Yukari Hirata, Colgate University
Shigeaki Amano, Aichi Shukutoku University

Duration of Japanese single/geminate stops in three- and four-mora words

In Japanese disyllables with single and geminate stops across different speaking rates examined by Hirata and Whiton (2005), the durational ratio of stop closure to the word (C/W) classified the single and geminate categories reliably despite the overlap of absolute closure duration. It is not clear, however, whether a word-internal unit smaller than the entire word would be sufficient as an anchor that the stop closure relates to. Does the stop closure relate more stably (1) to the entire "word" of any length than just (2) to the moras preceding and following the contrasting stops? The present study examined this question with three- and four-mora nonsense and real words in Japanese.

We defined "Subword" as the portion of the three- and four-mora words that excludes the final mora (i.e., the underlined portion in <u>CV.(C.)CV</u>.CV or <u>CV.(C.)CV</u>.N). How accurately does the closure-over-Subword (C/Subword) ratio classify produced tokens of varied rates into the single and geminate categories? We hypothesized that, if it is the unit "word" that makes the stable durational representation across rates (Port et al., 1987), C/W ratio would classify the singleton and geminate categories with higher accuracy than C/Subword would. If the distinction of single and geminate stops was stably represented in the duration of stop closure in relation to the preceding and the following moras (i.e., not needing the entire "word," assuming mora isochrony; Han, 1962), C/Subword could classify the two categories as accurately as C/W ratio would.

Fourteen nonsense words and 60 real words were spoken in a carrier sentence at three speaking rates (slow, normal, and fast) by four speakers. Segments of the nonsense words were controlled, e.g., /te.(t.)te.te/ (word type C), /te.(t.)te.n/ (word type N), and /te.(t.)te.e/ (word type V), whereas real words included varied segments, e.g., /ko.(k.)ka.ku/ (word type C), /to.(t.)ta.n/ (word type N), and /ge.(k.)ko.o/ (word type V). C/W ratio for all tokens and C/Subword ratio for word types C and N were calculated.

Classification accuracy was similar between the C/W ratio (97.5%) and the C/Subword ratio (97.2%) for nonsense words, but slightly lower with the C/Subword (94.1%) than with the C/W ratio (96.7%) for real words. Implication is that the distinction of single and geminate stops was stably represented in the duration of stop closure in relation to the preceding and following moras, as well as to the word. When there is segmental variability in real words where mora isochrony may be harder to observe and where the preceding and following moras are not as stable of an anchor, the entire word as a unit may serve as an additional anchor.

References
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