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Introduction

Three possible sources of creak:

- Tone [1]
- Low F0 [2]
- Utterance-final position: mark finality [3]

F0 declination:

- F0 declines as sentence proceeds [4].

Research Questions

- Controlling F0, do utterance-final positions continue being creakier than non-final positions?
- Does the effect of F0 and utterance position differ between statements and questions?

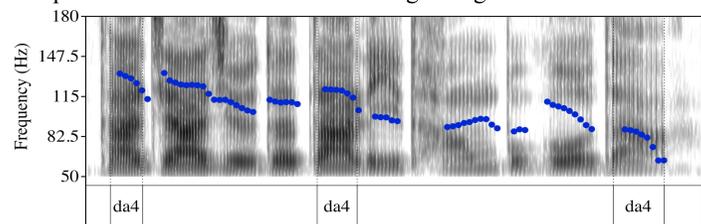
Method

- Subjects: 32 speakers of Northern Mandarin dialect
- Stimuli: 64 sentences (8 Statements + 8 Questions + 8 fillers * 3)
- **Statement**

大家觉得大礼堂不够大。

da4 jia1 jue2 de3 da4 li3 tang2 bu2 gou4 da4.

“People think that the ballroom is not big enough.”

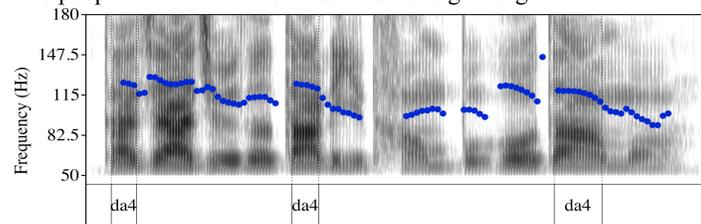


- **Question**

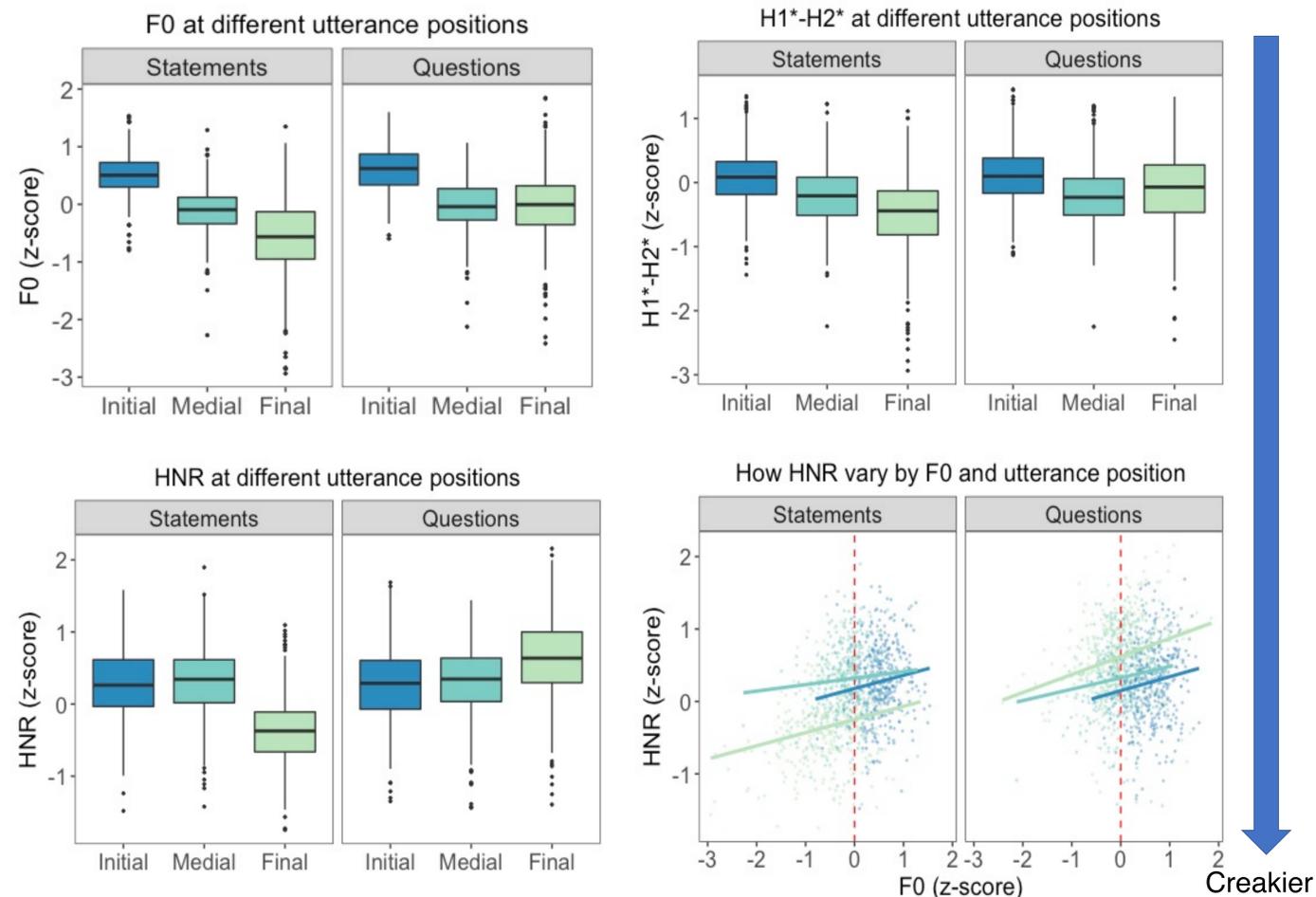
大家觉得大礼堂不够大吗？

da4 jia1 jue2 de3 da4 li3 tang2 bu2 gou4 da4 ma?

“Do people think that the ballroom is not big enough?”



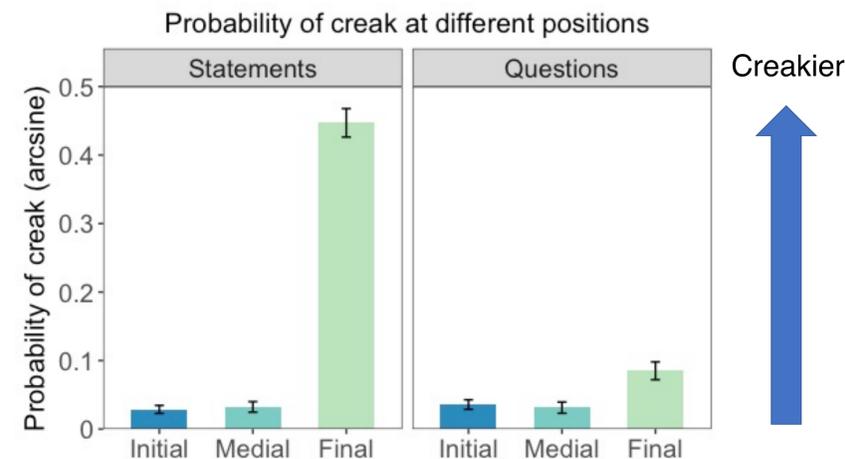
Results | Creak Acoustics



Conclusions

- Effect of F0: The lower the F0, the creakier the voice quality is.
- **Controlling F0:**
 - **Statement:** Final position is creakier than non-final positions.
 - **Question:** Final position is more periodic than non-final positions.
- The source of creak differs by sentence type:
 - **Statement:** Utterance-final triggers creak independent of F0.
 - **Question:** F0 is the main trigger of creak. Utterance-final is not marked by the creaky voice.

Results | Creak Probability



Future Direction

- Expand the target word to all four Mandarin tones.
- Include more types of questions in Mandarin (e.g. questions without particles and questions with “ba” (吧) and “ne” (呢) particles)

References

- [1] Garellek, M., & Keating, P. (2011). The acoustic consequences of phonation and tone interactions in Jalapa Mazatec. *Journal of the International Phonetic Association*, 41(2), 185-205.
- [2] Kuang, J. (2017). Covariation between voice quality and pitch: Revisiting the case of Mandarin creaky voice. *The Journal of the Acoustical Society of America*, 142(3), 1693-1706.
- [3] Zhang, H. (2016). Boundary effects on allophonic creaky voice: A case study of Mandarin lexical tones. *Tonal Aspects of Languages 2016*, 94-98.
- [4] Yuan, J., & Liberman, M. (2014). F0 declination in English and Mandarin broadcast news speech. *Speech Communication*, 65, 67-74.