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

ANNE HERMES, SAM TILSEN & RACHID RIDOUANE



GEMINATION CONTRAST

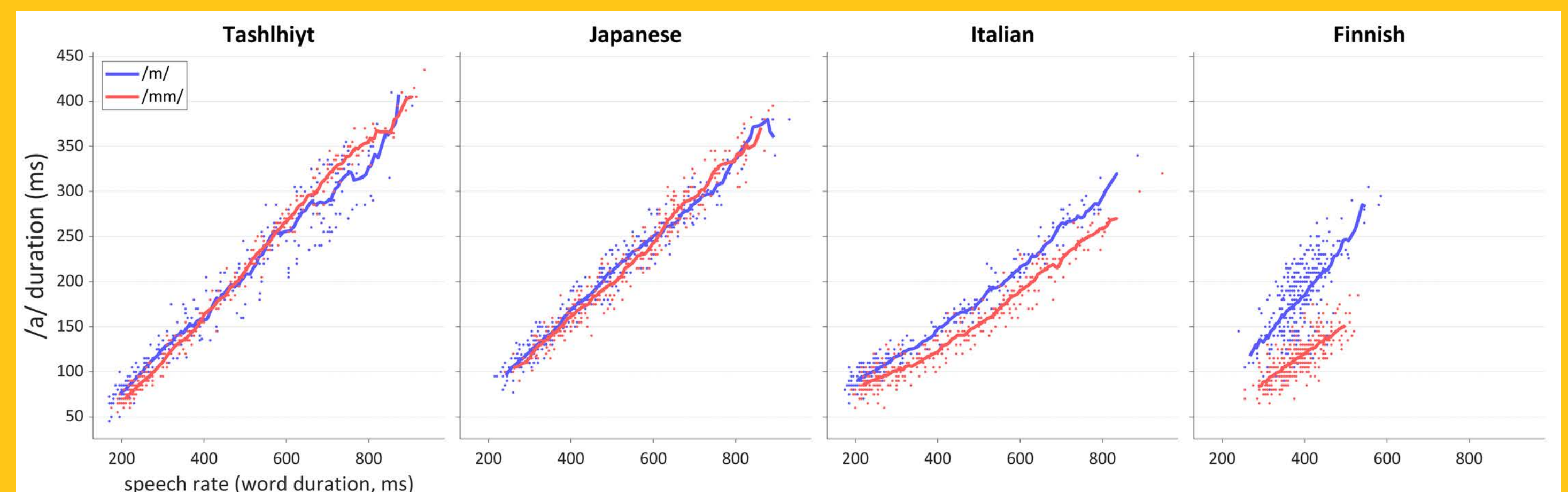
geminate shows longer duration than singleton counterparts (Lehiste 1970, Ridouane 2010)

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?

