

Preceding prosody influences metrical expectations during online sentence processing

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A growing body of work indicates that expectations about the acoustic realization of the phonemes and prosody of a spoken sentence influence how listeners initially interpret incoming acoustic-phonetic cues during sentence processing. However, little is known about the types of representations that contribute to these perceptual expectations. The present study investigates whether perceived prosodic and metrical patterning across preceding portions of an utterance can influence listeners' expectations about the metrical organization of upcoming material. In particular, we examined whether expectations modulate listeners' interpretation of proximal cues to lexical stress and therefore influence the activation of potential lexical candidates.

Experiment 1 ($n=12$) used the visual world paradigm to establish that phonemically overlapping words with different initial stress patterns compete for recognition. Participants listened to spoken sentences containing a target word beginning either with a strong-weak (SW) stress pattern, like *jury*, or with a weak-strong (WS) stress pattern, like *giraffe* [1]. Their task was to correctly identify the target in a four-picture display containing images of the target, the opposite-stress competitor, and two unrelated distractors. Hearing the initial sounds of a SW target word elicited transient activation of a phonemically overlapping WS word, and vice versa. Participants were significantly more likely to fixate competitors than distractor pictures, beginning about 200ms after word onset.

Experiment 2 ($n=32$) further investigated whether metrical expectations based on preceding fundamental frequency and syllable timing patterns can influence the relative activation of competing SW and WS lexical alternatives. Target type (SW vs. WS) was crossed with two prosodic context conditions [2], which were created by employing methods used in previous work investigating effects of distal prosody on lexical processing [3,4,5]. In the **SW-biasing condition**, syllables preceding the target word were synthetically manipulated such that the initial syllable of the target word had acoustic characteristics that were similar to preceding lexically *stressed* syllables (e.g., relatively high f_0 and approximately isochronous timing). In the **WS-biasing condition**, syllables preceding the target word were instead manipulated such that the initial syllable of the target word had acoustic characteristics that were similar to preceding *unstressed* syllables. Critically, the acoustic characteristics of the rest of the utterance, starting at the syllable immediately preceding the target word, were identical across SW- and WS-biasing conditions. The main result was a significant interaction between target type and prosodic condition, starting shortly after the onset of the target word: SW words were most strongly activated in the SW-biasing condition, whereas WS words were most strongly activated in the WS-biasing condition. This interaction demonstrates that prosodic patterning in distal sentence context influences listeners' expectations about the relative metrical prominence of upcoming syllables and their interpretation of proximal cues to lexical stress.

Taken together, these findings suggest that listeners' expectations about the acoustic realization of an utterance include information about metrical organization and lexical stress, and that these expectations constrain the interpretation of acoustic-phonetic cues to lexical identity in the earliest moments of processing. These results are interpreted as support for expectation-based forward models in which acoustic information in the speech stream is interpreted based on expectations created by preceding speech.

[1] SW target word: Heidi sometimes saw that **jury** leaving the courthouse.

WS target word: Heidi sometimes saw that **giraffe** in the city zoo.

[2] SW-biasing f_0 & duration: H L H L H L H L H ...

... saw ...

WS-biasing f_0 & duration: L H L H L H L H L H ...

... saaw ...

[3] Dilley, L. & McAuley, J. D. (2008). Distal prosodic context affects word segmentation and lexical processing. *Journal of Memory and Language*, 59, 291-311.

[4] Dilley, L., Mattys, S. L., & 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.

[5] Brown, M., Salverda, A. P., Dilley, L. C., & Tanenhaus, M. K. (2011). Expectations from preceding prosody influence segmentation in online sentence processing. *Psychonomic Bulletin and Review*, 18, 1189-1196.