How do listeners evaluate creak: A matched-guise study in Mandarin Chinese
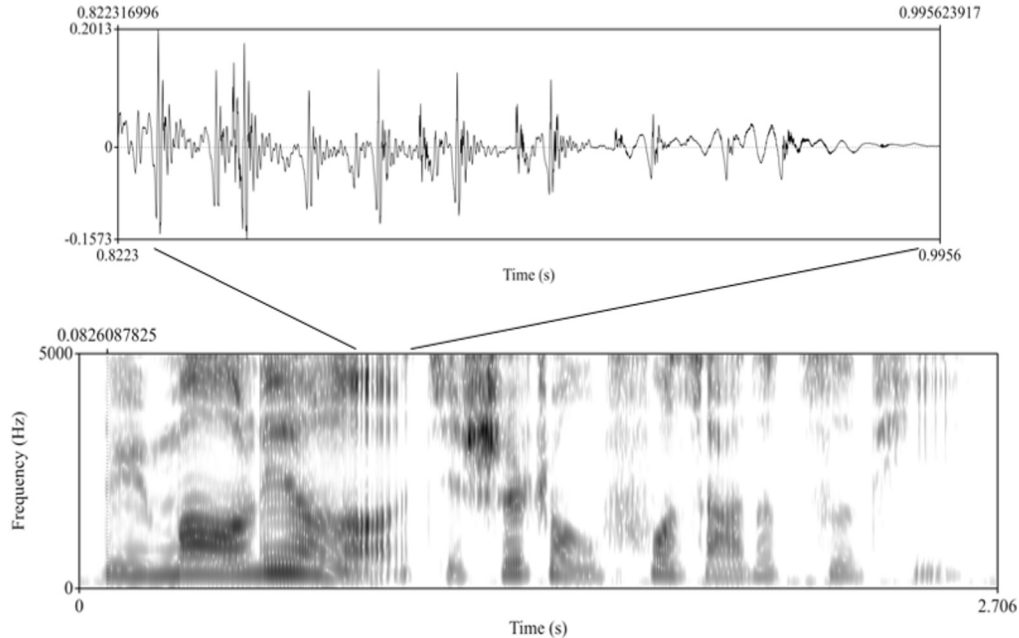
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Creak

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- Contrastive
  - Southern Yi
  - Mazatec

- Allophonic
  - English
  - Mandarin

Allophonic creak and gender

- In the U.S. context, creak is negatively evaluated for male voices but even more so for female voices (e.g., Greers & Winters, 2015)

- This stereotypical binary-gender evaluative bias can influence how listeners identify creak in perception:

  - under certain conditions, <u>American English </u>listeners tend to identify more creak in female voices than male voices (Davidson, 2019)

  - in all conditions, <u>Mandarin</u> listeners tend to identify more creak in male voices than female voices (Li et al., 2022)

Creak evaluation and identification

- Differences in creak identification (English vs. Mandarin) may be partially driven by how creak is evaluated in these two languages

- **Research question**: does creak have gender-differentiated social evaluation in Mandarin?

- **Solution:** A matched-guise study on Mandarin creaky voice

Mandarin creaky voice evaluation

Experimental Design

- Within-subjects evaluation

- Matched-guise paradigm

Female creak

Female modal

Male creak

Male modal

From the same speaker

Stimulus Design

- 64 declarative sentences, 12-syllable long with the same syntactic structure (NP1-TP-NP2), varying in content and lexical items.

(1) 李艾在公园散步碰到了李哀。
   Li Ai4 zai gongyuan sanbu pengdao le   **Li Ai1**.
   Li Ai4 at   park   walk   met   ASP Li Ai1
   'Li Ai4 met Li Ai1 while taking a walk in the park'.

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   1: highlighted is the creak-containing target syllable

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  - Prosodic position: final vs. nonfinal
  - Creak amount: local vs. global
  - Balanced lexical tone

(1) 李艾在公园散步碰到了李哀。　(local final)
(2) 李艾在公园散步碰到了李哀。　(global final)
(3) 李艾在公园散步碰到了李哀。　(local nonfinal)
(4) 李艾在公园散步碰到了李哀。　(global nonfinal)
  'Li Ai4 met Li Ai1 while taking a walk in the park'.

