

How many phonological units? How many words? Context effects of speech rhythm and rate on segment-prosody interactions

Laura Dilley, Michigan State University

Linguistic theories often assume components of the grammar (phonology, pragmatics, syntax, etc.) are modular and separable from one another. In both phonology and phonetics, segmental and suprasegmental (i.e., prosodic) representations are usually treated as separable and distinct. Phonetic indices of prosodic representations are commonly assumed to include pitch, speech rate, timing, and speech rhythm, among other characteristics. One well-known case of segment-prosody interactions is voice onset time (VOT), in that both overall speech rate and segment-level timing information influence the perceived voicing status of the segment (e.g., Summerfield, 1981). A second example of such interactions is the influence of prosodic structure on allophonic realization of glottal stops (Dilley, Shattuck-Hufnagel & Ostendorf, 1996; Malisz, Żygis & Pompino-Marschall, in press).

This presentation will focus on a third kind of segment-prosody interaction which has been investigated in my laboratory for several years now: the role of the context prosody on perceived phonological representations of segments and syllables. Two kinds of context prosodic information have been a focus of our work on segment-prosody interactions: context speech rhythm and context speech rate. First, in our work on context speech rhythm, we have shown that the pitch and timing (i.e., rhythmic) properties of words prior to (i.e., leading up to) a critical lexically ambiguous syllable sequence influence how that syllable sequence is perceived as arranged into words. For example, context speech rhythm can influence whether a lexically ambiguous syllable sequence like [kraɪsɪstɜːnɪp] is perceived as *crisis turnip* or *cry sister nip* (Dilley & McAuley, 2008; Dilley, Mattys, & Vinke, 2010). The influences of context speech rhythm also has been verified using grammatical sentences in an eyetracking paradigm, e.g., *Heidi sometimes saw that panda in the city zoo*, where *panda* is momentarily ambiguous with the embedded word *pan* (Brown, Salverda, Dilley, & Tanenhaus, 2011). This work suggests that context speech rhythm can influence segmental representations, including whether a given segment (e.g., [n] in *nip*) is heard as word-initial or word-medial, and whether a given syllable (e.g., [nɪp]) is heard as lexically stressed (e.g., as the monosyllabic word *nip*) or unstressed (e.g., as part of the disyllabic word *turnip*). We have begun to explore how variations on the realization of context speech rhythm – e.g., downtrends or list intonation – influence perceived subsequent lexical information.

Second, in our work on context speech rate, we have shown that the rate of words prior to phonetically reduced speech material influence the perceived lexical and segmental content. For example, context speech rate can influence whether a heavily coarticulated function word, such as *or* in the sentence *Deena didn't have any leisure or time*, is perceived or not (Dilley & Pitt, 2010; Heffner, Dilley, McAuley, & Pitt, in press). This perceptual effect is novel and distinct from other kinds of context speech rate effects (e.g., on VOT perception, Summerfield, 1981) because context speech rate influences how many segments are perceived, not just which segments are perceived. I will describe work demonstrating that context speech rate influences perceived lexical and segmental content in both English and Russian. Finally, the implications of these segment-prosody interactions for linguistic theory will be discussed. Specifically, I will consider how theories which take into account the temporal

dynamics of perception and production (e.g., entrainment theory, articulatory phonology, task dynamics) may be adapted to account for these results.

References

- Brown, M., Salverda, A. P., Dilley, L., & Tanenhaus, M. (2011). Expectations from preceding prosody influence segmentation in online sentence processing. *Psychonomic Bulletin and Review*, 18, 1189-1196.
- Dilley, L., Shattuck-Hufnagel, S., & Ostendorf, M. (1996). Glottalization of vowel-initial syllables as a function of prosodic structure. *Journal of Phonetics*, 24, 423-444.
- Dilley, L., & Pitt, M. (2010). Altering context speech rate can cause words to appear or disappear. *Psychological Science*, 21(11), 1664-1670.
- Dilley, L., Mattys, S., & Vinke, L. (2010). Potent prosody: Comparing the effects of distal prosody, proximal prosody, and semantic context on word segmentation. *Journal of Memory and Language*, 63, 274-294.
- Heffner, C., Dilley, L., McAuley, J. D. & Pitt, M. (in press). When cues collide: How distal speech rate and proximal acoustic information jointly determine word perception. *Language and Cognitive Processes*.
- Malisz, Z., Żygis, M., & Pompino-Marschall, B. (in press). Glottalisation as a consequence of rhythmic structure? A study of different speech styles in Polish and German. Special Issue of *Journal of Laboratory Phonology: Temporal Structure and Mechanisms of Timing*.
- Summerfield, Q. (1981). Articulatory rate and perceptual constancy in phonetic perception. *Journal of Experimental Psychology: Human Perception & Performance*, 7, 1074-1095.