

## The effect of lexical competition on phonetic realization of the singleton-geminate stop length contrast in Japanese

Keiichi Tajima<sup>1</sup>, Mafuyu Kitahara<sup>2</sup>, and Kiyoko Yoneyama<sup>3</sup>  
<sup>1</sup>Hosei University, <sup>2</sup>Sophia University, <sup>3</sup>Daito Bunka University

Many lexical factors have been shown to influence the phonetic realization of words. For example, words from dense neighborhoods with many high-frequency phonological neighbors are produced with more extreme phonetic properties—they have more extreme formant frequency values, resulting in more distinct vowels—than words from sparse neighborhoods with low-frequency neighbors (Wright, 2004). Similarly, voice onset time (VOT) of word-initial stops are shorter in high-frequency words than in low-frequency words, and longer in words that form a voicing minimal pair, e.g. *cod-god*, than in words that do not, e.g. *cop-\*gop* (Baese-Berk and Goldrick, 2009). However, studies on the effects of lexical factors on phonetic properties have been conducted almost exclusively with English and other stress-based languages, and the repertoire of phonetic properties investigated thus far has been restricted to just a few dimensions, such as vowel formants and VOT. Thus, it is unclear to what extent such lexically conditioned phonetic variations occur in other languages, especially non-stress-based languages such as Japanese, and with respect to other phonetic dimensions.

Meanwhile, many studies have shown that the primary acoustic correlate of the singleton-geminate stop length contrast in Japanese is the duration of the target stop closure. Studies have shown, however, that closure duration of singleton and geminate stops highly overlap, especially in the face of variations in speaking rate (Hirata and Whiton, 2005). As an alternative, more invariant phonetic cue to the singleton-geminate contrast, it has been proposed that closure-to-word duration ratio (stop closure duration divided by word duration) effectively normalizes for speaking rate variations and best separates singleton and geminate stops among other acoustic measures (Hirata and Whiton, 2005).

The present study explores the extent to which the singleton-geminate stop length distinction is influenced by lexical factors in Japanese. In particular, the present study adopts methods similar to Celata *et al.* (2018) and investigates the independent contribution of two factors, (1) lexical status, i.e. whether the target word is a real word or a nonword, and (2) lexical competitors, i.e. presence vs. absence of a minimal-pair that contrasts in stop length. The stimulus materials consisted of two-mora accent-matched Japanese minimal pairs contrasting in stop length, e.g. /kaki/ “persimmon” vs. /kaQki/ “liveliness”. Half of the words were real words, while the other half were similar-sounding nonwords, e.g. \*/raki/ and \*/raQki/. Furthermore, half of the items had a lexical competitor differing only in stop length, e.g. /kaki/ has a lexical competitor, /kaQki/, while the other half did not, e.g. /taki/ “waterfall” does not have a lexical competitor, \*/taQki/. The stimuli were split so that each participant read only one member of each minimal pair. A group of native Japanese speakers read the target items interspersed with filler items. Closure duration of the target stop was measured, along with other measures such as word duration.

Results revealed that closure duration did not vary as a function of either lexical status or lexical competitors. However, when closure-to-word duration ratio was analyzed instead of the raw closure duration, the ratio for geminate stops was higher if the word had a lexical competitor than if the word did not. That is, words with geminate stops were more acoustically distinct from their singleton counterparts when the singleton words actually existed as real word competitors than when the singleton words were nonwords. Whether the word itself was a real word or a nonword had no effect on closure-to-word duration ratio.

These results suggest that the presence vs. absence of lexical competitors may to some extent influence the phonetic realization of the singleton-geminate stop length distinction in Japanese. Future research is needed to evaluate how robust and systematic these variations are, and whether these variations are salient enough to be perceptible to listeners.

### References

- Baese-Berk, M. and Goldrick, M. (2009). Mechanisms of interaction in speech production. *Language and Cognitive Processes*, 24, 527-554.
- Celata, C., Dmitrieva, O., Meluzzi, C., and Concu, V. (2018). The effects of lexical status and lexical competitors on production of Italian stops. Poster presented at LabPhon16, Lisbon, Portugal.
- Hirata, Y. and Whiton, J. (2005). Effects of speaking rate on the single/geminate stop distinction in Japanese. *Journal of the Acoustical Society of America*, 118, 1647-1660.
- Wright, R. A. (2004). Factors on lexical competition in vowel articulation. In Local, J., Ogden, R., and Temple, R. (eds.), *Laboratory Phonology 6*, Cambridge University Press, pp. 26-50.