54 target words & 18 dummy words) x repeated 6 times
  – (9 stops) x (3 quantal vowels /i/, /a/, /u/) x (2 syllable structures CVC, CVCV)
**Stimuli**

<table>
<thead>
<tr>
<th>Syllable structure</th>
<th>Lenis</th>
<th>Tense</th>
<th>Aspirated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CVC_i</strong></td>
<td>pim</td>
<td>ppim</td>
<td>phim</td>
</tr>
<tr>
<td><strong>CVC_u</strong></td>
<td>pum</td>
<td>ppum</td>
<td>phum</td>
</tr>
<tr>
<td><strong>CVC_a</strong></td>
<td>pam</td>
<td>ppam</td>
<td>pham</td>
</tr>
<tr>
<td><strong>CVCV_i</strong></td>
<td>pina</td>
<td>ppina</td>
<td>phina</td>
</tr>
<tr>
<td><strong>CVCV_u</strong></td>
<td>puna</td>
<td>ppuna</td>
<td>phuna</td>
</tr>
<tr>
<td><strong>CVCV_a</strong></td>
<td>pana</td>
<td>ppana</td>
<td>phana</td>
</tr>
</tbody>
</table>

*Table II. Word list*
Results

• Hypothesis 1 – VOT differences
  – 3(stop category) x 3(place of articulation) x 2 (group) repeated measure ANOVA
  – Main effect: Stop category \((F(2, 44) = 195.821, p < 0.0001)\) and Place of Articulation \((F(2, 44) = 29.319, p < 0.0001)\)
  – Significant interaction: Stop category and Group \((F(2, 44) = 9.372, p < 0.0001)\), Stop category and Place of Articulation \((F(4, 88) = 2.482, p < 0.05)\), and Stop category, Place of Articulation, and Group \((F(4, 88) = 2.829, p < 0.05)\)
Results: VOT, stop category
Results: VOT, place of articulation
Results: VOT, stop category (including NS)
Results

• Hypothesis 2 – $f_0$ differences
  – Three-way repeated measures ANOVA (stop category by place of articulation by group)
  – Main effect: stop category ($F(2, 44) = 22.900, p < 0.0001$)
  – Significant interactions: the Stop category by the Group ($F(2, 44) = 16.040, p < 0.0001$), and the Stop category by the Place of articulation ($F(4, 88) = 2.795, p < 0.05$)
Result: $f_0$, stop category
Discussion

• Hypothesis 1 – VOT differences
  – Both groups used VOT to distinguish stop sounds
  – Both groups: longer VOT values in the lenis category compared to NS
    • Neither group acquired right VOT range for lenis category, which confirms Jun’s findings
  – L2s’ use of VOT is significantly different from the other two groups in the tense stops
Discussion

• Hypothesis 2 – $f_0$ differences
  – Only HLL were able to use $f_0$ differences
  – This confirms Kim & Lotto’s findings re F0 distribution
  – Why?
Conclusion

• Support previous findings on phonological development of Korean stop sounds:
  – Heritage language speakers: difference between the lenis and the aspirated stops is learned later (Hypothesis 1), $f_0$ is acquired earlier than VOT (Hypothesis 2).
  – Second language learners: difficulty in learning tense stops (Hypothesis 1), could not use $f_0$ values to distinguish stop sounds (Hypothesis 2).
Selected References