

## Evolving rhythms:

### A quantitative assessment of rhythmic alternation in the history of English

Stress-based languages such as English favor alternating rhythms made up of stressed and unstressed syllables (Selkirk 1984; Kelly & Bock 1988). At a basic level of rhythmic structure, this means that consecutive stressed syllables, i.e. ‘clashes’ (e.g. *búild báck bétter*), and consecutive unstressed syllables, i.e. ‘lapses’ (e.g. *survival of the fittest*), are dispreferred. Non-optimal patterns typically trigger prosodic repair mechanisms such as pauses or prominence adjustments. However, Breiss and Hayes (2020) have demonstrated statistically that rhythmic optimization reaches beyond phonology, showing that clashes are not only repaired with prosodic means but outright avoided through syntactic (or lexical) choices (see also Schlüter 2005; Shih et al. 2015; Anttila 2016).

The proposed study extends this line of inquiry into diachrony by asking (a) whether a global preference for rhythmically optimized patterns can be detected throughout the history of English, and, if so, (b) whether it is possible to identify lexical or morpho-syntactic developments that have helped to stabilize or even improve rhythmic well-formedness.

To this end, the study investigates rhythmicity in the history of English, measured in terms of the occurrence probabilities of clashes and lapses in word bigrams sampled from Middle, Early Modern and Modern English texts. The data for the analysis come from the Penn-Helsinki Parsed corpora of English (Kroch & Taylor 2000; Kroch, Santorini & Delfs 2004; Kroch, Santorini & Diertani 2016). Quantitative analysis is carried out with R (R Core Team 2023), using linear and generalized additive models (GAMs) (Wood 2017). Apart from time period, various other predictor variables encoding prosodic and morpho-syntactic constituency will be taken into account.

Identifying clashes and lapses in the historical texts crucially depends on the correct interpretation of (the reflexes of) unstressed inflections and monosyllabic function words. The former are generally not pronounced as syllabic in Present-Day English, but their status in Middle English is not always obvious in the individual case (e.g. ME *makede* ‘made’). Monosyllabic function words generally exhibit low stress probabilities in Present-Day English, but might have been more prominent in earlier stages of the language (e.g. ME *thou schalt haue* ‘you will have’). To account for these complications in a systematic manner, evidence from contemporaneous metrical verse (e.g. Chaucer, Lydgate, Shakespeare, Spenser) will be used to calculate probability scores for inflectional syllabicity and monosyllable stress with the help of machine learning techniques such as conditional inference trees and hierarchical clustering (Levshina 2015).

Preliminary results suggest that overall rhythmicity has not changed much since Middle English. However, it can also be shown that the diachronic process of schwa loss (Minkova 1991) must have posed a major challenge to rhythmic well-formedness, as it would have significantly increased the occurrence of clashes, had it not been offset by various structural adjustments, including analyticization (e.g. ME *Gódes sóne* vs. PDE *son of Gód*). The results are interpreted in terms of language evolution (Croft 2000; Baumann & Ritt 2017): prosodic preferences act as a selective pressure tipping the balance in favor of rhythmically more optimal syntactic (or lexical) variants.

## References

- Anttila, Arto. 2016. Phonological effects on syntactic variation. *Annual Review of Linguistics* 2(1), 115–137. doi:10.1146/annurev-linguistics-011415-040845.
- Baumann, Andreas & Nikolaus Ritt. 2017. On the replicator dynamics of lexical stress: accounting for stress-pattern diversity in terms of evolutionary game theory. *Phonology* 34(3), 439–471.
- Breiss, Canaan & Bruce Hayes. 2020. Phonological markedness effects in sentence formation. *Language* 96(2), 338–370. doi:10.1353/lan.2020.0023.
- Croft, William. 2000. *Explaining language change: an evolutionary approach*. Harlow, England; New York: Longman.
- Kelly, Michael H. & J. Kathryn Bock. 1988. Stress in time. *Journal of Experimental Psychology* 14(3), 389–403. doi:10.1037/0096-1523.14.3.389.
- Kroch, Anthony, Santorini, Beatrice, & Delfs, Lauren. 2004. The Penn-Helsinki Parsed Corpus of Early Modern English (PPCEME). Department of Linguistics, University of Pennsylvania.
- Kroch, Anthony, Santorini, Beatrice, & Diertani, Ariel. 2016. The Penn Parsed Corpus of Modern British English (PPCMBE2). Department of Linguistics, University of Pennsylvania.
- Kroch, Anthony & Taylor, Ann. 2000. The Penn-Helsinki Parsed Corpus of Middle English (PPCME2). Department of Linguistics, University of Pennsylvania. <http://www.ling.upenn.edu/ppche-release-2016/PPCME2-RELEASE-4>.
- Levshina, Natalia. 2015. *How to do linguistics with R: data exploration and statistical analysis*. Amsterdam: John Benjamins. doi:10.1075/z.195.
- Minkova, Donka. 1991. *The history of final vowels in English: the sound of muting*. Berlin, New York: Mouton de Gruyter.
- R Core Team. 2023. R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Schlüter, Julia. 2005. *Rhythmic grammar: the influence of rhythm on grammatical variation and change in English*. Berlin; New York: Mouton de Gruyter.
- Selkirk, Elisabeth. 1984. *Phonology and syntax: the relation between sound and structure*. Cambridge, Mass.: MIT Press.
- Shih, Stephanie, Jason Grafmiller, Richard Futrell & Joan Bresnan. 2015. Rhythm's role in genitive construction choice in spoken English. In Ralf Vogel & Ruben Vijver (eds.), *Rhythm in cognition and grammar: a Germanic perspective*. Berlin: De Gruyter Mouton, 207–233.
- Wood, Simon N. 2017. *Generalized Additive Models: An Introduction with R*. 2nd ed. Chapman and Hall/CRC. doi:10.1201/9781315370279.