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Recording and Manipulation

- 64 sentences naturally produced by a female native speaker (mean pitch: **225Hz**) ~2.5 seconds
- All the critical sentences were first read with target syllables being produced with creaky voice and then with target syllables being produced with modal voice.
- Cross-splicing to create pairs that differed only in the presence of creak

- Manipulated into low-pitched targets by adjusting vowel formant frequencies, mean pitch, and pitch range (mean pitch:**110Hz;** pitch range: **0.7;** vowel formant ratio: **0.75**)
- Cross-splicing was then conducted on the male voice

Procedure

- Stimuli divided to four **blocks**: 2 creaky and 2 modal

- No guises from the same utterance appeared more than once within the same block.

- Within the block, sentences were rated in **groups.** Listeners evaluated sentences of the same type as a group

Procedure

- Groups within a creaky block

Group 1: Sentence final + global creak + female
Group 2: Sentence final + global creak + male
Group 3: Sentence nonfinal + global creak + female
Group 4: Sentence nonfinal + global creak + male
Group 5: Sentence final + local creak + female
Group 6: Sentence final + local creak + male
Group 7: Sentence nonfinal + local creak + female
Group 8: Sentence nonfinal + local creak + male
…

Procedure

- **Participants:** 40 Mandarin listeners (M=15, F=23, Other =2)

请听下面两段录音 (Please listen to the two sentences)

▶ 0:00 / 0:03 🔊 ⋮

▶ 0:00 / 0:02 🔊 ⋮
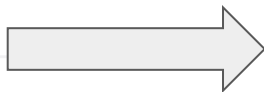
- **7-point Likert scale:** likeability, competence, intelligence, attractiveness, wealthiness, educatedness, friendliness trustworthiness.

根据您刚刚所听到的声音，您认为说话人是一个富裕的人吗？(wealthy)

| 非常不富裕 | 2 | 3 | 4 | 5 | 6 | 非常富裕 |

根据您刚刚所听到的声音，您认为说话人是惹人喜欢的人吗？(likeable)

| 非常不惹人喜欢 | 2 | 3 | 4 | 5 | 6 | 非常惹人喜欢 |

根据您刚刚所听到的声音，您认为说话人是一个聪明的人吗？(intelligent)
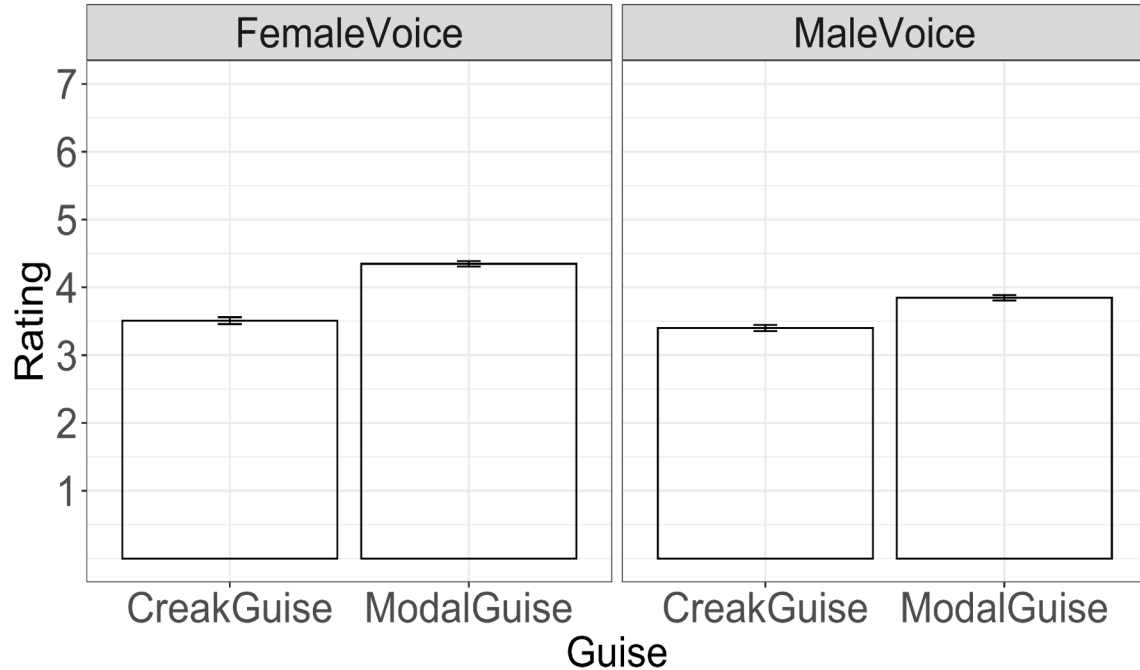
| 非常不聪明 | 2 | 3 | 4 | 5 | 6 | 非常聪明 |

