Phonetic cue enhancement in hyperarticulation of Korean sibilants

Jessamyn Schertz\(^1,2\), Yoonjung Kang\(^3,2\), Sungwoo Han\(^4\)

\(^1\)University of Toronto Mississauga, \(^2\)University of Toronto, \(^3\)University of Toronto Scarborough, \(^4\)Inha University

**CONTRAST ENHANCEMENT**

Hyperarticulation can be contrast-specific.
- Speakers increase VOT of “tehn” when contrasting it with “dean” but not “keen” (e.g. Maniwa et al., 2009; Schertz 2012).

Extent of hyperarticulation appears to depend on the “importance” of the dimension to the contrast.
- Age differences in enhancement of f0 and VOT in Korean stop contrast (Kang and Guion 2008).

What determines how much a given cue is enhanced in hyperarticulation?
- Use of the cue in baseline productions?
- Use of the cue in perception?
- Use of other cues in enhancement?

**KOREAN SIBILANTS**

<table>
<thead>
<tr>
<th>Affricates</th>
<th>Fricatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>fortis /lc/</td>
<td>high unaspirated f0 (short VOT)</td>
</tr>
<tr>
<td>aspirated /c/</td>
<td>high aspirated f0 (longest VOT)</td>
</tr>
<tr>
<td>lenis /l/</td>
<td>low aspirated f0 (long VOT)</td>
</tr>
<tr>
<td>fort. /s/</td>
<td>high unaspirated f0 (short VOT)</td>
</tr>
</tbody>
</table>

Laryngeal status of “nonfortis” /s/ is ambiguous (Iverson 1983, Chang 2013)
- phonologically: patterns with lenis
- phonetically: high VOT, like aspirated
- f0 of /s/ vs. /ss/ does not differ in production, but f0 affects perception of the contrast (Chang 2013)
- Sound change in progress:
  - VOT merger in lenis/aspirated series for younger speakers, and increase in use of f0 (Silva 2006, Kang 2014).

**RESEARCH QUESTIONS**

- 2 contrasts
- 2 dimensions

<table>
<thead>
<tr>
<th>Material</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>/s/ vs. /ss/</td>
<td>VOT (aspiration)</td>
</tr>
<tr>
<td>/s/ vs. /c/</td>
<td>f0 (pitch)</td>
</tr>
</tbody>
</table>

- Does extent of hyperarticulation reflect baseline differences in cue use?
- Does individual variability in perception correspond to production differences?
- Is there a relationship between the extent of enhancement of multiple cues on a trial-by-trial level?

**PARTICIPANTS AND MATERIALS**

62 L1 Korean speakers from Seoul and surrounding area
- Male Female
- Older: 13 16 54.82 (65)
- Younger: 17 17 19.53 (34)

Sibilant-initial minimal pairs
- e.g. [sʌlt] vs. [sʌltə], [sʌlt] vs. [sʌltə]
- 4 minimal pairs per contrast
- 3 vowel contexts: /a/, /i/, /ʌ/
- 2664 total tokens analyzed

**TASK AND SPEECH STYLE MANIPULATION**

<table>
<thead>
<tr>
<th>TASK 1</th>
<th>TASK 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Please read the following words as they appear”</td>
<td>“Please pronounce the following words carefully, as if to a foreigner”</td>
</tr>
</tbody>
</table>

**Effect of speech style on VOT/f0**

4 linear mixed-effects models
- Response variable: VOT or f0 (separate models for each dimension and contrast)
- Fixed factors:
  - Segment * Speech style * Age (YOB) * Gender + Vowel (Vowel duration for VOT)
- Random factors:
  - Segment * Style | Participant + Style | Word

“Enhancement” = segment by style interaction

**DISCUSSION**

**Overall cue use**
- Sound change in progress for /c/-/lc/ contrast: decrease in use of VOT, increase in f0.
- Use of f0 to distinguish /s/-/ss/ only emerges in hyperarticulation.

**Enhancement**
- All dimensions are enhanced. Larger baseline differences in cue use did not predict more enhancement.
- VOT enhancement for /s/-/lc/ occurs at different styles for younger vs. older speakers.

**Factors influencing enhancement**
- Speakers may dynamically adapt enhancement strategies if one dimension is not available (inverse relationship of f0 and VOT enhancement when /ss/ follows /s/).
- Weak perception-production link in use of f0 (strongest in clear speech), but enhancement was not predicted by perception.

**ACKNOWLEDGMENTS**

We would like to thank Yuruny Luo and Yuanyang Song for help with the data collection process, as well as Rachel Soo for help with data annotation. This research was supported by SSHRC Grant #416-2013-292 to Yoonjung Kang.

Abstraction, Diversity, and Speech Dynamics, Hersching am Ammersee, May 3-5, 2017