

Jaw displacement patterns reflect metrical structure

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This paper reports a summary of—and a new set of data regarding—our general project that investigates the relationship between phonological metrical structure and phonetic articulatory patterns. Natural English sentences show rhythmic patterns, and in order to model and formalize that observation, the theory of Metrical Phonology posits that syllables are hierarchically organized, such that each syllable has a numerical value of stress, as determined by counting the number of metrical grids assigned by the hierarchical prosodic layers [1-3] (e.g. *syllable*, *word*, *foot*, *phrase*, and *utterance*). We are testing a set of hypotheses regarding the articulatory correlates of these metrical structures: (i) jaw displacement patterns reflect numerical metrical strength [4-5]; (ii) vowel height differences can "hide" this correlation, but we can "wash away" these effects by subtracting each vowel's specific jaw displacement factor [6]; (iii) to the extent that jaw displacement patterns are articulatory correlates of metrical structure, we can turn around and investigate the nature of the metrical organization of a particular language by studying jaw displacement patterns. To illustrate the first two theses, Fig. 1 shows jaw movement of *Kip met Pat* and *Pat met Kip* (with sentence stress on the final word) as measured by EMA. The raw data for *Kip* (left two graphs) has the smallest jaw opening whether it is in the initial or final position; however, once vowels' effects are washed away [6], the two sentences have the same metrical pattern—with sentence-stress on the final word (right two graphs). After establishing this relationship between jaw displacement patterns and metrical structure, we will present some new results on Japanese, which shows that Japanese may have initial and final stress—apart from the well-known accentuation—within each phrase.

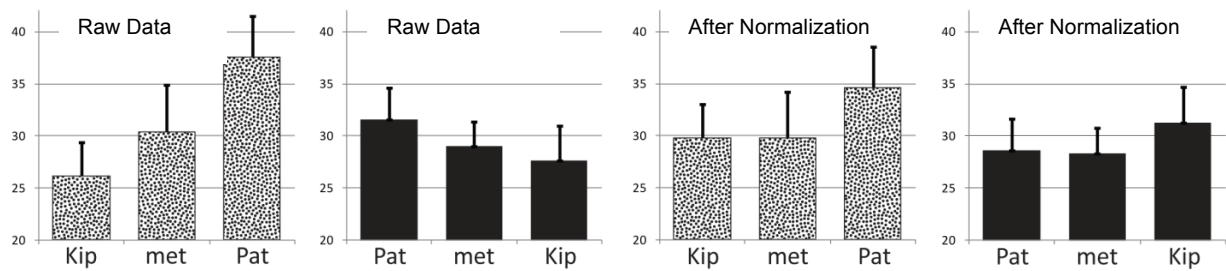


Fig 1. Raw jaw movement of *Kip met Pat* (left); *Pat met Kip* (right); normalized data for the two sentences.

References

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