

Categorical and gradient dimensions of stress in English compounds

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In this paper, we present an experiment investigating stress assignment in English compounds from the Boston University Radio News Corpus (Ostendorf et. al, 1995) as part of a larger project on the representation of compounds. The present work explores the relationship between phonological reduction in naturalistic speech and the perception of stress in compounds, concluding that gradient reduction has categorical reflexes in stress perception.

Motivation Under traditional approaches, highly transparent compounds are assumed to be produced online (Kiparsky, 1982) with stress assignment via the Compound stress rule (SPE), e.g. *híghchàir*, *lìghthòuse*. In contrast, more opaque compounds (e.g. *cupboard*, *hotdog*) are listed in the lexicon as lexical items. This suggests highly transparent compounds have the canonical compound prosodic structure of $[[A]_{\text{pwd}}[B]_{\text{pwd}}]_{\text{pwd}}$ (Ito & Mester, 2007). Based on our previous work where we found a correlation between opacity (distinct from lexical frequency) and phonological reduction (Davis & Cohn, 2019), we posit that highly opaque compounds have a structure lacking prosodic word status on the head corresponding to a loss of (secondary) stress, as in $[[AB]]_{\text{pwd}}$ (with $[[A]_{\text{pwd}}B]_{\text{pwd}}$ as a possible intermediate form). We suspect, then, that gradient degrees of phonological reduction will be perceived categorically relative to higher level prosodic organization.

Methods Our experiment consisted of 248 items from the corpus, of which 133 were bisyllabic compounds including *tax plan*, *bathroom*, *chairman* with 14 listeners asked to assign no stress, secondary stress, or primary stress to each syllable. Our acoustic measure is the duration of the compound's head normalized by subtracting the duration of the head as a monomorphemic word (negative values correspond to shorter durations in compounds). We calculate consistency of judgements using Fleiss's kappa (values from zero, for the minimal level of agreement, to one, for perfect agreement) and the correlation between the three stress categories and duration using multinomial logistic regression.

Results The listeners have a kappa of 0.15 for all stimuli and 0.26 for compound heads, suggesting some agreement between participants. Duration is a highly significant predictor in assigned stress level ($p < 0.0001$). Distributions of durations are shown in Fig 1 and probability of a stress level by duration is shown in Fig 2. We see that when the duration of the head is less than the duration of its monomorphemic form, the head has a high probability of being assigned no stress, and when it is longer, it has increasing probability of being assigned primary stress.

These results suggest that greater reduction in compounds relative to monomorphemic words is correlated with perceived loss of secondary stress, with the inverse relationship holding for perceived primary stress. Taken together this work suggests a relationship between phonological reduction and prosodic structure, where reduction acts gradiently upon phonological form resulting in categorical changes in phonological representations. This poses interesting questions for the relationship between phonological and lexical representations.

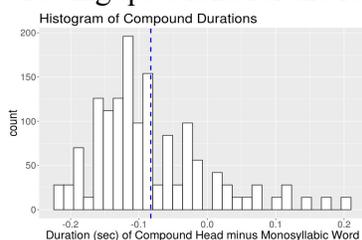


Fig 1. Compound durations

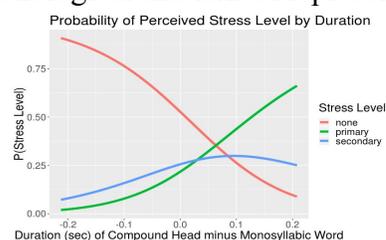


Fig 2. Probability of Stress (none, primary, secondary)

References

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