Cross-linguistic timing contrast in geminates: A rate-independent perspective

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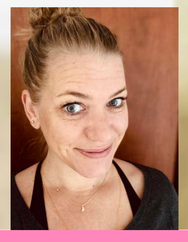
CROSS-LINGUISTIC TIMING CONTRAST IN GEMINATES: A RATE-INDEPENDENT PERSPECTIVE

ANNE HERMES, SAM TILSEN & RACHID RIDOUANE



GEMINATION CONTRAST

geminates show longer duration than singleton counterparts (Lehiste 1970, Ridouane 2010)

adjacent vowels can be affected (Esposito & Di Benedetto 1999, Kawahara 2015)

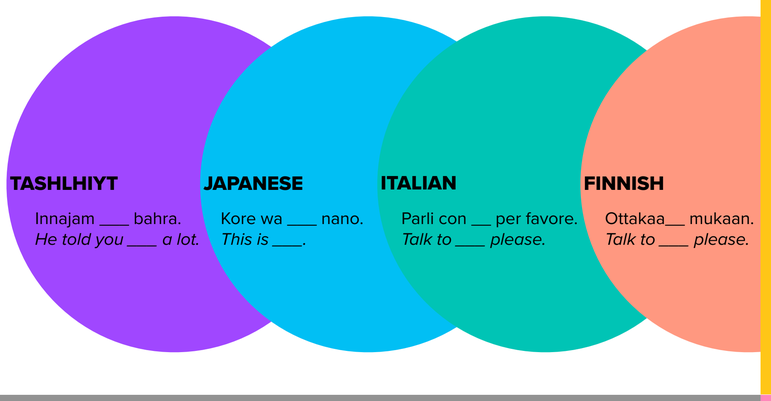
variability: a consequence of several interacting constraints: structural ones (e.g. different phonological systems) and physical ones (e.g. speech rate)

- how do these structural and physical constraints interact shaping the way length contrast is acoustically implemented in unrelated languages?

HOW DO SINGLETONS, GEMINATES, AND ADJACENT VOWELS SCALE WITH SPEECH RATE?

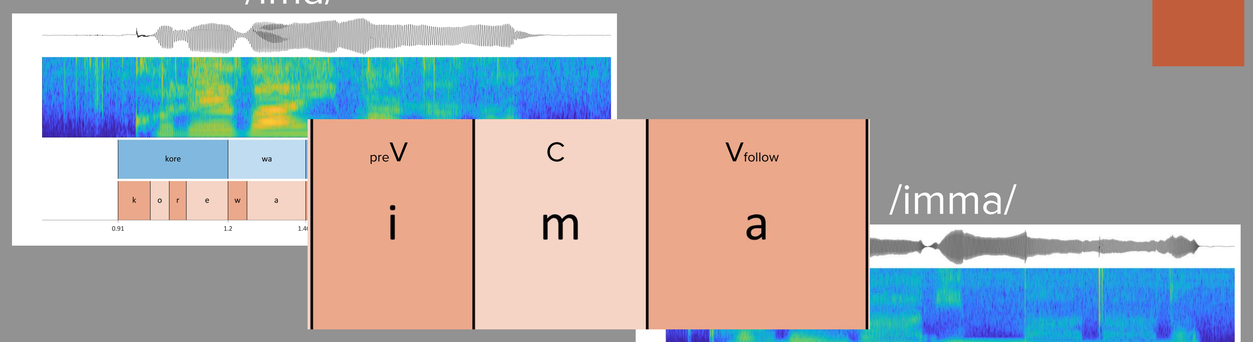
IS THERE A DURATIONAL MEASURE WHICH DISTINGUISHES B/W SINGLETONS AND GEMINATES?

