

Comparing measures of word confusability and their effect on speech production

Esteban Buz & T. Florian Jaeger (University of Rochester)

ebuz@bcs.rochester.edu

To what extent are the systems underlying language production organized to facilitate efficient information transfer? According to one position, words are articulated with more signal when they are *confusable* with other words [1, cf. 2]. According to others, the phonetic realization of words is predominantly or exclusively determined by *ease of articulation* [3-5]. In comparing these hypotheses, researchers have relied on a variety of measures of confusability. Previously used measures make the assumption that all phonemes are equally confusable. We first compare two of these measures against each other and a novel measure of word confusability based on a database of perceptual word-to-word confusability. We then compare the predicted effect of these measures on word durations from a picture-naming database.

Log word durations were derived from a picture naming study (40 target words; 60 fillers; 36 participants). Each target had one neighbor occur in the experimental list to add to potential confusability. Targets had a large continuum of confusability. We compare **three operationalizations of confusability**: (1) lexical neighbor count (*NHD*); (2) the sum of all lexical neighbors' frequencies (*fNHD*); (3) the frequency-weighted probability of confusing a word with any neighbors (*fCOM*) [cf. 6] based on word-to-word perceptual confusability matrices [7]. In all measures a neighbor different from the target word by one phoneme. A version of each measure was derived from each of three **lexical databases**: MRC2 [8], CELEX2 [9], and SUBLEXus [10]. Add-1-smoothed frequency counts were used for the two frequency-weighted measures. All measures were log-transformed.

Comparisons of the same measure across databases yielded high correlations ($.80 < r < .90$). **Comparisons of different measures within the same database** yielded high correlations for NHD and fNHD ($.86 < r < .92$), but low correlations of those measures with fCON ($.31 < r < .47$). More confusable words were associated with **shorter duration** regardless of **measure and database**. This effect reached significance (1) for NHD in all databases, (2) for fNHD in MRC2 and CELEX2, and (3) for fCON in SUBLEXus. All effects held when frequency was controlled for. This effect suggests that these measures of confusability do not affect *speech rate*, at least not in monologues (non-interactive picture description). Instead, speech rate was facilitated for words with multiple neighbors. Remarkably, binning the targets (high vs. low confusability) yielded the opposite result, suggesting an explanation for conflicting results in the literature ([11, 12] vs. [5]).

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