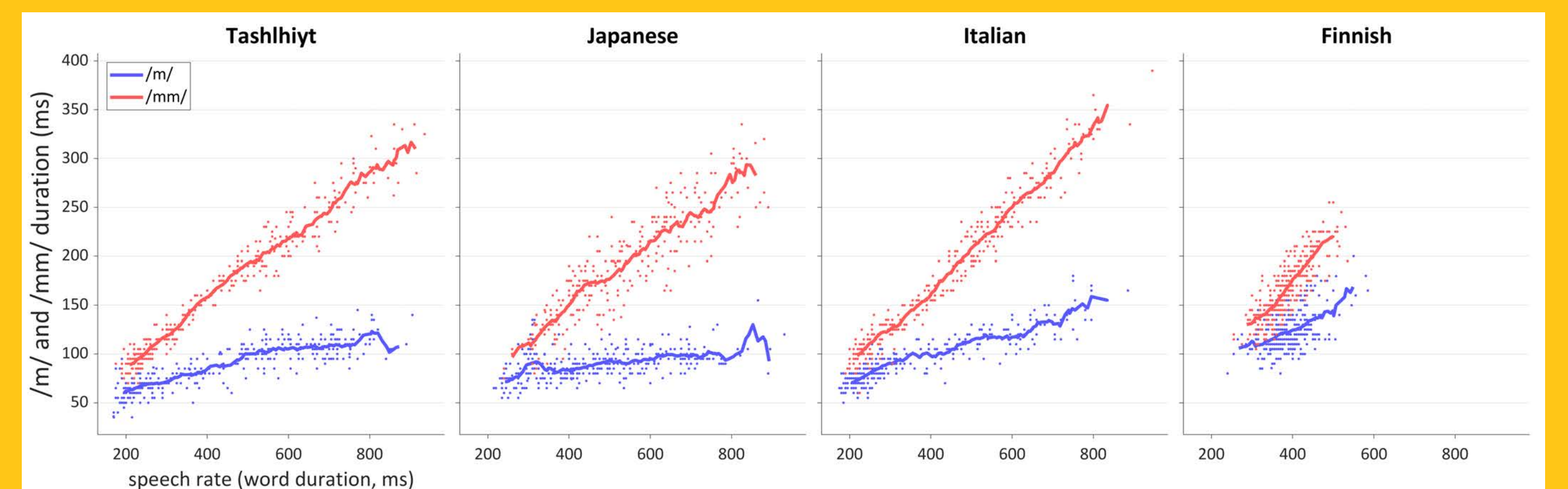
FOLLOWING VOWEL DURATION



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**

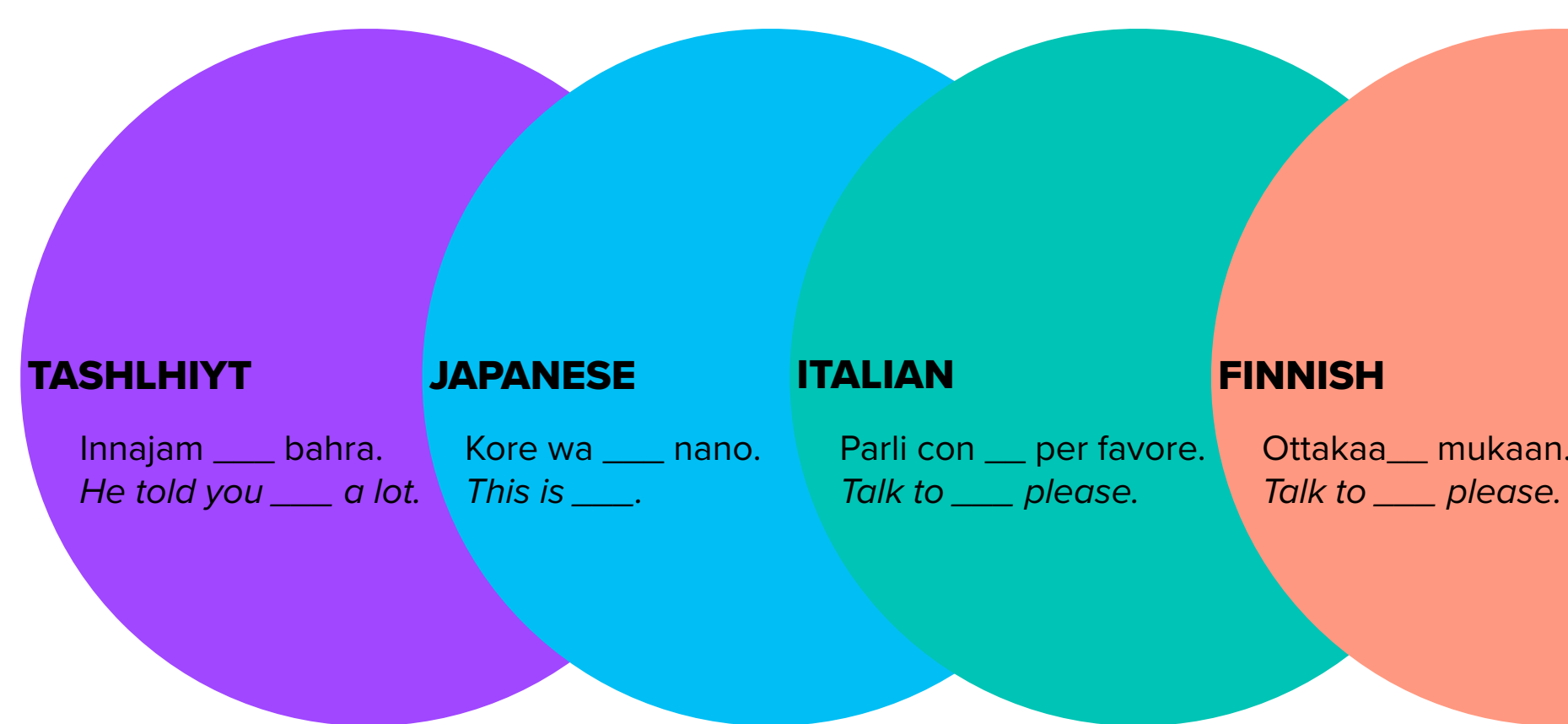
biggest durational differences between **singletons** and **geminate**s at slower rates (in line with Port et al. 1980, Pind 1999, and Hirata & Whiton 2005 at lower speech rate further enhanced of geminate durations)

possible overlap of **singletons** at slow rate with **geminate**s at faster rates; not reliably distinguishable across rates