/ima/ vs. /imma/



SPEECH RATE MANIPULATION TASK & DURATIONAL MEASURES

/ima/

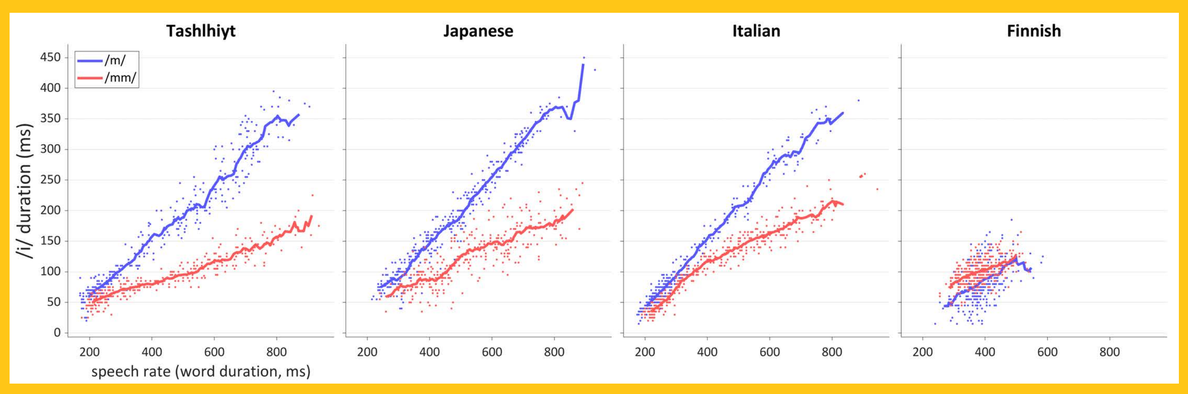


visual analog cue (20-step continuum of rates)

640 repetitions per speaker

forced alignment with monophone HMMs, no imposed distinction between singleton and geminate phones

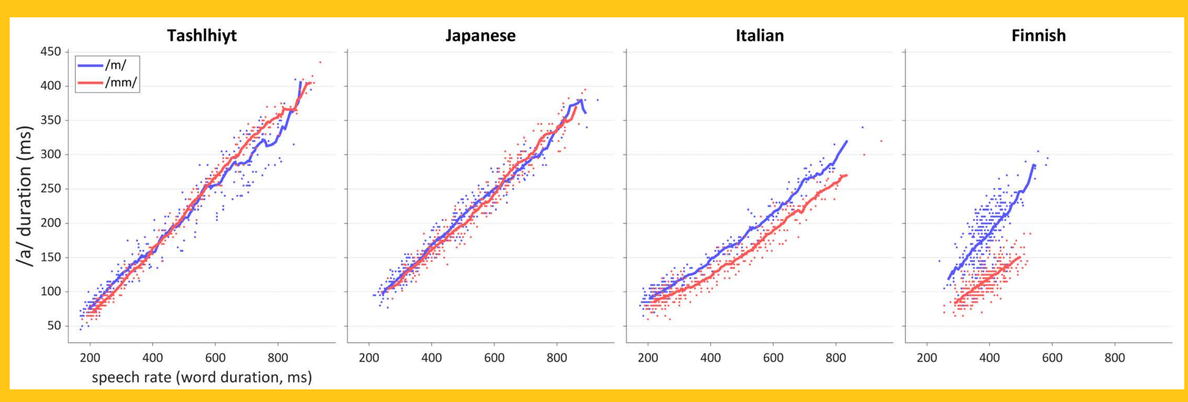
PRECEDING VOWEL DURATION



in 3 of 4 languages (Tashlhiyt, Japanese, and Italian), vowels shorter before geminates than before singletons

speech rate effects on preceding vowel smaller before geminates than before singletons (not observed for Finnish)