Results : overall pattern
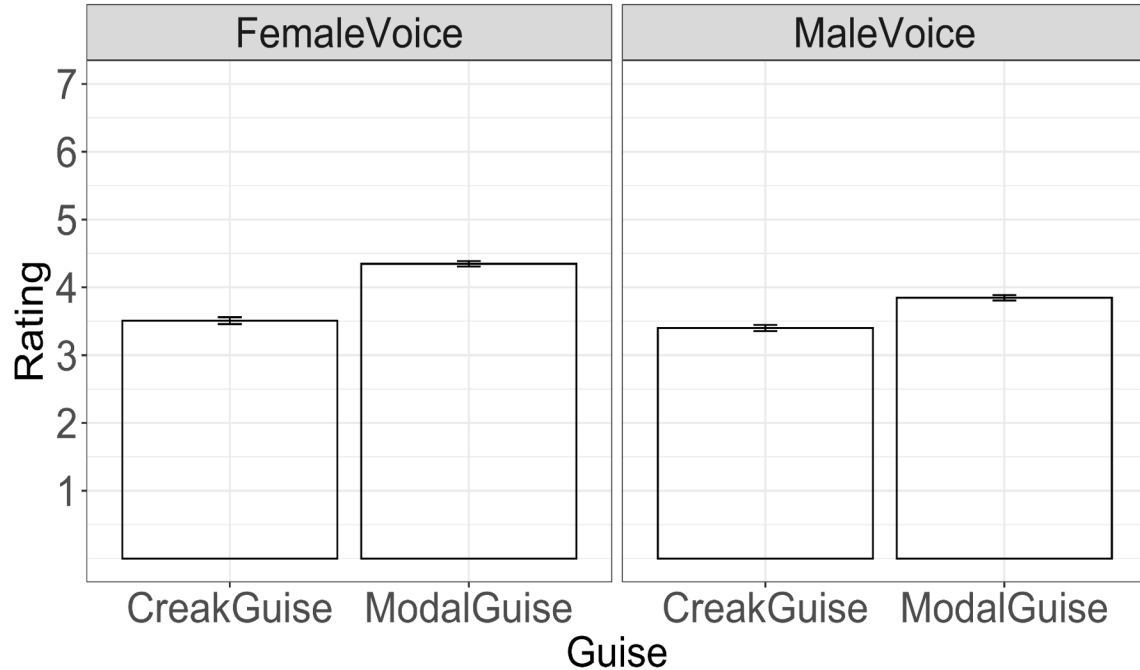
Mixed-effects regression

- Dependent variable: Rating (z-scored by participant)

- Fixed factors: Gender x Guise (both sum-coded)

