The Textsetting in Standard Chinese
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Background In Standard Chinese it is necessary to assume metrical structure in order to account for its systematic interactions with other components of grammar: 1) metrical structure interacts with tone — toneless syllables may occur only in metrically weak positions, while metrical heads require tones and trigger tone insertion; 2) morphologically, metrical foot serves as the prosodic template of reduplication, and infixation only targets metrically weak positions; 3) phonetically, tones and segments tend to be realized more faithfully to their articulatory targets in metrically strong positions, but reduced in metrically weak positions.

Issue The interactions of metrical structure with other components of grammar support the hypothesis of a generalized trochee system and word-initial stress for Standard Chinese, but native speakers cannot make consistent prominence judgments, and prominence judgments may diverge from metrical structure under the influence of tone and final lengthening effect.

Research question In tasks whose performance must employ metrical structure knowledge but meanwhile does not consciously impose on speakers’ prominence judgment, how will metrical structure be revealed?

Methodology Textsetting aligns syllables in the text with the rhythmic patterns in music. It observes the general constraint of aligning stressed syllables in lyrics to strong metrical positions in music (Halle & Lerdahl 1993, Halle 1999, Hayes 2009). If Chinese textsetting obeys the constraint, it is expected that strong metrical positions in music will be aligned with stressed syllables — stressed based on the trochaic metrical structure hypothesis.

Experimental design The folk song ‘Red River Valley’ that is adapted into Cantonese in 4/4 meter is chosen for the rhythmic patterns. The texts are selected from an independent study by Shen (1998), which examines the probability of prosodic phrasing in Chinese sentences. 14 subjects of Standard Chinese speakers participated in the experiment. In the familiarization phase, the subject is familiarized with the rhythmic patterns of the song. In the experimental phase, the subject sings the texts to the rhythmic patterns. The experimenter assisted the subject’s singing by tapping the rhythm along. The textsetting is recorded with Praat.

Results About 70 percent of stressed syllables are aligned to strong metrical positions, and 76 percent of unstressed syllables are aligned to weak metrical positions. A Pearson’s correlation test shows a strong positive correlation between the two variables of syllable being stressed and syllable being mapped to strong metrical position, (r = 0.45, df = 2109, p < 2.2e-16).

In addition, a strong constituency matching tendency is shown between linguistic prosodic phrasing and musical phrasing, (Pearson’s correlation test, r= 0.203, df= 307, p= 0.0003372). Within a music phrasing, the ratio between the number of stressed syllables and strong metrical grids in music is a strong predictor of the probability of stress-to-strong metrical grid mapping, but no matter how many stressed syllables there are in a music phrase stressed syllables are consistently mapped to strong metrical grids.

Conclusion The alignment of stress and rhythmic patterns in textsetting provides a new type of phonological evidence for trochaic metrical structure hypothesis in Standard Chinese.