Language-specific strategies and L1-L2 interaction in bilingual clear speech

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BACKGROUND

- Clear speech: a speaking style adopted when fluent communication is compromised (e.g. due to background noise)
- Clear speech is acoustically distinct from casual speech in both suprasegmental and segmental dimensions (Picheny et al., 1986)
- Some clear speech strategies are thought to be language-universal: slower speaking rate, longer vowel duration, and expanded vowel space.
- Language-specific clear speech strategies involve phonetic enhancement of phonological contrasts.
  → *potentially subject to L1-L2 transfer in clear speech production*
- Korean & English laryngeal contrasts:
  - Korean: both VOT and onset f0 are utilized (Silva, 2006).
  - English: VOT is a primary cue, while onset f0 is secondary (Holt et al., 2001).
- This is reflected in native clear speech produced in each of the languages (Picheny et al., 1986; Kang & Guion, 2008)

RESEARCH QUESTIONS

- Do late Korean-English bilinguals implement language-specific (or language-appropriate) clear speech strategies in each language?

METHODS

Participants:

Bilingual speakers

- 30 late Korean-English bilinguals residing in US (19M 11F, mean age = 29.73)

Control Group

- 20 monolingual native speakers of Mid-Western English (4M 16F, mean age = 24.95)

Task:

- Reading words in isolation on screen
- Casual speech first, and then clear speech
- 3 repetitions of each word in each speaking style

Measurements:

- VOT (word-initial stops) in ms
- Onset f0 (measured at the beginning of the following vowel) normalized to semitones

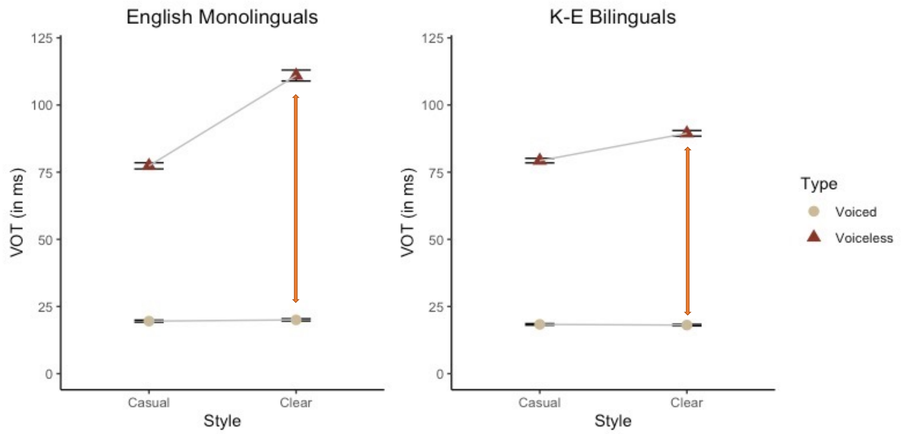
Stimuli:

- 6 English minimal pairs differing in voicing of word-initial alveolar stops (e.g. *ten* vs. *den*)
- 6 Korean (near) minimal triplets differing in laryngeal states of word-initial stops (e.g. *p^hanp^{h}anhata* vs. *panpanhata* vs. *p*anc*akhata*)

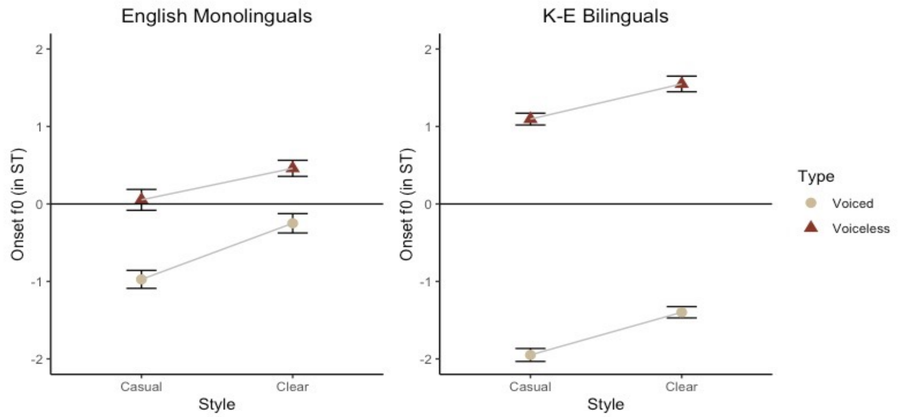
Statistical verification:

- A linear mixed-effect model was implemented in R.
- Fixed effects for English data: Stop Type (voiceless vs. voiced), Speaking Style (casual vs. clear) and Group (English vs. Korean)
- Fixed effects for Korean data: Stop Type (aspirated vs. lenis vs. fortis) and Speaking Style (casual vs. clear)
- Subject and Item were included as random intercepts.