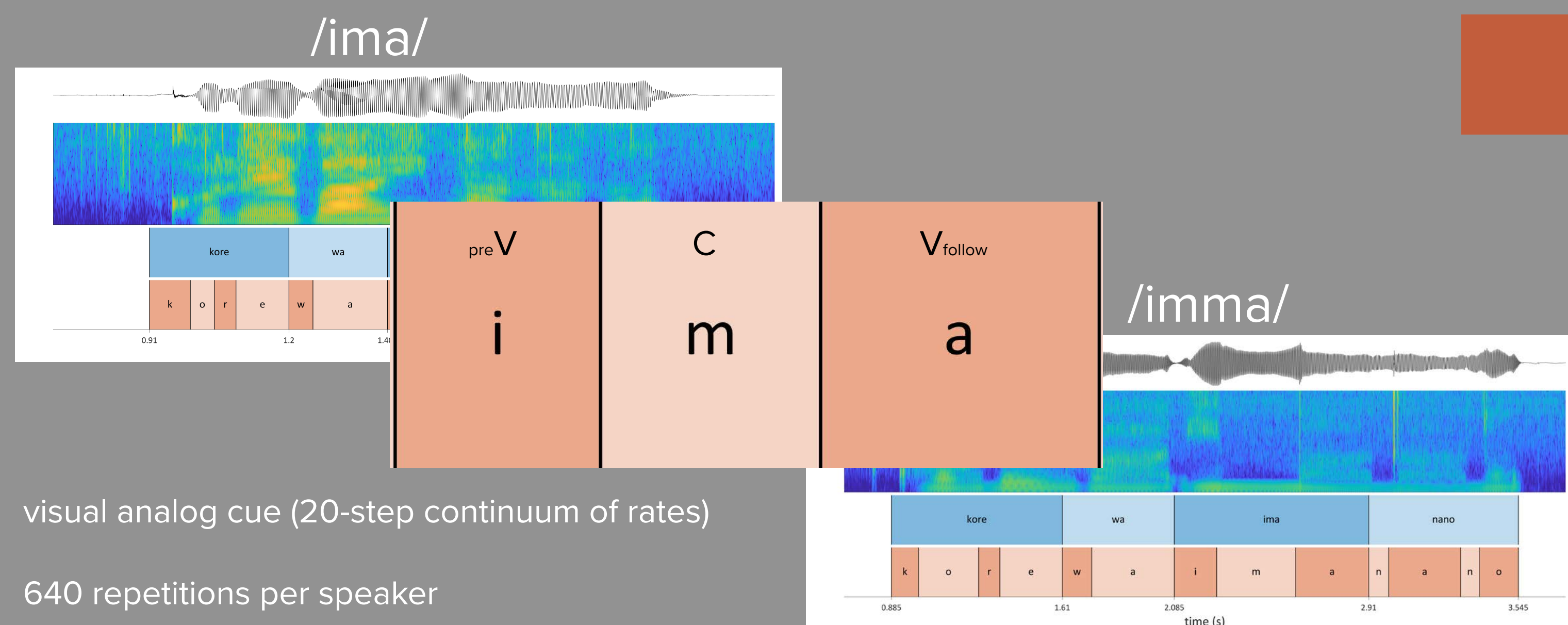
HOW DO SINGLETONS, GEMINATES, AND ADJACENT VOWELS SCALE WITH SPEECH RATE?

