Allotonic variants do not prime each other: evidence from long-lag priming

Stephen Politzer-Ahles[1], Yixin Cui[2]

[1]*University of Kansas (USA)*, [2]*Hong Kong Polytechnic University (Hong Kong)*
sjpa@ku.edu, yixin.cui@connect.polyu.hk

Linguistic forms, like words and morphemes, may be realized in different ways depending on the context in which they are produced. For example, in Mandarin, a tonal language, syllables that canonically have Low tone (also called "tone 3") are instead pronounced with Rising tone (also called "tone 2") in certain phonological contexts. Do listeners use their knowledge of this phonological alternation during word recognition? In other words, do listeners hearing a Low-tone syllable in Mandarin also activate its Rising-tone variant, and vice versa?

Politzer-Ahles and colleagues [1] addressed this question using long-lag priming. In the long-lag priming paradigm, participants typically respond to a word faster if they have seen the same word, or a morphologically-related word, earlier in the experiment; for example, people can respond to *hunt* faster if they have seen *hunt* or *hunter* earlier than if they have not. Politzer-Ahles and colleagues [1] had Mandarin listeners make lexical decisions to auditorily-presented one-syllable Mandarin morphemes, like *shi*^{L} (使, meaning to make or let [someone to do something]), which were preceded earlier in the experiment by either identical primes (*shi*^{L}), allotonic primes (e.g. *shi*^{R}, the Rising-tone variant of *shi*^{L}), or unrelated primes (e.g. *hua*^{F}, a syllable with completely different segments and with Falling tone). They found priming for the identical condition, but not the allotonic condition, suggesting that hearing one form (e.g. *shi*^{L}) does not cause comprehenders to activate its allotonic variants (e.g. *shi*^{R}).

A limitation of that study, however, is that Mandarin syllables tend to be highly homophonous: for example, *shi*^{L} is the pronunciation of many different morphemes (such as 史 "history", 驶 "drive", and 屎 "poop"). Politzer-Ahles and colleagues [1] speculate that maybe the reason they didn't observe priming between allotonic variants is because such priming depends on the comprehender being able to uniquely identify a particular morpheme to activate. In other words, maybe *shi*^{L} doesn't activate its variant *shi*^{R} if the listener doesn't know which morpheme to activate.

The present study addresses that limitation by testing participants in a paradigm in which each prime unambiguously corresponds to one morpheme. We conducted a long-lag priming experiment with the same conditions as Politzer-Ahles et al. [1]: targets (like *shi*^{L}) were preceded earlier in the experiment by either an identical prime (*shi*^{L}) or an allotonic prime (*shi*^{R}); targets without either an identical or allotonic prime were unprimed. Unlike that experiment, though, we presented the primes visually, in Chinese characters, and participants' task was to name each character aloud. The experiment thus consisted of two blocks: a "priming" block in which participants saw Chinese characters and named them, and a later "target" block in which they performed lexical decisions to auditorily-presented targets. Thus, the identical prime for the target *shi*^{L} was the character 使 (pronounced *shi*^{L}) and the allotonic prime for that same target was the character 十 (pronounced *shi*^{R}). We avoided using any characters that have multiple pronunciations. The experiment consisted of 71 critical items, divided across three lists in a Latin square design. Both the prime and target blocks included additional filler/distractor trials consisting of words with other tones to help mask the purpose of the experiment, and the target block also included nonword foils.

60 native Mandarin speakers participated in the experiment. Priming effects for the identity and allotone conditions (relative to the unprimed baseline) are shown in Figure 1, and the effects were statistically evaluated using a Bayesian mixed model implemented in the {brm} package of R. As suggested by the figure, there was significant identity priming (22 ms; Bayesian 95% credible interval: [6, 38]) but no significant allotone priming (1 ms; Bayesian 95% credible interval: [-17, 15]).

These results provide a further confirmation that there is not long-lag priming between phonologically related variants of the same morpheme in Mandarin (e.g., *shi*^{L} does not prime *shi*^{R}), while ruling out the possibility that previous experiments' failure to find this priming was due to participants' not being able to uniquely identify one meaning from a homophone. The use of written primes in the present study should guarantee that participants can uniquely identify a morpheme for activation during the priming phase of the experiment, but this still did not facilitate auditory lexical decisions during the target phase.

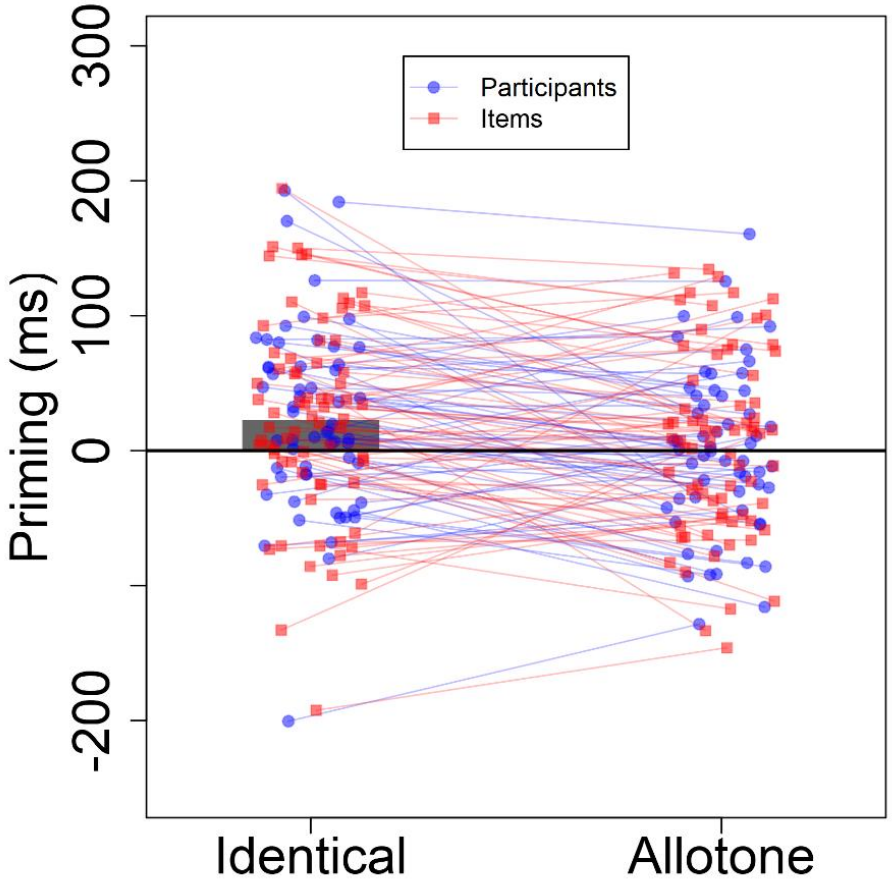

Fig.1 Priming effects for identity priming (left) and allotone priming (right), each expressed as the difference between the unrelated condition and the corresponding related condition. Blue circles represent priming effects for individual participants, red squares represent priming effects for individual items, and the gray bar represents the average priming effect.

References

[1] Politzer-Ahles, S., Pan, L., Lin, J., & Lee, K. (in press). Long-lag identity priming in the absence of long-lag morphological priming: evidence from Mandarin tone alternation. *Glossa: Psycholinguistics*.