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SPEAKER ACCOMMODATIONS TOWARDS VUI VOICES ON THE DIMENSIONS OF VOICE ONSET TIME AND PITCH RANGE

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Overview

- Voice user interfaces (VUIs):
  - Used with smartphones & smart home devices to execute automated tasks [1]
  - VUIs consist of:
    - Automatic speech recognition (ASR) - process speech
    - Artificial Intelligence (AI) - execute instructions
    - Text to [synthetic] speech - respond to speaker
- Research with earlier rudimentary VUI's found
  - To be better understood, speakers hyperarticulate; this accommodation includes converging or diverging pitch (f0), voice onset time (VOT), pause & vowel insertions [2]
- Recent research focuses on user experience:
  - Less on phonetic adjustments
  - Has targeted the advancement ASR
- Hyperarticulation in human-animate speech:
  - Relate speech to human interlocutor's [3, 4]:
    - Converge with in-group (speakers of same region or status, etc.) or diverge from out-group
  - Human-VUI speech may be distinct from human-human, more like human-animal [5]

Question

Do speakers change their speech to accommodate to a VUI?

- If considered in-group, speaker will converge to VUI, minimizing distance and treat VUI as human
- If not considered in-group, speaker will diverge from VUI, increasing distance and treat VUI as non-human
- If considered inanimate, speaker will not accommodation to the VUI

Methods

- To determine exposure effects, compared pre- & post-exposure to robotic and human-like VUIs
- Materials (Fig 1):
  - 2 voices generated for VUI responses
    - In Praat, VOT of /p/ and /t/ were edited:
      - VOT shortened in Human-like VUI voice
      - VOT lengthened in Robotic VUI voice

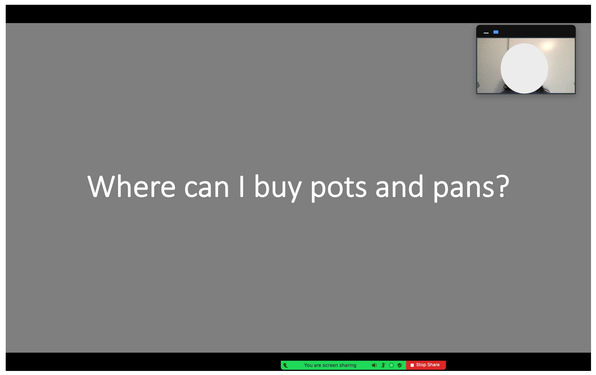

Figure 1. Screenshot of participants' view

- Participants:
  - 18 students from the University of British Columbia participated via Zoom
  - Participants counterbalanced for voice order
- Procedure (Fig 2):
  - Participants told they were speaking to virtual assistants
  - Provided sentences to read via share screen
  - Participants heard a beep (signalling speech recognition), read sentence aloud, heard the VUI response and waited for next sentence
  - Practice: 3 sentences prior to exposure to voices
  - Read 12 sentences to each VUI, received spoken response from VUI
  - Repeated with second VUI

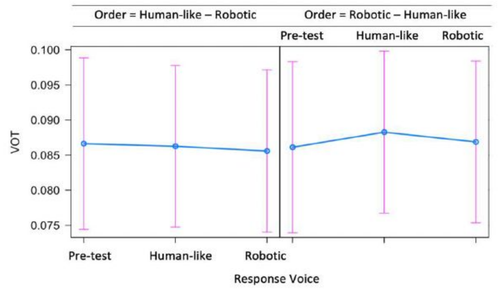

Figure 2: VOT results by voice order group and response voice.

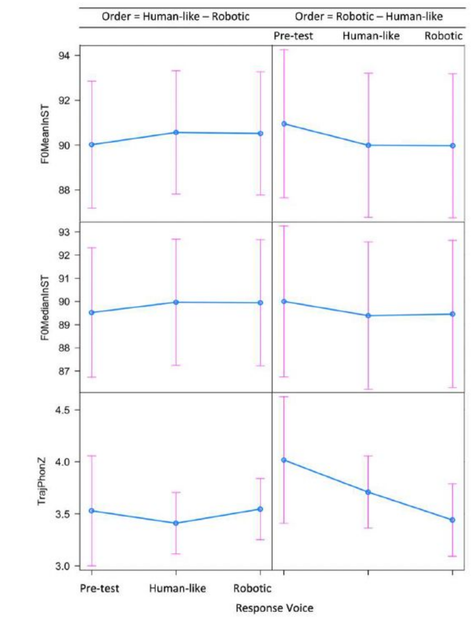

Figure 3: Pitch results by voice order group and response voice.

Analysis

- Participants who didn't speak English as their dominant language, and/or had poor audio quality were excluded from the analysis
- Extracted audio was manually segmented at the sentence level in Praat, after forced alignment (Darla), manually annotated VOT in Praat, time extracted with script

Statistical analysis: R - Linear mixed effect models across participants and T-tests within participants

Results

•Insignificant differences in VOT and pitch range between voices

•Some individual differences but varied across participant pool

Conclusion

Results show that speakers do not accommodate to synthetic VUI voices regardless of how human-like or robotic they sound. This indicates that VUIs are treated as inanimate interlocutors and are unlikely to change the way people produce speech.

References

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