What causes subphonemic differences between different types of /s/ in English? Evidence from pseudowords

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Recent research suggests that homophonous affixes show systematic differences in their phonetic realization (e.g. Ben Hedia & Plag 2017, Plag et al. 2017, Seyfarth et al. 2017). Such findings pose a challenge for theories of speech production (e.g. Levelt & Wheeldon 1994, Levelt et al. 1999) because it is currently unclear how morphological information would come to influence articulation.

A prominent case is English final {s}, which can express a number of morphological categories; plural, genitive, genitive plural, and 3rd person singular. Additionally, English also has three {s} clitics; the clitics of *has*, *is*, and *us*. Previous research on durational differences between these types of {s} found differences between clitics, suffixes, and non-morphemic word-final /s/. However, there is no agreement on the nature of these differences. Experimental studies, for example Walsh & Parker (1983) and Seyfarth et al. (2017) for North American English, found non-morphemic realizations to be shorter than suffix /s/. In contrast, corpus studies on New Zeeland English (Zimmermann 2016) and North American English (Plag et al. 2017, Tomaschek et al. 2019) found results going in the opposite direction: the duration of /s/ is longest in non-morphemic contexts, somewhat shorter with suffixes, and shortest in clitics.

The interpretation of these contradictory findings is difficult due to potential weaknesses of these studies. The results of the corpus studies rely on unbalanced data sets due to the nature of corpora, while experimental results depended on rather small data sets. In all cases, previous results were subject to potentially confounding effects of the lexical and contextual properties of the items under investigation, e.g. potential storage effects (e.g. Caselli et al. 2016).

To address these concerns, the present study uses pseudowords to test whether there are durational differences between non-morphemic, plural, and the *has-* and *is*-clitic /s/. A production study with forty native speakers of Southern British English was carried out, adopting Berko-Gleason's (1958) pseudoword paradigm. Speakers produced almost 1200 pertinent forms in a sentence production task with carefully controlled stimuli consisting of 48 monosyllabic pseudowords.

Linear mixed effects regression analyses show a significant effect of type of /s/ (non-morphemic, suffix, or clitic) on /s/ duration (see Figure 1). The differences between the different types of /s/ pattern as in the corpus studies: the duration of /s/ is longest in non-morphemic contexts, somewhat shorter with suffixes, and shortest in clitics.

The findings can be interpreted as follows. Durational differences between different types of /s/ are not caused by unbalanced distributions in corpus data sets as similar results are found in controlled experimental data. Additionally, such differences cannot be a result of lexical properties of the base affecting the realization of the /s/ since we tested pseudowords, for which no lexical representation was available. This means that the realization of /s/ in pseudowords appears to be subject to the same paradigmatic and contextual effects that have been discerned by Tomaschek et al. (2019) for real words.

The present study shows that durational differences between different types of /s/ are of a robust nature rather than a by-product of confounding factors. This leads to the conclusion that differences in /s/ durations are due to the processing of the morphological information encoded in

the pertinent type of /s/. In other words, morphological information may influence speech production in such a way that systematic subphonemic differences arise. This calls for revisions of current models of speech processing in which morphology does not play a role in later stages of production.
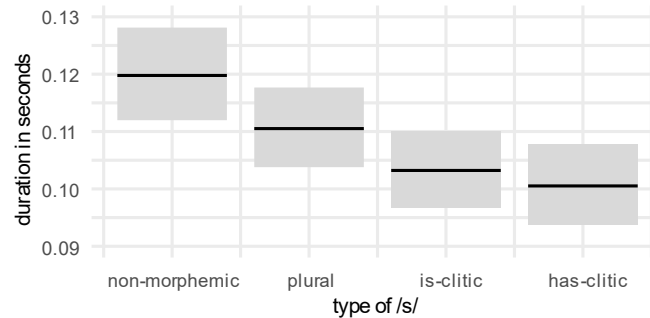

Figure 1. *Estimated durations of types of /s/ as predicted by the linear mixed effects regression model.*

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