Mandarin Chinese tone sandhi modulates sentence completions (to a limited extent)

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Introduction

- Evidence for the use of phonological information in real-time lexical prediction remains limited.
- Although some studies reported prediction effects based on tone sandhi with slow speech rates [1-2]; such evidence has remained elusive with more naturalistic speech rates [3].
- A recent study has found minimal effects of tone sandhi on listeners' responses in the sentence completion task [4].
- In this study, we looked at two tone sandhi patterns in Mandarin Chinese (the T3 sandhi and the *yi* sandhi) and used a forced-choice sentence completion task to investigate the effect of phonological cues on listeners' expectations.

Methods

- Participants (n=50) listened to non-constraining sentence frames ("Wang thoughtfully prepared …") and were asked to select their preferred continuation between two noun phrases (NPs).
- The NPs always shared the initial syllable, but it was realised in different tonal forms due to tone sandhi applying in one of them (*hao3 cha2* 'good tea' vs. *hao2 jiu3* 'good wine').
- In the Experimental condition, the sentence frame was truncated after the first syllable of the target NP (the critical syllable), realised either in the base tone or the sandhi tone (e.g. "… *hao2* …").
- In the Control condition, the spoken sentence was truncated before the critical syllable, leaving no tonal information to help identify the target NP.

Stimuli Type	Tone Sandhi	Base Form	Base Example	Sandhi Form	Sandhi Example
***yi* ('one')**	Yi sandhi	*yi4*	*yi4 zhang1/tiao2/ba3*	*yi2*	*yi2 ge4*
***liang* ('two')**	T3 sandhi	*liang3*	*liang3 zhang1/tiao2/ge4*	*liang2*	*liang2 ba3*
T3 morphemes	T3 sandhi	*jing3*	*jing3che1 / jing3ju2 / jing3wei4*	*jing2*	*jing2quan3*
T3 adjectives	T3 sandhi	*xiao3*	*xiao3 mao1/she2/lu4*	*xiao2*	*xiao2 gou3*

Table 1. Illustration of tone sandhi patterns and types of stimuli.

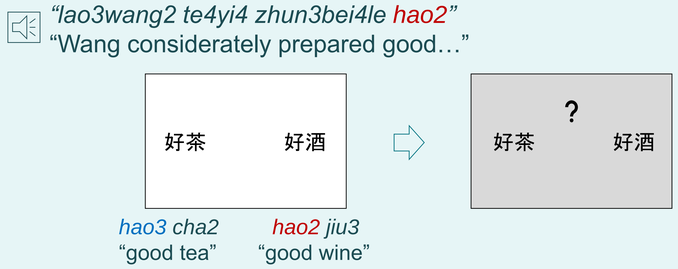

Figure 1. Experimental procedure. In the Experimental condition, only the target was compatible with the critical syllable's tone. In the Control condition, the sentence was truncated prior to the critical syllable so both NPs were compatible.

Results

- Generalised linear models revealed a higher rate of target responses in the Experimental condition than the Control condition across all critical syllable types (Figure 2).
- However, the effects of tone sandhi cues was limited (Figure 3): A non-negligible error rate (>25%) was found in all Experimental conditions, indicating that listeners selected the competitor a significant proportion of the time even though it was phonologically incompatible with what they heard.

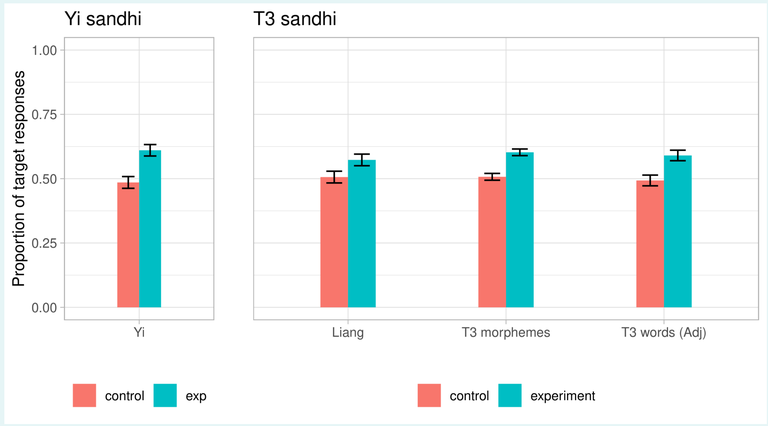

Figure 2. Proportion of target responses across stimuli types.

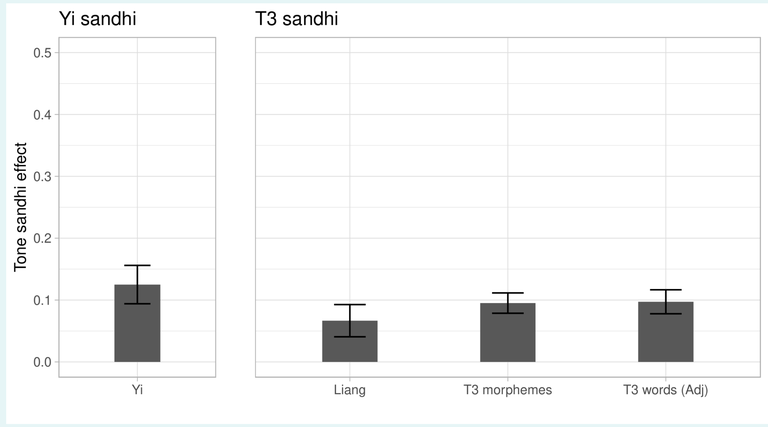

Figure 3. Effect of tone sandhi (i.e. proportion of target responses in the Experimental minus Control condition) across critical syllable types.

Discussion

- Listeners are sensitive to tone sandhi as an informative cue in selecting sentence continuations.
- But this sensitivity is rather limited:
- Although listeners somewhat adjusted their expectations about upcoming lexical input according to tone sandhi cues, they were still happy to accept continuations that were phonologically incompatible with the given tonal cue.

- These results provide insights into the role of phonological cues in real-time lexical prediction:
- Although comprehenders are more likely to pick continuations that are compatible with the tone sandhi cue in the input, options that are incompatible with the input are still chosen a significant portion of the time.
- This can potentially explain why lexical predictions based on tone sandhi cues can be difficult to observe [3].

References

[1] Ito, A., & Hirose, Y. (2024). Quarterly Journal of Experimental Psychology.
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[3] Huo, Y., & Chow, W.Y. (2024). Poster presented at LingO 2024: Oxford Postgraduate Conference in Linguistics, Jesus College, Oxford, UK.
[4] Huo, Y., Hsu, Y.C., & Chow, W.Y. (2024) Poster presented at HSP 2024: 37th Annual Conference on Human Sentence Processing, University of Michigan, Ann Arbor, MI, USA.