Behavioral and ERP evidence for the representation of metrical structure in silent reading

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The Implicit Prosody Hypothesis (IPH; Bader, 1998; Fodor, 1998) maintains that suprasegmental information (e.g., prosodic phrasing, prominence, or metrical structure) can influence on-line sentence processing during silent reading. In this talk, I will present results from a series of experiments demonstrating that metrical structure is activated in silent reading, influencing eye movements during reading and lexical processing, thereby providing support for the IPH.

The critical words in all studies were stress-alternating noun/verb homographs, which are words that have a strong-weak stress pattern when produced as nouns (e.g., *REcall*), but a weak-strong pattern when produced as verbs (e.g, *reCALL*). In two eye-tracking experiments (Breen & Clifton, 2011), we embedded these homographs in contexts which created the anticipation of a word with one stress pattern or the other, which was then confirmed or disconfirmed by the content of the sentence in which the word appeared. In both cases, readers' eye movements were disrupted, suggesting that readers are imposing an implicit metrical structure on what they read, and that there is measurable cost in revising an anticipated metrical structure to conform to what is actually required by the sentence.

We conducted a follow-up experiment using electrophysiological methodology to determine if the observed eye-tracking results are the result of one process or two: Either a) syntactic reanalysis is more difficult when it also requires metrical reanalysis or b) syntactic and metrical reanalysis are distinct processes. Participants silently read sentences like those in (1), in which a target noun/verb homograph was disambiguated as a verb by prior sentence context (1b, 1d) or by subsequent context (1a, 1c). ERPs to the first disambiguating word (*their*) revealed two separate effects: First, an early main effect of ambiguity, such that the conditions which were disambiguated prior to the target (1b, 1d) were more negative between 50 and 150 ms after word onset; second, a later interaction of ambiguity and alternation such that the disambiguation of syntactically ambiguous stress-alternating homographs (*recall* in 1a) elicited a larger anterior, slightly right-lateralized negativity 300-500 ms after word onset compared to all other conditions. These results suggest that syntactic and metrical reanalysis are two separate processes: Readers recognized the syntactic ambiguity very early in processing, but upon encountering evidence that the target word also required a different metrical structure, readers re-engaged lexical access, in order to select the correct lexical entry with the correct stress pattern for the target word.

I will argue from these results that a word's metrical structure is part of its default representation, and that revising this initial commitment is costly, as evidenced by longer reading times and larger ERP waveforms elicited by a word with the wrong metrical pattern. In summary, these findings demonstrate that metrical stress is activated during silent reading and influences parsing decisions, providing additional support for the Implicit Prosody Hypothesis (Bader, 1998; Fodor, 1998).

(1) a. Ambiguous; stress-alternating
The famous **recall** *their* coverage in the press.
b. Unambiguous stress-alternating
The mobsters **recall** *their* coverage in the press.
c. Ambiguous; non-alternating
The famous **study** *their* coverage in the press.
d. Unambiguous non-alternating
The mobsters **study** *their* coverage in the press.

Bader, M. (1998). Prosodic influences on reading syntactically ambiguous sentences. In J. Fodor & J. Ferreira (Eds.), *Reanalysis in sentence processing* (pp. 1–46). Dordrecht: Kluwer.
Breen, M. and Clifton, C., Jr. (2011). Stress matters: Effects of anticipated lexical stress on silent reading. *Journal of Memory and Language*, 64 (2), 153-170.
Fodor, J. D. (1998). Learning to parse? *Journal of Psycholinguistic Research*, 27, 285–319.

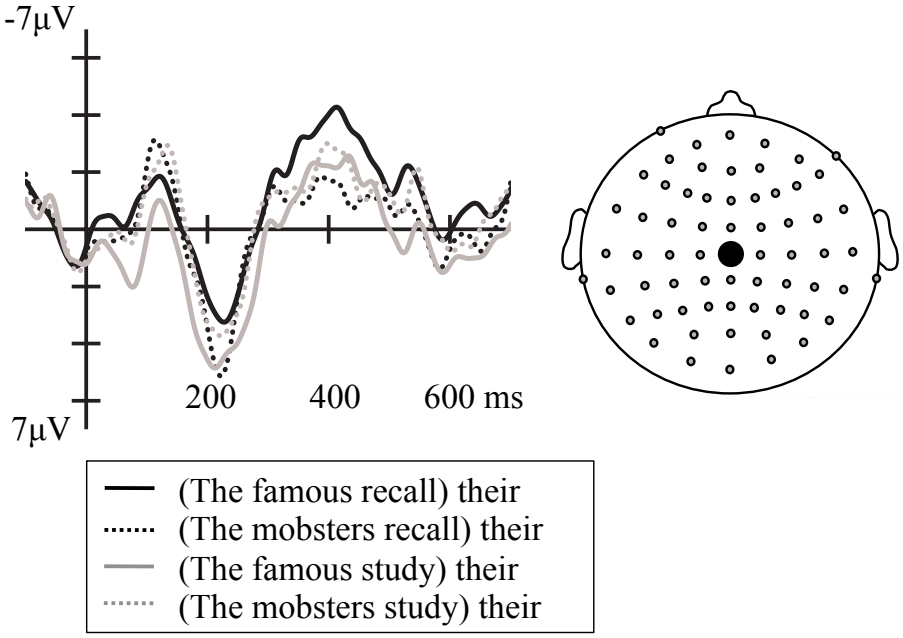

Figure 1. ERP waveforms elicited at electrode CZ by the first disambiguating word *their*.