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

/ima/ vs. /imma/



SPEECH RATE MANIPULATION TASK & DURATIONAL MEASURES

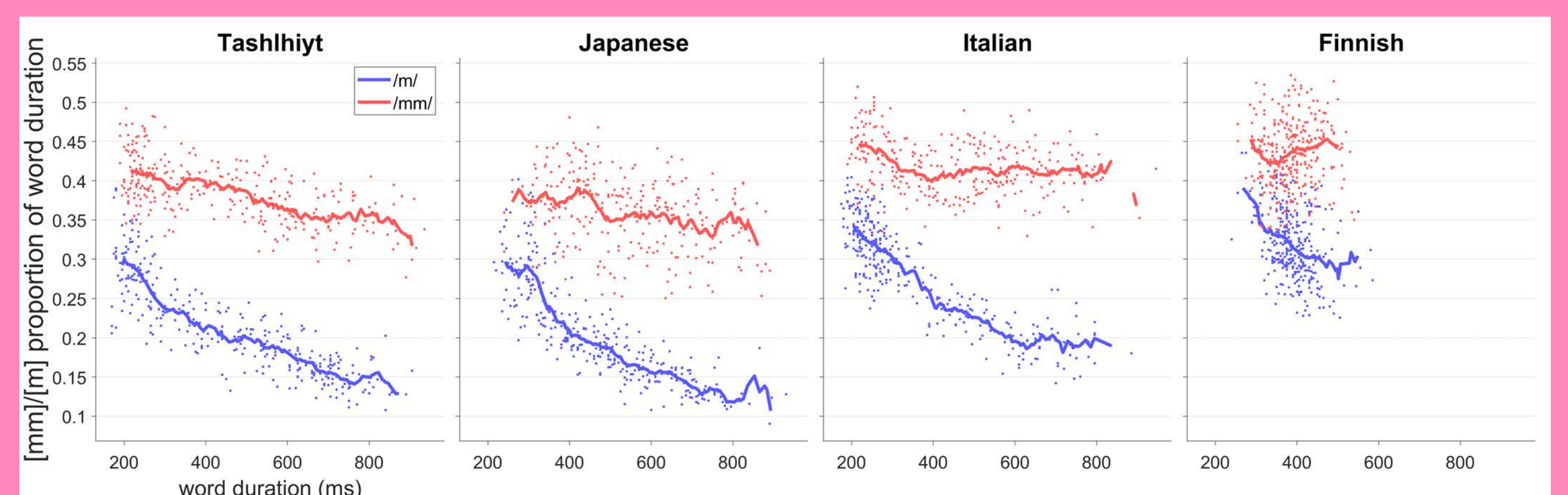


visual analog cue (20-step continuum of rates)

640 repetitions per speaker

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

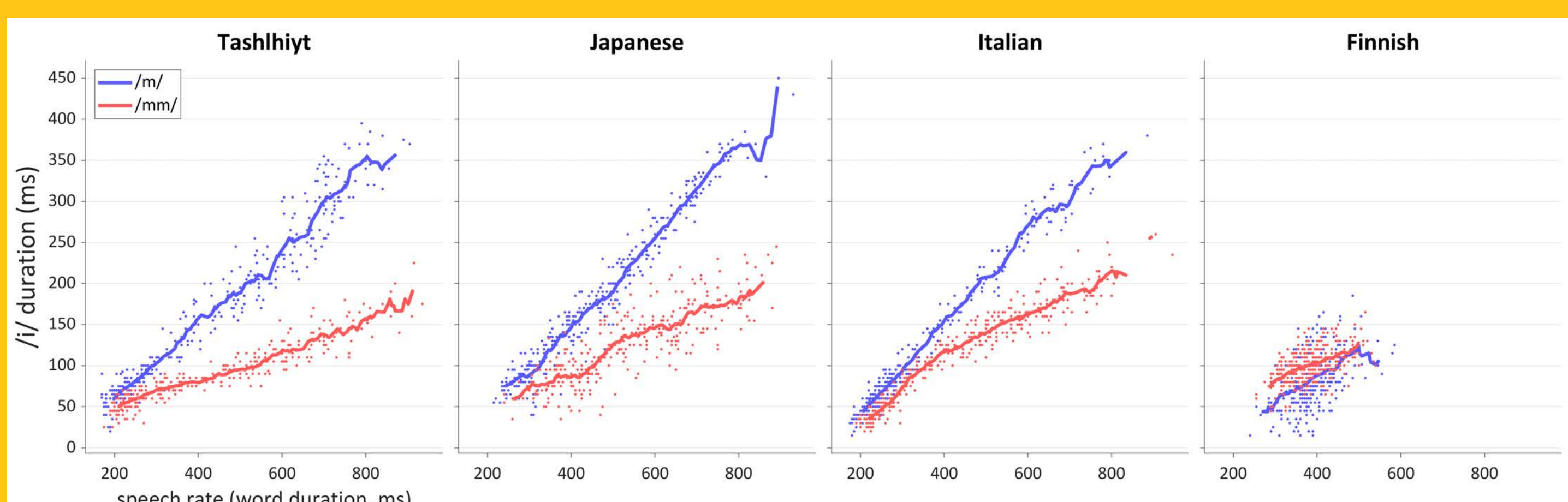
PROPORTIONATION OF M/MM



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)

PRECEDING VOWEL DURATION



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

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

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