

Beyond phonology: The role of distal suprasegmental rate and rhythm in phonotactic parsing of speech

Laura Dilley
Michigan State University

A robust finding is that the parsing of a given chunk of the acoustic speech signal can be heavily influenced by suprasegmental characteristics around that speech chunk. That is, it is now well-replicated that the rate and rhythm of distal, i.e., temporally nonadjacent, speech context can induce dramatic perceptual readjustments of how many syllabic units are perceived to be present in a chunk of acoustic signal, as well as in the phonemic composition and phonotactic structuring and sequencing of those units. For example, previous results show that distal context speech rate influences whether a phrase with an embedded reduced function word, e.g. “or” in the phrase “leisure or time”, is heard as containing a function word or not, implying that the same acoustic chunk of speech is parsed in different ways under different distal speech rates. These distal speech rate effects on parsing the acoustic speech signal have now been found in English, Russian, and Mandarin Chinese. Here we test the hypothesis that linguistic competency in perception and production entails knowledge of statistical dependencies between the timing of syllabic units and their rates of occurrence, with implications for phonotactic parsing of speech into units – phonemes, syllables, and words. We report on three experiments that tested whether distal speech rate affects perceived phonotactic structuring of not just function words, but also of other kinds of morpho-phonological contexts. In Experiment 1, we examined whether distal speech rate influenced lexical perception for content words differing in number of syllables, e.g., form vs. forum. In Experiments 2 and 3, we used separate tasks to examine whether distal speech rate influenced perception of a reduced vowel, causing reorganization into different lexical and phonotactic units (e.g., cease, see us). Results showed that that distal speech rate significantly influenced perception of lexical content in both experiments. These findings demonstrate that distal rate substantially influences how listeners perceive structure – including phonotactic sequencing and phonemic composition – for a wide variety of phonological contexts and lexical materials. Taken together with corpus evidence supporting statistical dependencies between distal context speech rate and proximal syllable duration, these findings support the view that language competency entails inferences about the phonological composition (e.g., number of syllabic and phonemic units) for sonorous speech material, as well as the phonotactic sequencing of those units. These inferential processes about phonotactic sequencing reveal themselves especially under experimental conditions when evidence of acoustic “landmarks” (i.e., spectral discontinuities) within proximal speech are minimal. It is suggested that data explanation and/or predictive coding approaches to language perception and production provide a means of accounting for these effects of distal speech rate and rhythmic context on phonotactic parsing of speech material.