

Learning to distinguish morphological categories based on subphonemic detail?

Dinah Baer-Henney and Dominic Schmitz
Heinrich-Heine University Düsseldorf

Recent research has shown that morphological structure leaks into subphonemic detail. One example of this is word-final /s/ which takes several morphological roles in English. While there are words with a non-morphemic final /s/ (e.g., *bus*), final /s/ can also denote number and case information (e.g., *two pots*, *the cat's fur*) as well as a cliticized form of auxiliary verbs (e.g., *it's been a long time*, *it's me in the picture*). Phonetic differences among morphological distinct types of /s/ have been found for several English varieties in corpus studies [1, 2]: several types of final English /s/ come with a unique duration. Experimental studies have also addressed this question [e.g., 3,4] on production differences between categories, however, mostly with mixed results. Recently, a carefully designed production study [5] confirmed the central finding from corpus data [1,2] with non-morphemic /s/ being the longest in duration, followed by suffix /s/, then followed by clitic /s/.

On a theoretical level, these differences are unexpected when the architecture of language production does not allow for an effect originating from the morphological level to leak down to the subphonemic level [6,7]. More recent experience-based models allow for such an influence and only recently it has been shown that the aforementioned subphonemic differences could be explained as emerging from the lexicon on account of naive or linear discriminative learning [8,9].

The accumulating evidence for the effects in production has raised the question as to whether these durational differences also play a role in comprehension. A recent PhD dissertation [10] addressed this question and investigated in a perception and two comprehension experiments whether subphonemic differences play a role in decoding morphological categories. Indeed, it was found that durational differences cannot only be perceived by English speakers but also significantly affected their comprehension process.

The present study investigates whether language users not only produce, perceive and comprehend durational differences, but also whether these cues are strong enough to guide a learner in morphological learning. We investigate whether the differentiation of morphological categories based on durational cues enables the learner to build up a new representation and whether there is a disadvantage compared to learning morphological categories that differ in phonemes. To avoid native language influences we invented an artificial language with varying final /f/ durations to be learned by adult German native speakers. Participants learn a certain alternation pattern which determines the encoding of singular and plural forms in their artificial language. The alternation pattern varies between experimental groups.-In an ongoing artificial language learning experiment, we are currently collecting data comparing the learning behaviour of these three experimental groups: The 'Phonemic group' learns an artificial language in which plurality is indicated by a phonemic change in the final sound of the word [f~p alternation]. Two 'Phonetic groups' learn an artificial language where plurality is indicated by a shorter or a longer durational difference in the word-final sound [f~f: alternation]. After a short training phase, participants are requested to perform a number decision task to demonstrate what they have learned. In addition to accuracy, we measure mouse tracks to reveal possible fine differences among groups. First results indicate that learners of the 'Phonemic group' have a clear learning advantage over those in the 'Phonetic groups'. Control groups with no specific learning tasks will reveal whether we are dealing with true learning behaviour. Our results will tell us whether information exchange between the domains of phonetics and morphology can be beneficial for language learners as they would be able to use durational cues to identify morphologically relevant units.

References

- [1] Plag, I., Homann, J. & Kunter, G. 2017. Homophony and morphology: The acoustics of word-final S in English. *Journal of Linguistics* 53, 181–216.
- [2] Zimmermann, J. 2016. Morphological status and acoustic realisation: Findings from NZE. In Carignan, C. & Tyler, M.D. (Eds.), *Proceedings of the Sixteenth Australasian International Conference on Speech Science and Technology*, Parramatta, , 201–204.
- [3] Walsh, T. & Parker, F. 1983. The duration of morphemic and non-morphemic /s/ in English. *Journal of Phonetics* 11, 201–206.
- [4] Seyfarth, S., Garallek, M., Gillingham, G., Ackermann F. & Malouf, R. 2017. Acoustic differences in morphologically-distinct homophones. *Language, Cognition and Neuroscience* 33, 1–18.
- [5] Schmitz, D., Baer-Henney, D. & Plag, I. 2021. The duration of word-final /s/ differs across morphological categories in English: Evidence from pseudowords. *Phonetica*, 78(5-6), 571-616.
- [6] Levelt, W. J. M., Roelofs, A. & Meyer, A.S. 1999. A theory of lexical access in speech production. *Behavioral and Brain Sciences* 22. 1–38.
- [7] Kiparsky, P. 1982. Lexical morphology and phonology. In Yang, I.-S. (Ed.), *Linguistics in the morning calm: Selected papers from SICOL*, Seoul: Hanshin, 3–91.
- [8] Tomaschek, F., Plag, I., Baayen R.H. & Ernestus, M. 2019. Phonetic effects of morphology and context: Modeling the duration of word-final S in English with naïve discriminative learning. *Journal of Linguistics* 57. 1–39.
- [9] Schmitz, D., Plag, I., Baer-Henney, D., & Stein, S. D. 2021. Durational differences of word-final /s/ emerge from the lexicon: Modelling morpho-phonetic effects in pseudowords with linear discriminative learning. *Frontiers in Psychology*.
- [10] Schmitz, D. 2022. *Production, perception, and comprehension of subphonemic detail: Word-final /s/ in English*. Studies in Laboratory Phonology 11. Berlin: Language Science Press.