

Speech context rate, not frequency, causes durational shortening of words

William D. Raymond (*University of Colorado, Boulder*) and Esther L. Brown (*University of Colorado, Boulder*)

Word frequency has been shown to correlate with the degree of formal and durational reduction of words, with more frequent words tending to be phonetically reduced (Bybee, 2001, Jurafsky et al., 2001) and to be produced more quickly (Gahl, 2008; Pluymaekers, Ernestus, and Baayen 2005) than less frequent words. Recent studies have suggested that word frequency may not per se cause phonetic reduction, but that the observed effect may be the result of the correlation of word frequency with the cumulative exposure of words to reducing environments, with more reduction in words that occur more often in these environments than words that occur less often. Continuous measures of reduction, such as spoken word duration, may also be affected by exposure to reducing environments, including phonetic contexts and also speech production parameters, such as speech rate. If so, then words that occur in faster speech contexts on average will be produced faster than words that occur in slower speech contexts, perhaps also correlating with frequency.

The current study examines the effect of speech context rate on word duration. The data are taken from a corpus of spontaneous spoken Spanish produced by native speakers of Puerto Rican Spanish. Frequency statistics from the corpus were used to construct a list of high and low frequency two-syllable nouns, with high frequency nouns in the highest third of the log frequency range of words occurring more than once and low frequency nouns in the lowest third. The dataset consists of high and low frequency words taken from the fluent speech utterances of seven speakers. High and low frequency words are paired by location in the interview to control for effects of discourse factors, but are not taken from the same utterance. The preceding speech context, comprising a continuous prosodic phrase with the target word, was used to calculate speech context rate. Contexts had an average length of 6.2 syllables.

A regression model was constructed to predict word duration that controlled context rate, word frequency, target word length in phones, stress pattern of the target, and the target's morphological complexity (i.e., plurality). Unsurprisingly, word length was the strongest predictor of duration. Although high frequency words were produced more quickly than low frequency words, the difference was not significant. After controlling other factors words in high speech rate contexts were produced more quickly than words in low speech rate contexts. In addition, speech context rate interacted with word frequency, with high frequency words in faster speech contexts having shorter durations than high frequency words in slower speech contexts, but with little difference for low frequency words in faster or slower speech. The results are similar to the pattern of results in studies of phonetic reduction (e.g., Brown & Raymond, submitted) and suggest that, as with phonetic reduction, speakers' continuous speech parameters are affected by reducing environments, implicating the need to pursue the possibility that previously reported word frequency effects on duration may be largely correlational.