RESULTS (1): ENGLISH CLEAR SPEECH

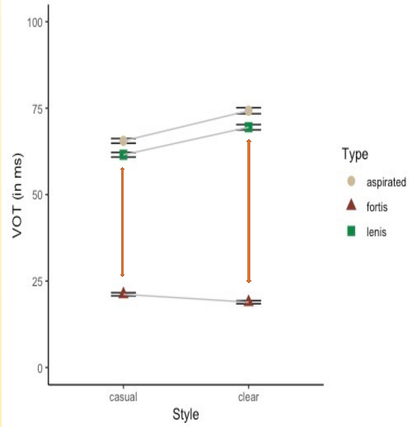


- Significant effects of Speaking Style (clear > casual; β = 10.907, SE = 0.593, p < .001) and Stop Type (voiceless > voiced; β = 70.720, SE = 0.917, p <. 001) for VOT were observed.
- There was a significant interaction between Speaking Style and Stop Type, suggesting that voicing distinction was enhanced in English clear speech (β = 21.971, SE = 1.186, p < .001).
- Voicing enhancement was achieved via asymmetrical VOT lengthening of voiceless stops in clear speech.
- VOT of voiced stops remained stable across speaking styles.
- The magnitude of voicing enhancement was greater in native English clear speech (β = -22.9637, SE = 2.372, p < .001).

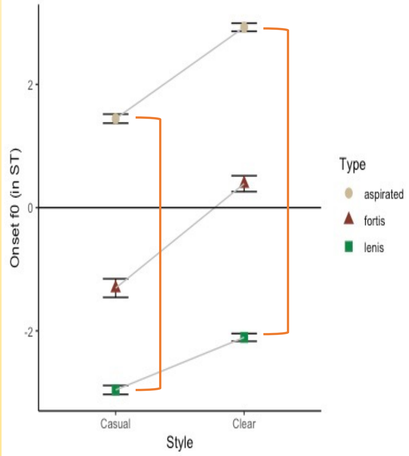


- Significant effects of Speaking Style (clear > casual; β = -0.534, SE = -0.071, p < .001) and Stop Type (voiceless > voiced; β = 1.932, SE = -0.121, p < .001) for onset f0 were observed.
- Voicing distinction via onset f0 was not enhanced in English clear speech as informed by the absence of the significant interaction between Stop Type and Speaking Style (β = 0.2076, SE = -0.142, p = .144).
- Korean-English bilinguals made a greater onset f0 distinction between voiced and voiceless stops than English monolinguals (β = 2.128, SE = -0.142, p <.001).

RESULTS (2): KOREAN CLEAR SPEECH



- Significant effects of both Speaking Style (clear > casual) and Stop Type (aspirated = lenis > fortis).
- Significant interaction between Speaking Style and Stop Type: VOT enhancement was found for the aspirated-fortis (β = 10.954, SE = 1.109, p < .001) and the lenis-fortis (β = 10.229, SE = 1.109, p < .001) contrasts.



- Significant effects of Speaking Style (clear > casual) and Stop Type (aspirated > fortis > lenis) were observed.
- Significant interaction between Speaking Style and Stop Type: onset f0 enhancements for the aspirated-lenis (β = -0.6313, SE = 0.197, p < .01) and the lenis-fortis contrasts (β = -0.8418, SE = 0.197, p < .001)

DISCUSSION

- Late Korean-English bilinguals implemented language-specific clear speech strategies in each of the languages they spoke.
- For English clear speech, they enhanced the voicing contrast by lengthening VOT of voiceless stops. However, they did not enhance the onset f0 contrast between English voiceless and voiced stops.
  → *Both patterns were in line with native English speakers'.*
- For Korean clear speech, they enhanced the acoustic correlate that primarily signals the laryngeal contrast for each pair: onset f0 for the aspirated-lenis contrast, and VOT for the aspirated-fortis and the lenis-fortis contrasts.
- **No evidence that Korean influenced English clear speech production**: this might be because clear speech is essentially "native-listener oriented" (Bradlow & Bent, 2002).

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