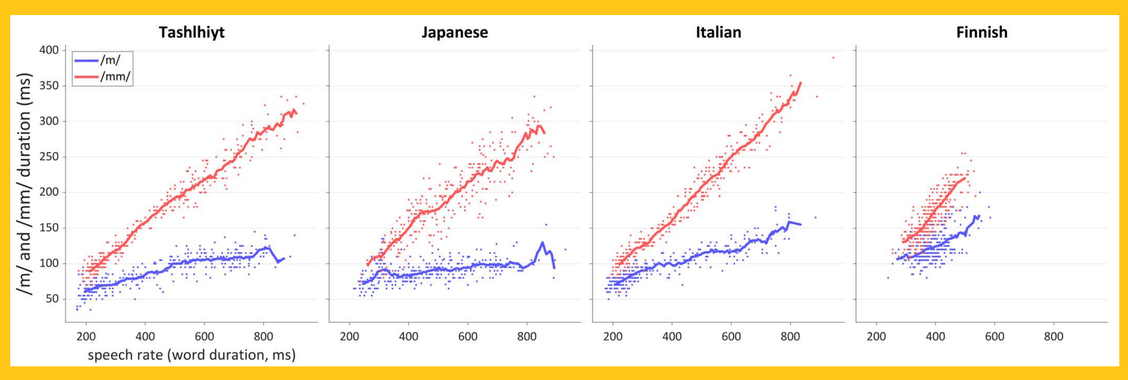
FOLLOWING VOWEL DURATION



following vowel duration not affected whether preceded by singleton or geminate (although in a lesser degree for Finnish)

interaction of singleton or geminate with the preceding vowel is stronger than with the following vowel

CONSONANT DURATION

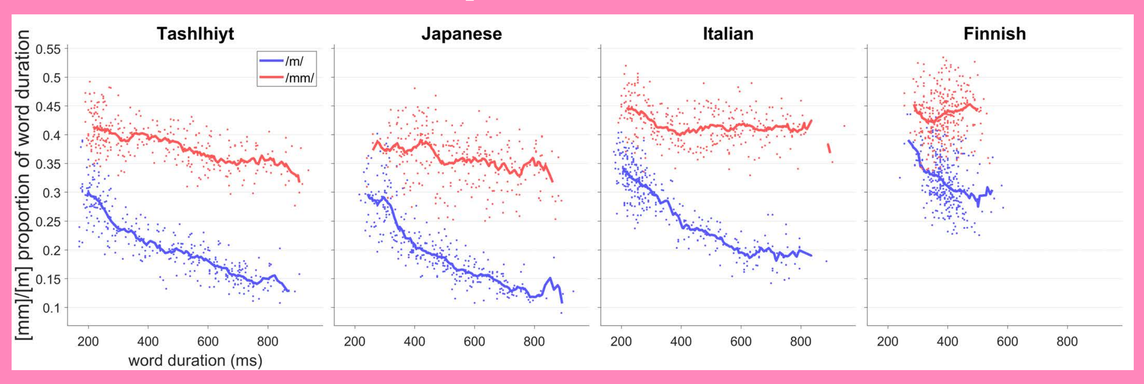


geminate durations scale approximately linearly with rate, thus being more affected by speech rate than singletons

biggest durational differences between singletons and geminates at slower rates (in line with Port et al. 1980, Pind 1999, and Hirata & Whiton 2005 at lower speech rate further enhanced of geminate durations)

possible overlap of singletons at slow rate with geminates at faster rates; not reliably distinguishable across rates

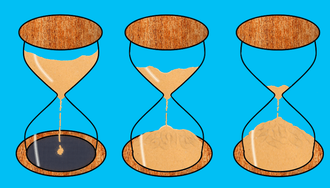
PROPORTATION OF M/MM



ratio of singleton and geminate consonants to word duration allows for rate-invariant boundary between singletons and geminates —> relational measure can distinguish between the two categories across speech rates and across languages

support of the idea of acoustic invariance (Pickett et al. 1999, Hirata and Whiton 2005)

SUMMARY



providing some additional insights on how singleton and geminate durations are controlled

although consonant and vowel durations scaled differently across languages, proportional durations may allow for a rate-invariant perceptual boundary for discriminating between singletons and geminates

found cross-linguistic variation, both in singleton/geminate duration and in the interactions with adjacent vowels, suggests that these differences are related to differences in the way length is controlled

differences in rate-scaling of singletons and geminates demonstrate that consonant durations cannot be modeled by a single global speech rate mechanism