The Effect of Segmental-Tonal Neighborhood Density in Chinese Spoken Word Recognition: A Visual World Eye-Tracking Study

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In lexical tone languages, tone is used to distinguish word meanings and may play a critical role in spoken word recognition. In Mandarin Chinese, each syllable may be assigned one of four tones. There is a debate of whether Chinese spoken words that shared the same syllable but differed in tone may have shared the same representation, or whether they may have different representations in the mental lexicon. A visual world eye-tracking experiment was conducted to examine this issue. Participants saw four pictures on a computer screen, and were asked to follow spoken instructions (e.g., "Please select *chest*") to select a target picture. The four pictures included a picture for the target (e.g., *xiong1* "chest"), a tone mismatch competitor (e.g., *xiong2* "bear"), an offset mismatch competitor (e.g., *xia1* "shrimp"), and an unrelated distractor. The tone mismatch competitors shared the same syllable segments with the targets but only differed in tone. These minimal tone pairs were selected so that they varied in segmental-tonal neighborhood density, and had two, three, or four possible tone neighbors. For example, the minimal tone pair *xiong1* "chest" and *xiong2* "bear" has two possible tone neighbors, given that the syllable *xiong* could only be assigned tone 1 or 2 as words. The minimal tone pair *deng1* "lamp" and *deng4* "stool" has three possible tone neighbors, given that the syllable *deng* could be assigned in tone 1, 3, and 4 as words. And, finally, the minimal tone pair *bi2* "nose" and *bi3* "pen" has four possible tone neighbors as the syllable *bi* could be assigned four possible tones as words. Results showed that participants looked at tone mismatch competitors more often than offset mismatch competitors, which received about the same number of looks as unrelated distractors. Crucially, participants looked more at tone mismatch competitors when targets had four possible tone neighbors than when they had two possible tone neighbors. The competition for recognition between targets and their tone mismatch competitors may support the account that Chinese spoken words that shared the same syllable segment but differed in tone may have shared the same representation. All possible tones for the syllable segments are activated in the early phase of lexical activation with greater competition from words residing in the dense tonal neighborhood.