

## Morphological processing is affected by subphonemic detail

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In language comprehension research there is a debate on whether, and if so, how, subsegmental information may influence lexical access (e.g. Cho et al., 2007; Christophe et al., 2004; Goldinger, 1996). Recent research on the phonetic realisation of complex words suggests that this debate needs to be extended to the role of subphonemic detail in morphological processing. For example, word-final /s/ in English is longest in non-morphemic contexts, shorter with suffixes, and shortest in clitics (Plag et al., 2017; Schmitz et al., 2021), and it is unclear whether such subtle phonetic differences also play a role in comprehension.

Previous research (Kemps et al., 2005a, 2005b; Blazej & Cohen-Goldberg, 2015) found that listeners are sensitive to the acoustic correlates indicating whether a stem is part of a suffixed word or not, and that listeners make use of such information in comprehension. The present paper tests whether listeners make use of the durational difference of English plural /s/ vs. *is*- and *has*-clitic /s/. That is, whether listeners' comprehension is influenced by the subphonemic information that is part of the signal.

We made use of a number-decision task in a mouse-tracking setup similar to that of Blazej & Cohen-Goldberg (2015). Two types of items were used in the task: matched and mismatched. Matched items consisted of stems and endings from one category (e.g. a plural stem added to a plural /s/). Mismatched items consisted of a stem from one category (e.g. a plural stem) and the /s/ of another category (e.g. an *is*-clitic /s/). Potentially confounding effects of lexical properties (e.g. Caselli et al., 2016; Gahl, 2008) or contextual effects (e.g. Klatt, 1976; Wightman et al., 1992) were minimised by using pseudoword instead of real word items. The set of pseudowords was taken from the production study by Schmitz et al. (2021). Items were embedded in carrier sentences in which the verb following the target disambiguated between non-clitic (i.e. plural), and *is*- and *has*-clitic contexts (e.g. plural: “the bloups blew”; *is*-clitic: “the bloup’s blowing”; *has*-clitic: “the bloup’s blown”). If subphonemic detail was to influence processing, we expected the mouse-tracks of the mismatched items to be different from those of the matched items.

Smooth additive quantile regression models (Fasiolo et al., 2021) were used to analyse the x and y coordinates of the mouse-tracks. The analysis shows that the type of stimulus, i.e. matched vs. mismatched, indeed led to significantly different mouse-tracks, with a durational mismatch showing a detour of the mouse-track. This means that the comprehension of word-final /s/ was affected by subphonemic detail.

Our results demonstrate that listeners' comprehension is influenced by subtle acoustic differences in the stimuli. Using pseudowords as items, we can rule out lexical and contextual effects as explanations for our findings. Listeners can perceive morphologically relevant subphonemic detail and make use of such detail in comprehension. This finding has important theoretical implications because in most extant models of language production and language comprehension morpho-phonetic effects are unexpected and unexplained (e.g. Roelofs & Ferreira, 2019; Turk & Shattuck-Hufnagel, 2020). This paper adds to the literature that calls for more adequate models.

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