The nature of phonological contrasts as a function of their position within syllables and words

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By comparing the numbers of minimal pairs occurring in syllable onsets and codas in a corpus, a recent study has shown that onsets play a more important role in keeping words distinct, and by extension in the organization of the mental lexicon (Sun & Poeppel, 2023). While such a functional asymmetry may seem sensible due to the temporal organization of speech, how does it further manifest itself phonologically? Do we observe larger phonological distances between codas than between onsets to enhance intelligibility? Beyond, what is the impact of the position of a phonemic contrast within syllables and words, especially in terms of the phonological features involved?

We assess the relationship between the functional weights of contrasts and the corresponding phonological distances at specific positions. For positions, we consider the first (First), middle (Mid) and final (Last) syllables in words containing three syllables or more, and the unique syllable (Mono) of monosyllabic words, by using semi-automatic language-specific syllabification. Stress and tones are considered when relevant. We study not only vowel contrasts but also consonantal contrasts at the onset and coda of each syllable. We compute phonological distances based on 22 subsegmental articulatory features – such as consonantal, voice and lateral, and coded as +, - or 0 – described in the *PanPhon* database (Mortensen et al., 2016), using the corresponding Python package and datafiles containing more than 6,000 IPA segments. To quantify the functional weight of phonemic contrasts, we use minimal word pairs and an information-theoretic measure of functional load (FL): considering a language as a source of phonemes, for the contrast between phonemes *x* and *y, FL* is the relative loss of entropy occurring when *x* and *y* merge into one single phoneme (Hockett, 1966; Oh et al., 2015). Three corpora are investigated: those in Sun & Poeppel (2023), Oh et al. (2015) and Oh et al. (2023).

Figure 1 displays scatterplots of the relationship between phonological distance and FL at different syllabic positions in six languages (Basque, French, German, Italian, Korean, and Māori). No cross-linguistic tendency is observed at any position. We further inspect the correlation between the number of minimal word pairs and phonological distance in French in onset and coda positions within First, Mid, Last and Mono syllables. Figure 2 suggests distinct patterns for onsets and codas at different positions within words. We work toward including more languages and proper statistical modelling to offer explanations for our observations.