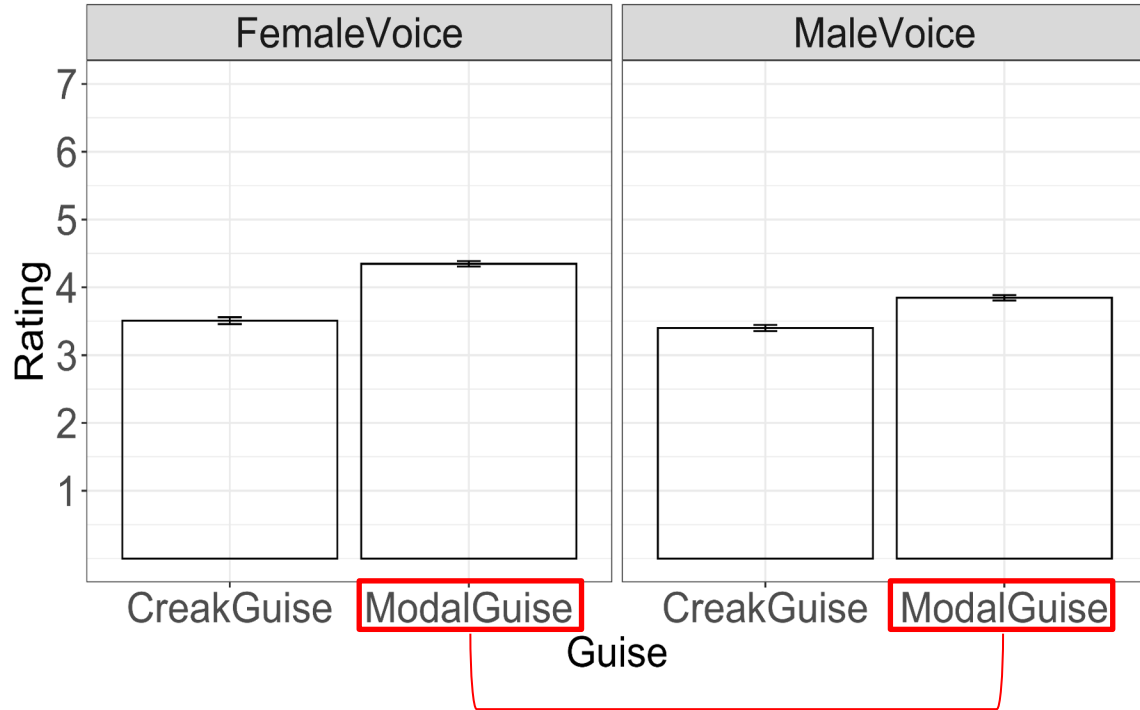- Random factors: Participant, Utterance

Results : overall pattern

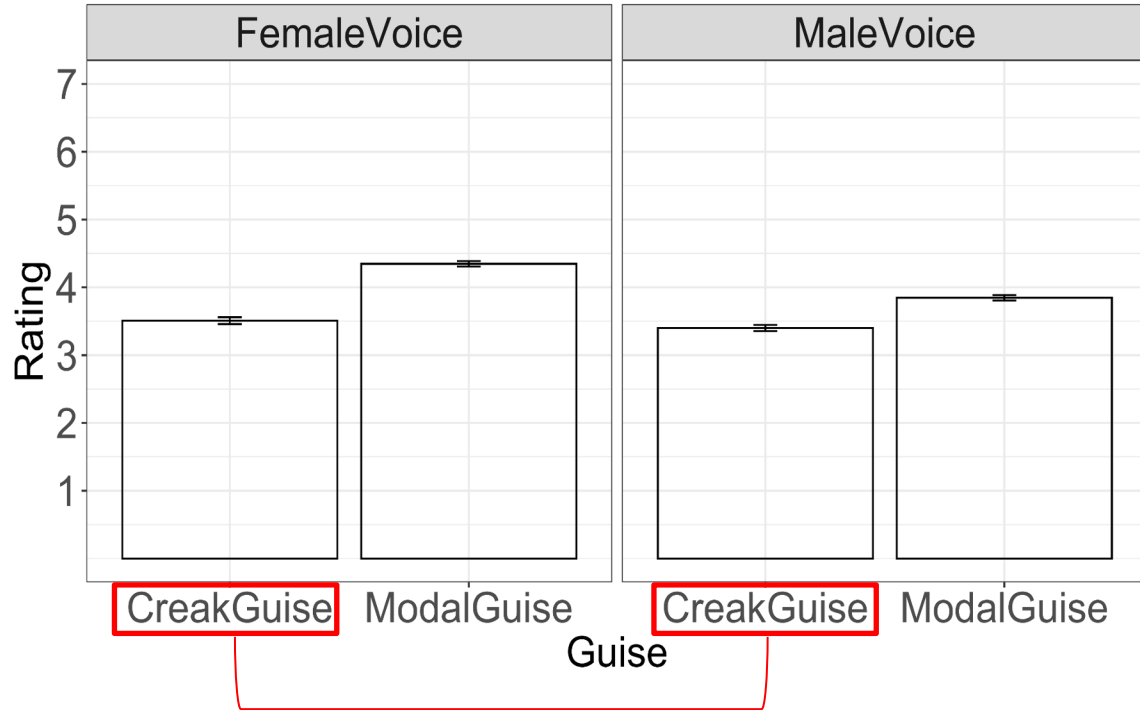Creak guises were significantly dispreferred (β=-0.31, p<0.001)

