English auxiliary realization and the independence of morphology and phonetics

Language variation can provide striking evidence for abstract linguistic representation and processes [1]. In this paper, we use data on auxiliary realization in English to demonstrate the independence of morphology and phonetics, supporting the classical feed-forward approach to language and variation [1, 2].

Certain English auxiliaries vary in phonological shape in natural speech. Our interest in this paper is in the auxiliaries *had* and *has*. Each may surface in three distinct forms: two syllabic ones (1a, 1b) and one single-consonant (1c). For *had*, this variation occurs after personal pronoun subjects; for *has*, after non-pronoun ("NP") subjects [3].

(1) a. [hæd] [hæz] b. [əd] [əz] c. [d] [z]

Variation between the syllabic and non-syllabic forms is said to be morphological [4], while variation between the two syllabic forms is attributed to a fast-speech phonetic rule deleting /h/ in unstressed function words [3, 5]. Under the feed-forward approach, the selection of morphological variants takes place prior to phonetics; phonetics cannot "see" morphology. This predicts a constant rate of /h/-deletion across words. We test this prediction.

We coded 284 tokens of post-pronoun *had* and 252 tokens of post-NP *has* from Switchboard [6]. Only tokens in which the auxiliary surfaced in a syllabic form were examined; these were coded for presence or absence of /h/. Auxiliaries were not coded in environments which block reduction [7]. As a control, we also coded variable /h/ absence in 273 tokens of *he* from Switchboard. *He* was found to show variable /h/-deletion after conjunctions, *wh*-words, complementizer *that*, and *then*; data was restricted to these environments. A fitted rate of /h/-deletion was obtained for each word through mixed-effects modeling with speaker and neighboring words as random effects. These rates are provided in column 2 of Table 1. The rate of /h/-deletion across words is indeed constant.

Unambiguous support for the feed-forward approach can only be established by ruling out the effects of contextual factors such as frequency, word-specificity, and predictability, which have all been reported to affect lenition [8, 9]. Word frequency is not a determining factor in /h/-deletion (column 3). To assess the role of predictability, we use part-of-speech-tagged Switchboard transcripts to calculate each word's mean transitional probability, a measure of how likely it is to follow those words it follows in our data. The wide variation in predictability (columns 4 & 5) again contrasts with the consistent /h/-deletion rate across words. Where following item is concerned, each of the three words under study has one particular successor that substantially exceeds all others in frequency: for *he*, this is *had*; for *had* and *has*, it is *been*. Accordingly, we divide the tokens into two groups, one followed by the most frequent successor ("top" in Table 1) and the other all the rest, and calculate separate deletion rates. For no auxiliary do these rates differ significantly.

Taken together, these findings provide another line of quantitative evidence for the modular organization of the grammar [1, 2] and pose challenges to word/exemplar-specific approaches to language and variation.

w	$P(d)$	frequency	$P(w$|prec-word$)$	$P(w$|prec-POS$)$	$P(d\|w$ top$)$	$P(d\|w$ other$)$
he	0.33	21854	0.115	0.014	0.37	0.33
had	0.38	18366	0.393	0.063	0.28	0.41
has	0.36	7640	0.650	0.005	0.29	0.39

Table 1: Values for three words based on the Switchboard corpus. $P(d)$: fitted probability of /h/-deletion. Frequency: relative frequency in Switchboard. $P(w$|prec-word$)$: mean transitional probability of word given preceding word. $P(w$|prec-POS$)$: mean transitional probability of word given preceding word's part of speech. $P(d|w$ top$)$: fitted probability of deletion when most frequent successor follows. $P(d|w$ other$)$: fitted probability of deletion when all other successors follow.

References

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