Limited impact of phonological information on listeners' expectations: sentence completion evidence from Mandarin Chinese tone sandhi

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The cloze task is widely used to assess the predictability of a word in a given context [1-3], but it has rarely been used to examine to what extent phonological information can modulate a word's predictability. In this study, we used Mandarin Chinese tone sandhi as a test case to investigate listeners' sensitivity to phonological information in a cloze task. Participants were asked to listen to incomplete sentences and provide a continuation verbally. The sentence frames ended in a critical syllable that could take on one of two tonal forms depending on whether it has undergone tone sandhi. We tested two tone sandhi patterns in Mandarin that can be informative about upcoming language: the T3 sandhi and the *yi* sandhi. **Results showed that listeners were sensitive to tone sandhi cues in the auditory cloze task, but only to a limited extent**.

Methods. Participants listened to incomplete sentences and were given four seconds to complete each sentence by producing one or more words. The sentences were composed of a neutral sentence frame (e.g. "As Wang entered the room, she saw two…") which ended with a numeral that took on one of two tonal forms (the critical syllable). Participants almost always continued the sentence with a classifier and a noun. We tested two tone sandhi patterns, the T3 sandhi and the *yi* sandhi (see table). The T3 sandhi changes a syllable from T3 to T2 when it is followed by another T3 syllable; this applies to the numeral *liang3* ('two'). The *yi* sandhi applies to the numeral *yi* ('one'): *yi* is realized in T2 when followed by a T4, but is in T4 otherwise.

Tone sandhi	Numeral	Base form	Base form example	Sandhi form	Sandhi form example
T3 sandhi	*liang* ('two')	*liang3*	*liang3 zhang1/tiao2/ge4*	*liang2*	*liang2 ba3*
Yi sandhi	*yi* ('one')	*yi4*	*yi4 zhang1/tiao2/ba3*	*yi2*	*yi2 ge4*

Crucially, both the *yi* and T3 sandhis are right-dominant, such that the first syllable in the sandhi domain changes its tone based on the syllable that follows, the tonal form of *yi* and *liang* is informative about the tone of the upcoming syllable. As such, the tone of the critical syllable in the present study served as a cue that restricts the set of possible responses. We tested the same materials in both an auditory cloze task (Experimental task, n=15) and a written version (Baseline task, n=19) where the numeral's tonal form was not encoded (*yi4/yi2* → 壹; *liang3/liang2* → 两).

If listeners were sensitive to tone sandhi information, they should be able to complete the sentence with a response that was compatible with the numeral's tone (or to provide 'tone-consistent' responses) in the auditory cloze task. Their responses in the written cloze task served as a baseline since tone sandhi information is unavailable in writing. If listeners were not sensitive to tone sandhi information in the auditory cloze task, their performance in the Experimental task should be no different from that in the Baseline written cloze task.

Results. Participants produced a numerically higher proportion of tone-consistent responses in the Experimental task than the Baseline task in all conditions except for the *liang2* trials (see figure). The distinct pattern for *liang2* may be a result of there being fewer classifiers in T3 (and thereby fewer possible tone-consistent responses) in Mandarin. Logistic regression with factors of task (auditory vs. written), numeral (*yi* vs. *liang*), and phonological form (base vs. sandhi) revealed a significant main effect of task ($z=2.77$, $p=0.006$) and a three-way interaction; Pair-wise comparisons revealed significant effects of task for *yi2* and *liang3* trials, but not for *yi4* or *liang2* trials. The effects in *yi2*/*liang3* trials could potentially be attributed to *ge4*, the general classifier, which is compatible with *yi2*/*liang3* and may be more frequent in spoken vs. written language. However, all significant effects of task remained after we removed responses starting with *ge4*.

Conclusions. Our results suggest that listeners were sensitive to tone sandhi information in the auditory cloze task to an extent, as there was a main effect of task. However, participants'

performance was far from perfect and the effect of task was not present in all trial types, showing that their sensitivity to tone sandhi in the cloze task may be rather limited.

References

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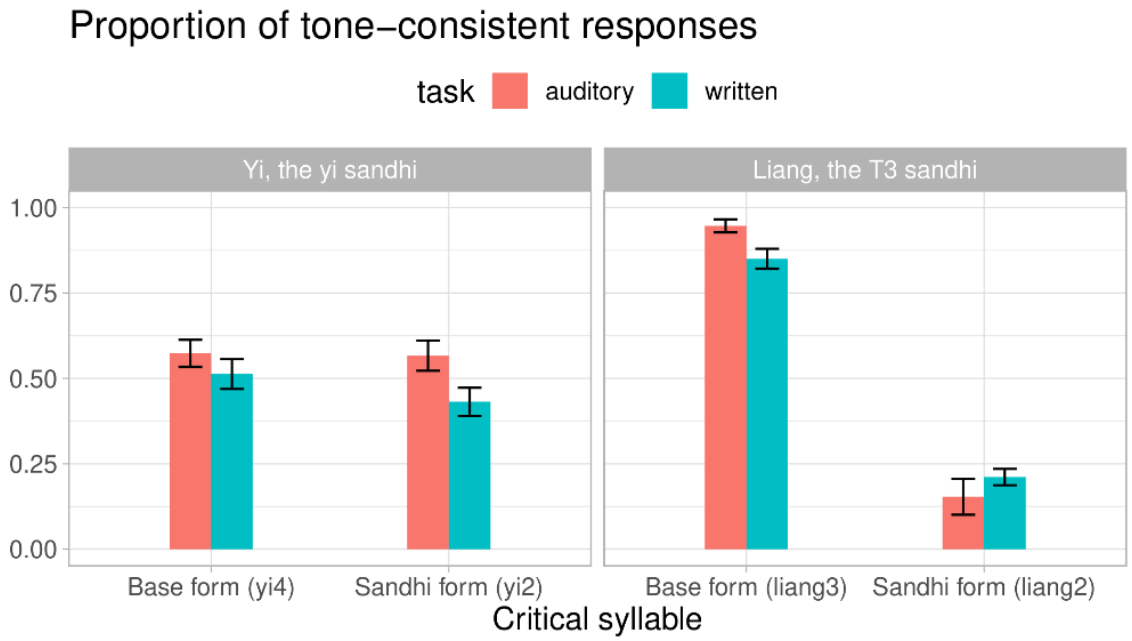

Figure 1. Proportions of responses that are consistent with the critical syllable’s tone.