

The Timing Isochrony of Spoken Mandarin at Different Speaking Rates

Jing-Yi Jeng

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

The behavior of speech timing plays an important role in the process of speech perception and production. The source of speech rhythm is based on the “isochrony”. Isochrony unit is a hypothetical unit which has an equal duration interval existing in the speech stream. The users of a language base on the isochrony unit to process the speech information during speech process. The purpose of this study is to investigate two candidates of speech timing units in connected Mandarin. The first candidate is “the whole syllables unit (pause/gap + CV)” and the other is “the rime onset unit (rime + pause/gap + C)”. This study consists of three experiments; the first two experiments are production tasks, and the third is a perceptual task. In the first experiment, 30 mandarin speakers read 33 sets of Chinese phrases and sentences and two passages at five speaking rates by using a metronome to modulate the speaking rates. Segmental durations were obtained via acoustic analysis, and then, the pairwise variation index (PVI) was computed for the two candidate units to compare the degree of isochrony. The results show that the rime onset unit had significantly less PVI value than the whole syllable unit, and the two kinds of units had the maximum difference at the slow speaking rates, but at the fast speaking rates there was no difference between them. The second experiment is the replicate of the first one, and the major difference is the method of speaking rate control. The second experiment had similar results as the first one, again, the rime onset unit had the less PVI. In the third experiment, 18 listeners estimated the degree of naturalness of 24 sentences with different PVI values. The results show that the degree of naturalness is highly correlated with PVI values; moreover, for the PVI calculated by the rime onset unit, the correlation is stronger than that by whole syllable unit. These findings support the rime onset unit is the isochrony unit in speech timing process of Mandarin. The results suggest the basic unit of Mandarin speech timing is related with rime onset, where is also known as the locus of “perceptual center”.

Keywords: *rhythm, speech timing, isochrony, pairwise variation index (PVI), perceptual center*

