

The Speech Timing Characteristics of Mandarin Sentence Production and Perception

Jing-Yi Jeng

Graduate Institute of Audiology and Speech Pathology, National Kaohsiung Normal University

The behavior of speech timing plays an important role in both speech production and perception. 'Isochrony' is the source speech rhythm, and there suggests a timing unit with equal duration in the speech stream. Based on the isochronous timing unit, the language users can produce sentences naturally and also implement speech segmentation for the perceived speech stream. The purpose of this study is to investigate the timing isochrony in Mandarin sentence production and perception. In the experiment 1, 21 mandarin speakers were instructed to read 42 sentences at five speaking rates. These sentences had similar syntactic structures in order to test the effects of neighboring syllables. Three units were proposed for speech timing: units with rime onset (rime + pause + C), units with gap onset (gap + CV), and units with consonant onset (CV + gap). Pairwise variability index (PVI) was compared for the three rhythmic unit. The results show that Rime onset unit had the significantly lowest PVI. Furthermore, it suggests that for maintaining the isochrony of rhythmic units in sentences, the durations of the rimes are influenced by the consonant in the following syllable across the syllables, and the gaps duration are also influenced by the vowel in the preceding syllable. In the experiment 2, the listeners were asked to judge the number of syllables in a spoken sentence with a segment replaced by white noise. The results showed that the listeners could successfully predict the number of syllables in the noise segment with 70% accuracy, even though four speaking rate variation. In the experiment 3, the participants were asked to imitate the sentences that had a segment replaced by noise, and some with prolonged vowels just before the noise segments. When given the sentences in written Chinese, most participants could successfully imitate the sentence with little timing difference from the original sentences, and they also could judge the prolongation of vowels with 73% accuracy. The results also show that the unit with rime onset had the smallest PVI values at most of the speaking rate situations. These results suggest that the basic unit of Mandarin speech timing is related with the vocalic onset, where is the boundary between an initial consonant and a rime of a syllable, or between a glide and a vocalic vowel in a syllable without an initial consonant.

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