Results : overall pattern

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Male modal voice was dispreferred than female (β=0.49, p<0.01)

Results : overall pattern

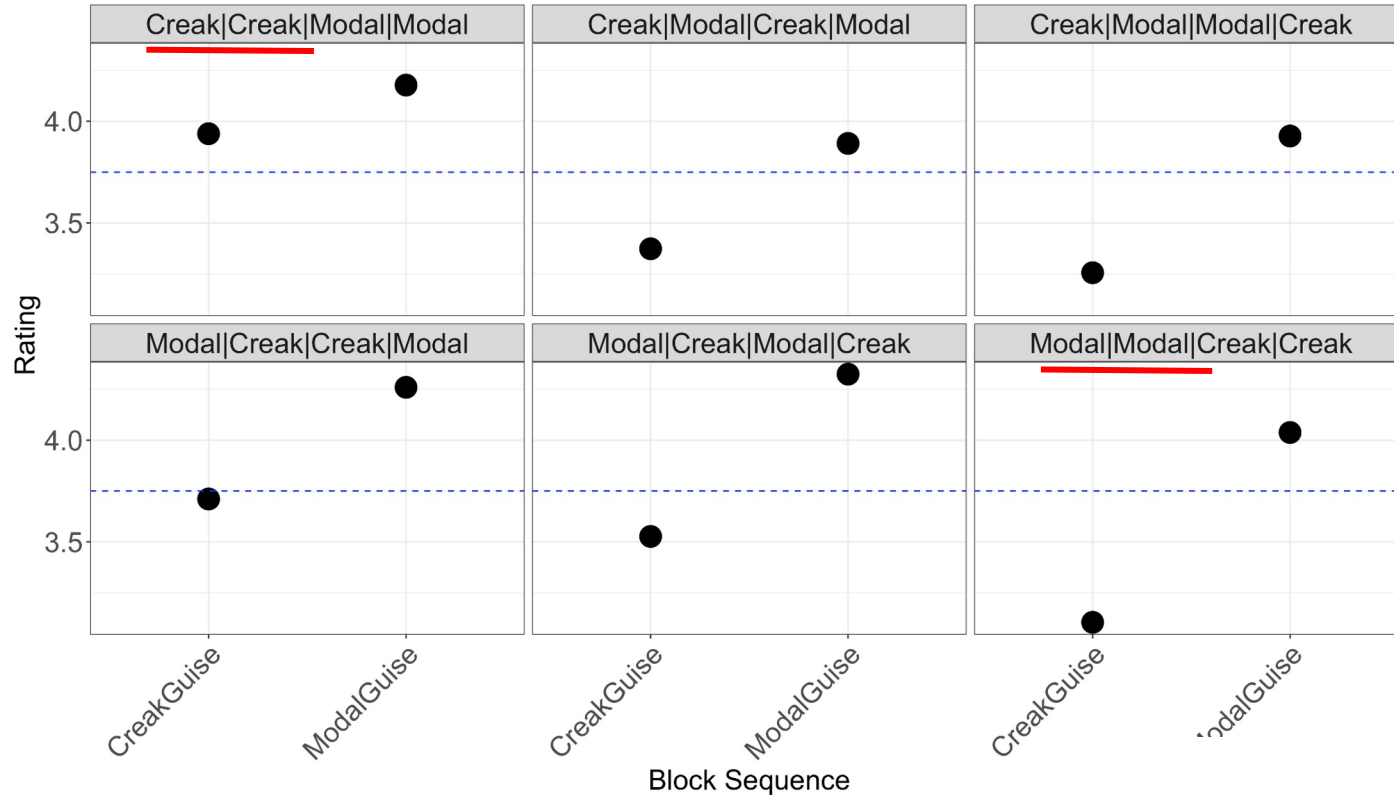Creak guises were significantly dispreferred (β=-0.31, p<0.001)
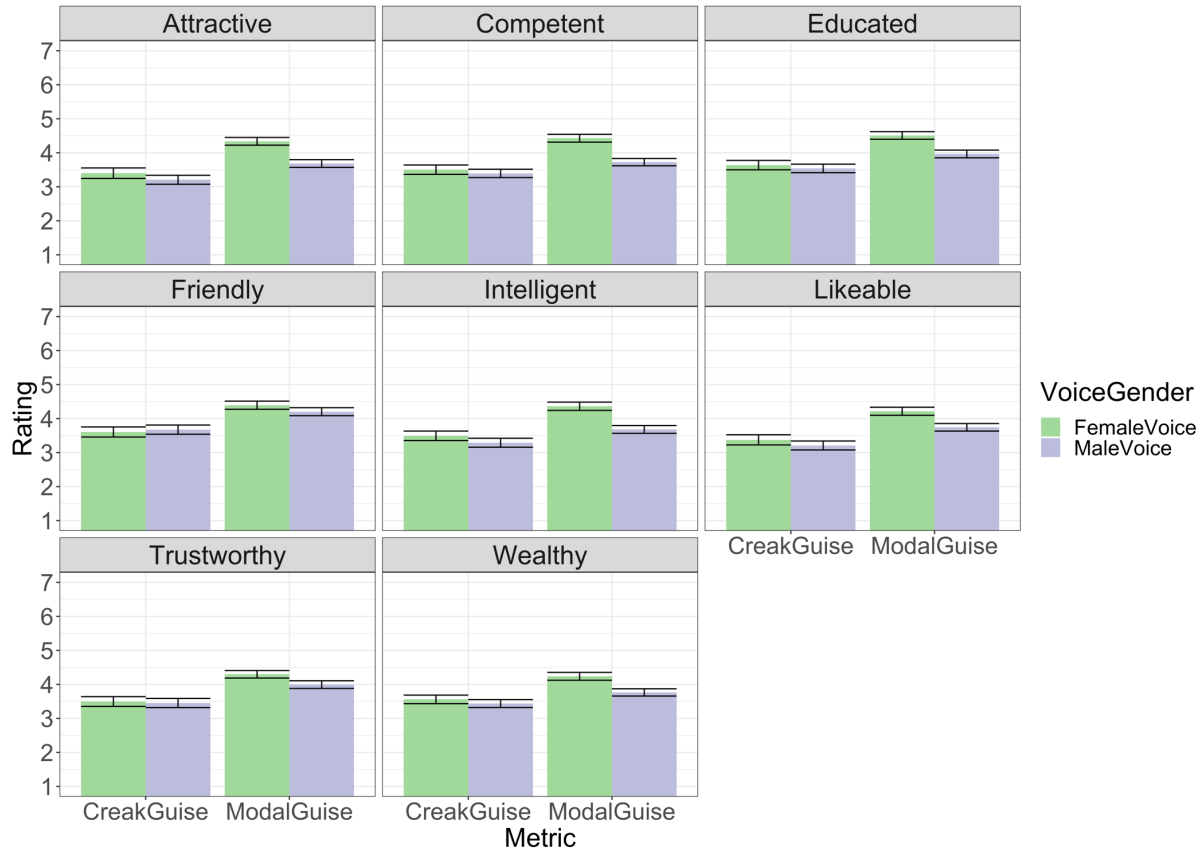
Male modal voice was dispreferred (β=0.49, p<0.01)

