

**Consonants are dispreferred in vocatives:  
tune-text interactions in the emergence of a morphological marker**

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Recent work suggests that many aspects of phonological structure ultimately derive from the function of phonological strings as carriers of meaning (Hall et al. 2018). Meaning is not monolithic, and different aspects of meaning are conveyed through different phonological channels: propositional meaning typically through *segmental* means (henceforth the *text*) and discourse-pragmatic meaning typically through *prosodic* means, most notably intonation (henceforth the *tune*; Ladd 2008). We therefore expect different aspects of phonological structure to respond to different functional pressures. However, as we explain below, the tune and the text are not independent of each other. As a result, the pressure to express discourse-pragmatic meaning through tunes can sometimes influence the text. We present an example of a grammaticalised tune-text interaction, where the need to carry specific prosodic patterns results in a marked preference for vowels – as opposed to consonants – in vocative markers.

For successful articulation and perceptual retrieval of pitch information, the segmental carriers need to have rich harmonic structure and high periodic energy (e.g. Barnes et al. 2014). The optimal carriers of the tune are therefore vowels. When there is a shortage of vocalic segments, communicatively relevant tunes can be phonetically impoverished (Odé 2005), endangering the recovery of the intended meaning. These functional conflicts can lead to biases towards speech variants that optimise the transmission of the tune, including the insertion of non-lexical vowels (Roettger 2017). The results of such systematic biases (e.g. intrusive vowels) might then be diachronically reanalysed as grammatical markers.

Vocative constructions – used to call interlocutors or to attract and maintain the addressee’s attention (Daniel & Spencer 2009) – are often characterised by specific tunes (e.g. Ladd 1978). Many languages also mark vocatives morphologically. Since the tunes associated with vocatives require ‘tune-friendly’ segmental carriers, one potential pathway for the diachronic emergence of such morphological markers is the grammaticalisation of tune-driven intrusive vowels. Such markers would consist of a single vowel, and therefore we predict that vocatives should contain consonants less frequently than other grammatical markers (Roettger & Grice 2019).

We performed a large-scale literature search and assembled a cross-linguistic database of 101 languages from 46 different language families that have been described with grammatical vocatives. We extracted segmental information about vocative markers and compared them to structural case markers for which we did not expect tune-friendly patterns. The results are shown in Fig. 1B alongside raw proportions by language family. The estimated probability of consonants in accusative-like forms is 0.85 (95% Credible Interval [0.62,0.97]), while in vocatives it is only 0.40 [0.17,0.66]. The estimated difference between the two is  $-0.45$  [ $-0.69,-0.18$ ]. These patterns hold even when only considering suffixes (see Fig. 1C). Our results indicate that vocative markers are substantially more tune-friendly than other comparable grammatical markers, suggesting that many of them have emerged from tune-driven segmental adjustments.

These findings suggest that approaches to the evolution of linguistic systems must seriously engage with a range of different communicative functions, not just the transmission of propositional information (Foulkes et al. 2018). Here we have focused on how the acoustic properties of prosodic patterns (used to convey pragmatic meaning) interact with segmental features, and how this interaction potentially shapes the emergence of grammatical morphemes. This research is also significant insofar as it demonstrates how an understudied and arguably marginal corner of inflectional morphology can inform broader debates about evolutionary links across different parts of the linguistic system (in this case, the tune and the text).

### A - Map: Presence of consonants

Vocatives often have no consonants

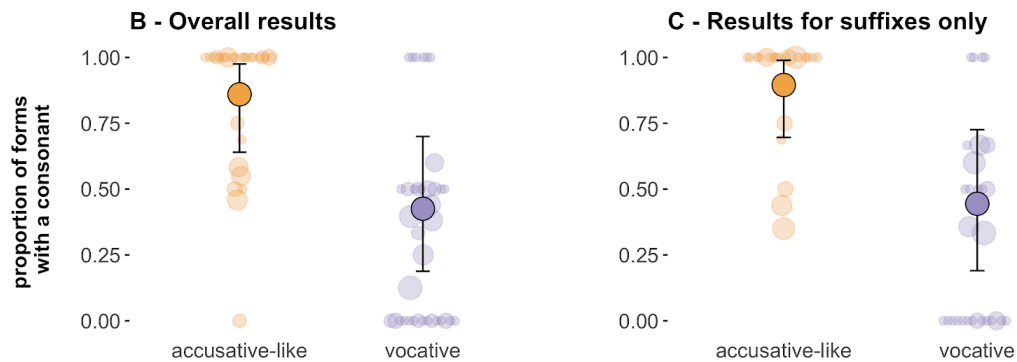
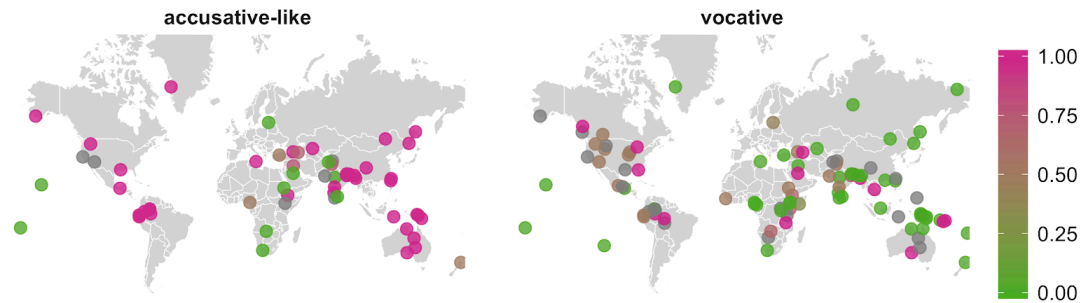


Figure 1. Vocatives tend not to have consonants. A: World map showing the proportion of grammatical forms with consonants across the languages in our corpus. We compare structural case marker (“accusative-like”) for which we do not expect tune-friendly forms with vocative markers; B: Model estimates for all markers; C: Model estimates for suffixes. Solid points indicate the posterior mean, error bars indicate the 95% CI around the mean. Transparent points are averages for language families. The size of the points indicates the number of languages in a family.

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