Measuring the Functional Load of Tonal Melodies

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The computation of functional load has been debated. We present a method which addresses the computation of the functional load of tonal oppositions by viewing tone as non-concatenative (non-linear) oppositions–tonal melodies (e.g., Snider 1990a, 1992). Current approaches (e.g., Oh 2013; Hall et al. 2022) classify combinatory attenuations as series of singleton attenuations, failing to accurately reflect oppositions. An accurate assessment of functional load must do two things:

1. Account for oppositions between sets of pitch heights across the domain to which the set attaches—account for non-linear distinctions.
2. Account for variations between underlying tonal melodies and their surface forms when changes represent a meaningful distinction—include morphological options in computational algorithms.

Promoted by Prague school linguists, the functional load hypothesis suggests that phoneme stability and consequential sound system stability (or inversely, sound system shifts) are the result of the relative importance (frequency) of phonological oppositions (Catford, 1988). Quantifying functional load, especially for tone, has been more challenging with suggestions from linear segmental (structuralist) approaches proposed by Greenberg (1959), Hackett (1966, 1967), Wang (1967b), Surendran (2003), and Surendran and Niyogi (2006). In addition to proposed impacts on language evolution, functional load remains a relevant concept among scholars involved with orthography development. They often justify orthography decisions for representing tone on the basis of perceived functional load, generally analyzing contrasts from a linear approach (Koffi 2014; Priestly 1992; Roberts 2009). This stands in contrast to the well-argued phonological importance of tonal melodies and their role in creating meaningful oppositions (Snider 1990a, 1990b, 1992).

Defining the contrastive units involving pitch in communication has been elusive. The context of conducting tonal analysis is often construed as the necessity to distinguish between underlying-forms and surface-forms (Snider 2014) or which set of phonological features support a given pitch within a larger set of phonological units and pitch height contrasts (among others: Anderson 1978; Fromkin 1972; Wang 1967a, Snider 1988, McPherson 2016). Much like text input processes in computing, the analytical methods for calculating functional load have assumed linearity in segments, computing pitch either in conjunction with specific segmental carriers or independent as its own segment (in addition to the carrier). In contrast, tone (Snider 1999, 2014; Yip 1993, 2002) as well as other segments in morphological constructs, e.g., segmental non-concatenative morphology (Davis & Tsujimura 2018), has been convincingly argued to operate in non-linear ways as both part of the base lexical unit and as part of a templatic morphological paradigm applied during post-lexical processes, where morpho-phonological processes still allow pitch heights to change. This further highlights the need for clarity when calculating functional load–is the calculation being conducted upon lexemes prior-to or after a morphological process has transpired? A non-linear view suggests that in both cases the contrast developed is not with specific other pitch segments (or their carriers) but is better analysed as a set of segments acting together indicating meaning, contrasting with other sets of indicators within a given domain (e.g., verbs, nouns, etc.). A more accurate approach to computing functional load must include the comparison of all phonological units.

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