For the **creaky guise**, gender difference was **insignificant** (β=0.10, p= 0.54)
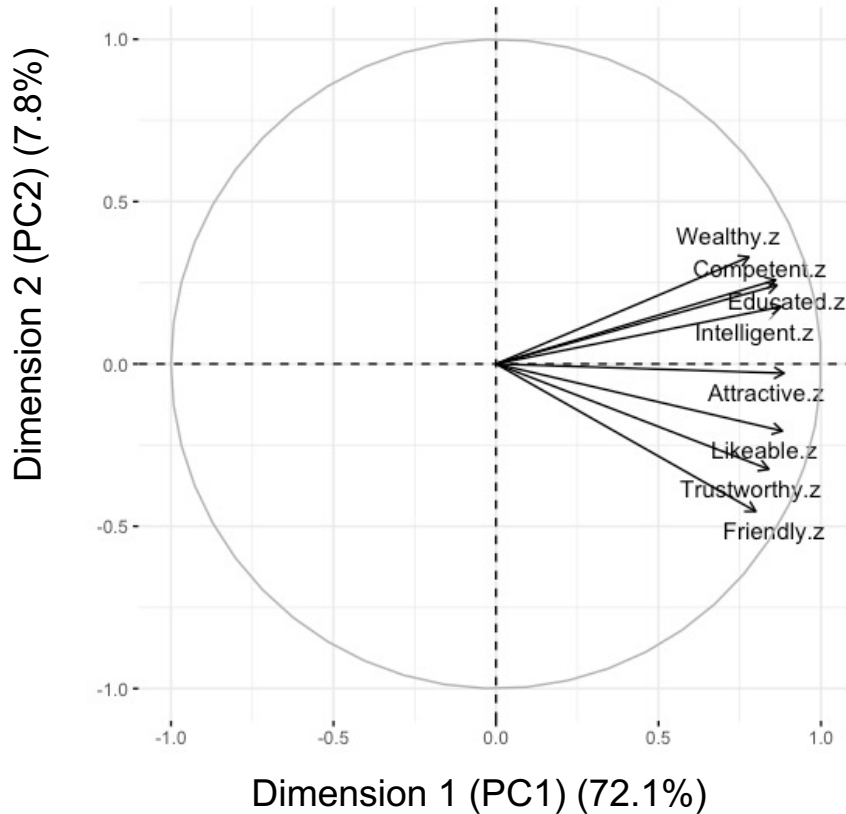
Results : order effects

Listeners tended to rate creak more harshly if they were first exposed to two blocks with modal utterances

Results : personality metrics
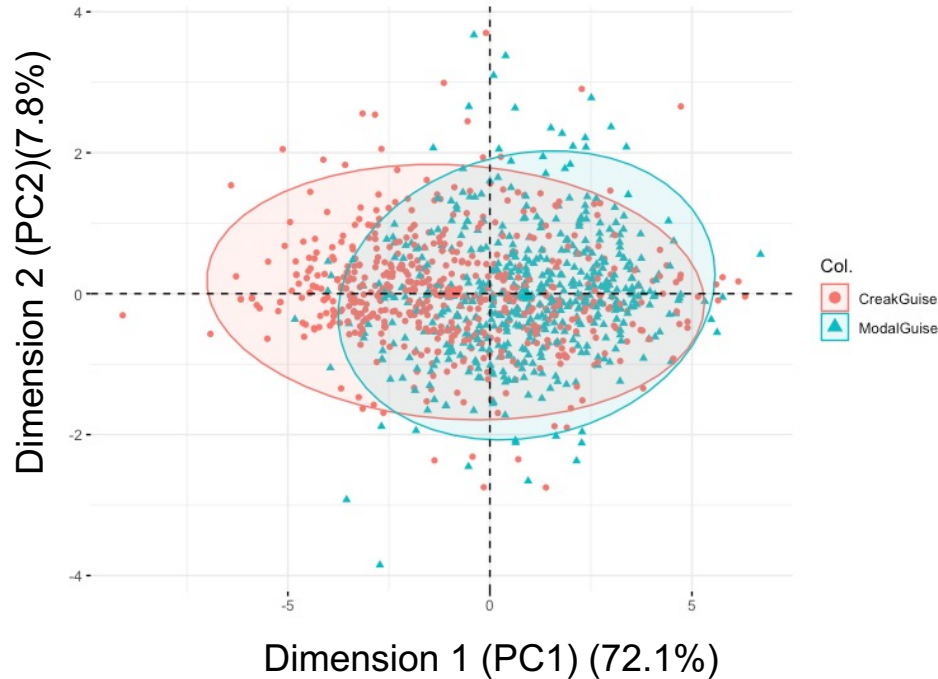
Results : personality metrics

