

Mandarin Tonal Asymmetries in Perception

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A well-known sandhi phenomenon in Mandarin replaces the first Tone 3 (T3) with Tone 2 (T2) when a word contains an identical sequence of T3+T3. Previous form priming experiments have shown that an underlying match is preferred to a surface match (Chien et al., 2015). That is, a [T3] syllable primes the surface form [T2 T3] if the first [T2] results from an underlying /T3/ while a perfect surface match of [T2] does not. In the present study, we tested this representational hypothesis in a series of lexical decision tasks with form and semantic priming using both /T2/ and /T3/ underlying forms. We ran our experiments in Beijing and since dialects tend to differ in tonal sandhi, we ensured that our participants (N = 52 in Experiment 1 and N = 50 in Experiment 2) did not speak any dialect other than Mandarin.

Experiments 1A and 1B address the question whether the surface form [T2] activates the underlying form /T3/, given that [T2] can come from two underlying sources: /T2/ and /T3/ in case of sandhi. We expect to observe both form priming and semantic priming: if the /T3/ form is activated, it should also activate its concomitant meaning. In addition, since /T3/ can have two surface manifestations, [T3] and [T2] in sandhi contexts, Experiments 2A and 2B address the question whether [T3] can activate the underlying form /T2/.

We used lexical decision tasks with audio-visual cross-modal priming designs. 36 monosyllabic Chinese words were selected as base words in each experiment. Frequency was controlled for both base words and target words. Experiments 1A and 1B used T3 base words while Experiments 2A and 2B used T2 base words. Auditory primes were either [T2] or [T3] with [T4] as a control. Participants heard the primes and made lexical decisions on visually presented disyllabic targets, which are either form related or semantically related to the prime. Recall that although the visual (form) target in 1A is represented as /T3 T3/, it would be pronounced as [T2 T3].

	Prime	Base	1A Form Target	1B Semantic Target
Underlying	[da3]			
Surface	[da2]	/da3/	/da3 sao3/	/gong1 ji1/
Control	[da4]	to beat	打扫 to clean	攻击 to attack
	Prime	Base	2A Form Target	2B Semantic Target
Underlying	[tan2]			
Mispronounced ¹	[tan3]	/tan2/	/tan2 lun4/	/dui4 hua4/
Control	[tan4]	to talk	谈论 to discuss	对话 to converse

Experiment 1A shows that both [T2] and [T3] prime the **form** target (Figure1), confirming the hypothesis that [T2] activates /T3/. Furthermore, the underlying match [T3] leads to larger priming effect than the surface match, suggesting that underlying match is preferred. These results also suggest that words undergoing sandhi are represented as /T3 T3/, supporting a canonical representation view (cf. Zhou and Marslen-Wilson, 1997). However, Experiment 1B shows that only the underlying match [T3] primes the **semantic** target whereas [T2] does not. This could be due to the activation of homophones; thus the semantic priming effect is too weak to be observed.

Experiment 2A shows that [T2] primes its **form** target whereas [T3] does not. This is because [T3] cannot be derived from /T2/ in any context. Interestingly, in Experiment 2B [T2] primes its **semantic** target, so does [T3]. This implies that hearing [T3] activates its alternative manifestation

¹ 'Mispronounced' is used instead of 'mismatch' because [tan3] can manifest as /tan2/.

/T2/ therefore its **semantic** related target. However since there is a mismatch in form, such an effect is not observed in **form** priming.

To conclude, we have found asymmetries in Mandarin tone perception. In form priming, a surface form can activate its underlying representation. Therefore [T2] activates both /T2/ and /T3/, but [T3] only activates itself. In semantic priming, it seems to be harder for semantic targets to be activated, likely due to the co-activation of homophones. However the manifestation of /T3/ as both [T2] and [T3] appears to lead to strong priming effects. We also discuss a potential containment relationship between T2 and T3, which might contribute to the asymmetry in semantic priming.

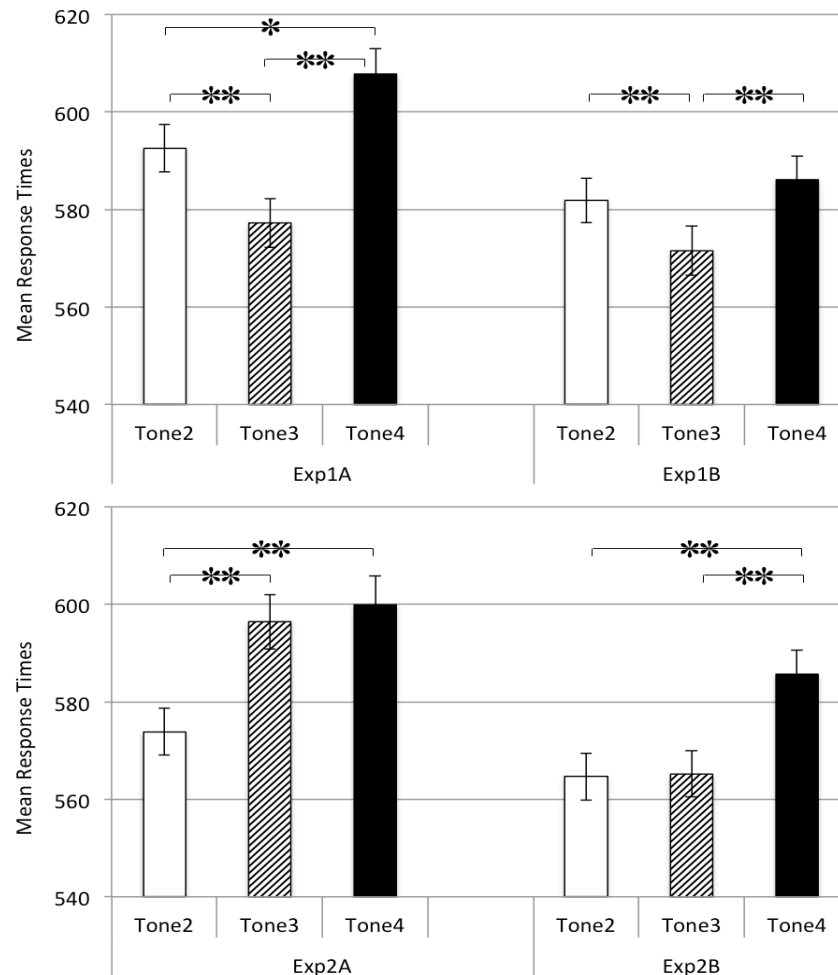


Figure 1. Mean response times of lexical decisions following primes of different tones in four experiments. Exp1A and Exp1B have T3 words as base words. Exp2A and Exp2B have T2 words as base words. Exp1A and Exp2A used form priming; Exp1B and Exp2B used semantic priming. Error bars represent standard errors. * indicates the p-value of modal coefficient < .01. ** indicates the p-value of modal coefficient < .001.

References

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