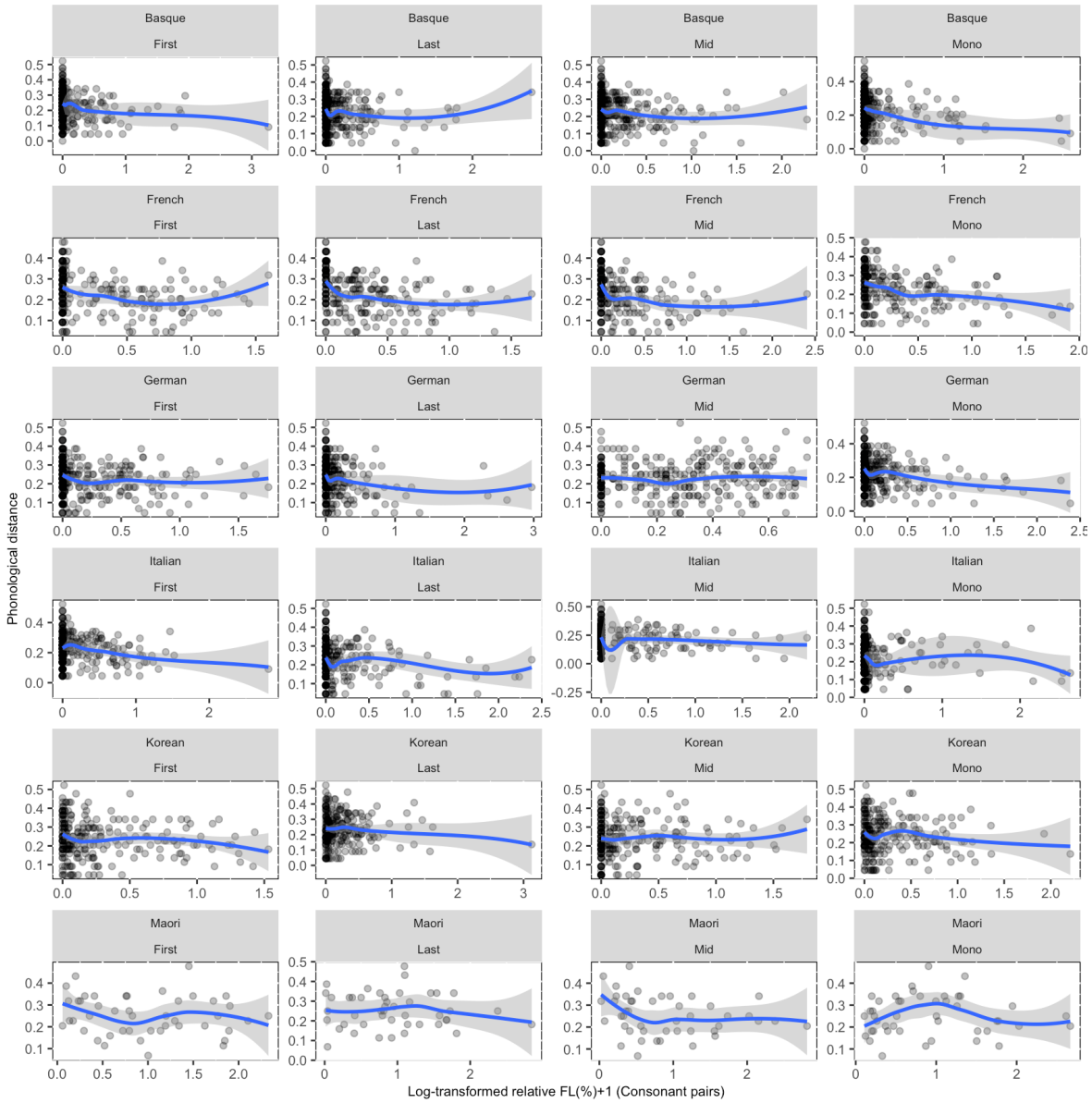

Figure 1: Phonological distance and log-transformed relative FL(%)+1 of consonant pairs as a function of syllabic position in Basque, French, German, Italian, Korean and Māori

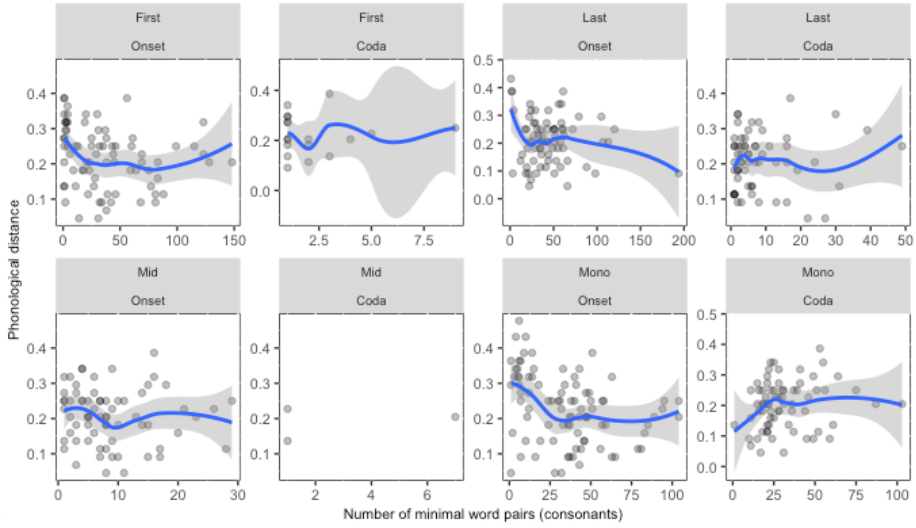

Figure 2: Phonological distance and number of minimal word pairs in French (consonants only)

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