FOR 2373 Spoken Morphology

DFG Deutsche Forschungsgemeinschaft

HEINRICH HEINE UNIVERSITÄT DÜSSELDORF

Morphological boundaries and stem duration in English: Replicating experimental results with corpus data

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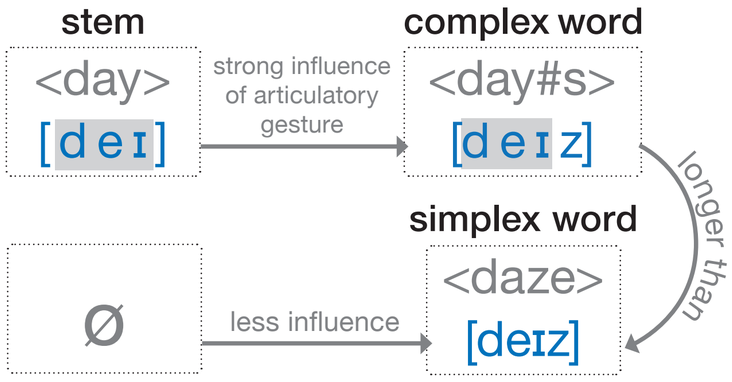
Background

- Morphological structure affects phonetic duration (Seyfarth et al. 2017)
- Possible cause of this effect: paradigm uniformity
- Problems with Seyfarth et al. (2017):
  - they only looked at homophonous word pairs
  - made no distinction between 3rd person singular and plural -s
  - no conclusive results on whether predicted influence of paradigm members is stronger if these are more frequent
- Replicating experimental results by Seyfarth et al. (2017) with corpus of New Zealand English

Paradigm Uniformity



Hypotheses

H1: Stems of plural words are longer than stems of non-morphemic words before [z]
a) in corpus data
b) in New Zealand English

H2: The more frequent a stem of a word, the stronger the lengthening effect on the inflected form

Methodology

- Dataset from QuakeBox Corpus of New Zealand English (Walsh et al. 2013; Zimmermann 2019)
  - Monosyllabic words ending in /z/
  - Monomorphemic or plural
  - Preceded by vowel
- Linear mixed effects regression modelling in R and lme4 (Bates et al. 2017; R Core Team 2015)
- Response variable: stem duration
- Predictor variables:
  - morphological status (H1a,b)
  - frequency ratio (word form frequency divided by base frequency) (H2)
- Covariates: number of phonemes, word form frequency, speech rate, position within sentence, voicing ratio, age group of speaker
- Random effects: speaker, word

Data and analyses

Model	Dataset	Hypothesis	Tokens	Types	Morphological Status	Response Variable	Predictor Variable
1	1	1a and 1b	435	63	monomorphemic and plural words	stem duration	morphological status
2	1a (subset)	2	317	37	plural words only	stem duration	frequency ratio

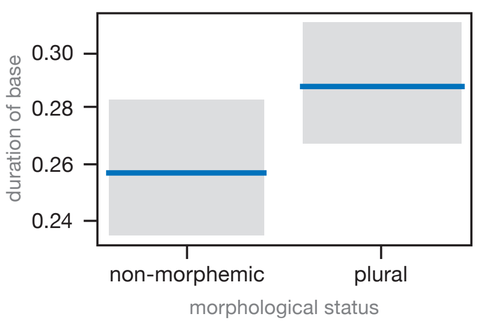
Example words

simplex: *size (23), noise (20), lose (13), rise (7), wise (6), cause (5)*

plural: *doors (24), guys (24), keys (24), news (23), shoes (23)*

Model 1: Stems of plural words are longer than stems of monomorphemic words ending in [z]

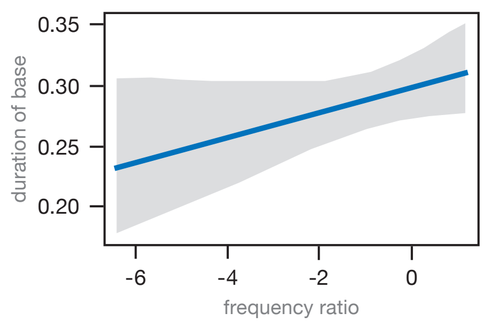
- Significant effect for morphological status in the expected direction ($p < 0.04$)
- Plural stems are about 20 milliseconds longer
- Covariates behave in expected direction: significant effects for word form frequency, speech rate, voicing ratio, age group, number of phonemes
- We are able to replicate experimental results with corpus data



- We are able to replicate Seyfarth et al. (2017)'s findings for North American English for another variety, New Zealand English
- We find **support for H1a and H1b**

Model 2: More frequent bare stems do not cause a stronger lengthening effect

- No significant effect for frequency ratio ($p = 0.131$)
- Effect goes in expected direction (the higher the frequency ratio, the larger the lengthening effect on the base)
- No conclusive evidence that more frequent bare stems cause a stronger lengthening effect



Conclusion

- We find a general effect of morphological structure on speech production
  - Stems of plurals are longer than stems of monomorphemic words
  - Successful replication of experimental results with corpus data
  - Successful replication of American English results for New Zealand English
- We are unable to provide conclusive evidence that the durational differences we found are stronger if bare stems are more frequent

Outlook

- Further controlled experiments needed in order to deal with issues that were neglected by Seyfarth et al. (2017):
  - They did not distinguish between 3rd person singular and plural -s in their analysis
  - They only looked at homophonous word pairs

References

Bates, Douglas, Martin Maechler, Ben Bolker, Steven Walker, Rune Haubo Bojesen Christensen, Henrik Singmann, Bin Dai, Gabor Grothendieck & Peter Green. 2017. *lme4: Linear Mixed-Effects Models using "Eigen" and S4.* https://cran.r-project.org/web/packages/lme4/index.html (24 October, 2017). • **R Core Team.** 2015. *R: A Language and Environment for Statistical Computing.* (Version 3.2.1). Vienna, Austria. https://www.R-project.org. • **Seyfarth**, Scott, Marc Garellek, Gwendolyn Gillingham, Farrell Ackerman & Robert Malouf. 2017. Acoustic differences in morphologically-distinct homophones. *Language, Cognition and Neuroscience.* • **Walsh**, Liam, Jen Hay, Derek Bent, Jeanette King, Paul Millar, Viktoria Papp & Kevin Watson. 2013. The UC QuakeBox Project: Creation of a community-focused research archive. https://ir.canterbury.ac.nz/handle/10092/15635 (20 November, 2018). • **Zimmermann**, Julia. 2019 (in preparation). *Homophony and morphological structure.* Heinrich-Heine-Universität Düsseldorf. PhD dissertation.

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We would like to thank Heinrich Heine Universität Düsseldorf and the Deutsche Forschungsgemeinschaft (DFG) for funding of this research as part of the research unit FOR 2373 - Spoken Morphology (Projects PL 151/7–1 and PL 151/8–1).

Presented at the
12th Mediterranean Morphology Meeting (MMM12)
27-30 June 2019, Ljubljana, Slovenia