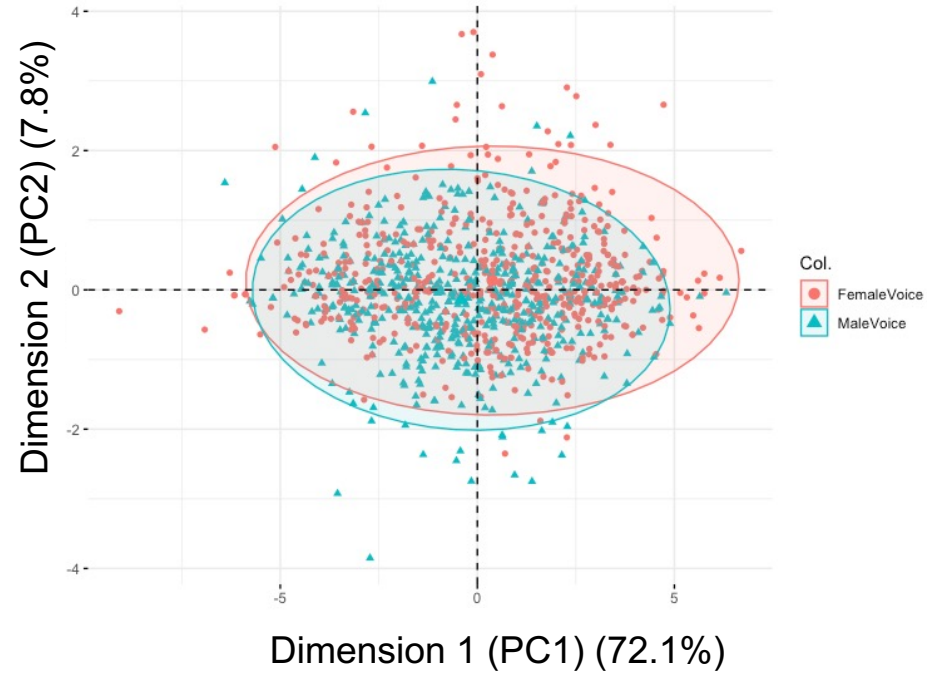-The top metric contributes to the PC1: Attractiveness

-The top metric contributes to the PC 2: Friendliness

Results : personality metrics

On guises

Dimension 2 (PC2)(7.8%)

Dimension 1 (PC1) (72.1%)

Col.
- CreakGuise
- ModalGuise

On voice gender

Dimension 2 (PC2) (7.8%)

Dimension 1 (PC1) (72.1%)

Col.
- FemaleVoice
- MaleVoice

Discussion & Conclusion

- In Mandarin, listeners do not display explicit gender biases with respect to creaky voice.

- Although creaky utterances are evaluated negatively compared to their modal counterparts, female creak and male creak were evaluated as equally negative.

- Even though listeners did not evaluate female creak and male creak differently, they tended to downgrade the low-pitched modal voice: a result of manipulation?

Discussion & Conclusion

- Order of exposure matters: listeners tended to rate creak more harshly if they were first exposed to blocks with modal utterances, compared to those who were first exposed to creaky utterances

- Back to English vs. Mandarin: Earlier we found a language difference in the identification of creak for female and male speech, and that might be mediated by social evaluation.

Thank you for your attention!

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