

# Listeners make use of subphonemic information in comprehension

FOR 2373 Spoken Morphology

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18. P&P – Phonetik und Phonologie im deutschsprachigen Raum

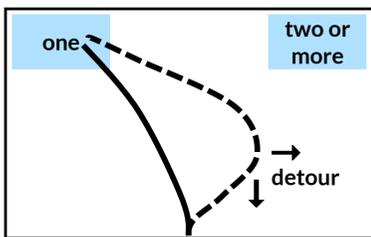
**hhu** Heinrich Heine Universität Düsseldorf

## Motivation

- Research has shown that seemingly homophonous elements, e.g. words (e.g. [1], [2]), stems (e.g. [3], [4]), prefixes (e.g. [5], [6]), and suffixes (e.g. [7]) differ in their acoustic duration
- A prominent case for subphonemic durational differences is word-final /s/ in English; studies (e.g. [8], [9], [10], [11]) show that: **non-morphemic > suffixes > clitics**
- Recent studies have shown that such subphonemic durational differences are apparently also perceivable (e.g. [7])
- Research question:** Do listeners make use of such subphonemic detail in morphological processing?
- Expectation:** If durational information is used in comprehension, a mismatch of durational information should show an effect on comprehension

## Method

- Number-decision task in a mouse-tracking paradigm



ɪ	i:	u:	ʌ	aʊ	eɪ
glips	pleeps	cloops	prups	bloups	glaipts
glits	pleets	cloots	pruts	blouts	glaits
gliks	pleeks	clooks	pruks	blouks	glaiks
glifs	pleefs	cloofs	prufs	bloufs	glaiifs

- Pseudowords** from a previous production study ([11]) were used to rule out potentially confounding lexical and contextual effects (e.g. [12], [13], [14], [15])
- For each pseudoword, **three audio stimuli** were created by manipulating the /s/ duration to get the durations as found in the literature [9]



- To allow for disambiguation of plural and clitic /s/, items were embedded into real word **contexts**, for example:

### Plural

The [gɪps] ate their lunch together.

### is-clitic

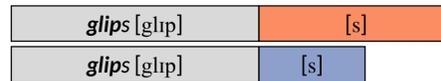
The [gɪps] eating cake with the bloup.

### has-clitic

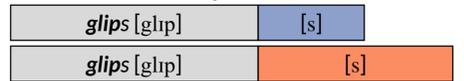
The [gɪps] eaten the bloup's lunch.

- Contexts were presented with stimuli of matched and mismatched /s/ durations to allow for a direct comparison

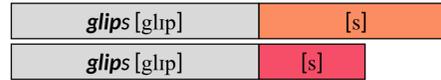
### plural contexts: is-clitic mismatch



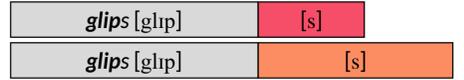
### is-clitic contexts: plural mismatch



### plural contexts: has-clitic mismatch



### has-clitic contexts: plural mismatch



## Analysis

- Data were analysed using QGAMs – Quantile Generalised Additive Mixed models ([16]) – for a detailed insight into the independent variables' effects across conditional quantiles
- QGAMs were fitted
  - for quantiles 0.1, 0.3, 0.5, 0.7, and 0.9,
  - for the four subsets, and with
  - response variables:** X coordinates or Y coordinates, **predictor of interest:** match vs. mismatch, **smooth term:** order of coordinates per trials

## Results

- A significant effect of match vs. mismatch is found across all sets of QGAMs

Q	plural contexts		clitic contexts			
	is-clitic mismatch	has-clitic mismatch	is: plural mismatch	has: plural mismatch	X	Y
0.1			→	↑		
0.3				↑		
0.5				↑		
0.7	←	↑	←	↑	→	↓
0.9	←	↑	←	↑	→	↓

- Where a significant effect is found, arrows indicate the position of mismatched coordinates relative to the position of matched coordinates

## Discussion

- Subtle morpho-phonetic differences
  - show an influence on comprehension, that is they do matter in comprehension
  - need to be taken seriously in both production and comprehension and in pertinent theoretical approaches
- Existent models of speech comprehension, e.g. abstractionist (e.g. [17], [18], [19], [20]) and feature-based approaches (e.g. [21], [22]), must be revised to accommodate these findings (see also [23] for further findings calling for a revision of extent models)
- Exemplar-based models (e.g. [24]) can potentially account for our findings as they assume fine phonetic detail to be stored in the lexicon

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