

Eye-tracking evidence for implicit prosodic phrasing of unambiguous sentences

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The current paper describes three eye-tracking experiments investigating the representation of prosodic boundaries in silent reading. Theories of implicit prosody hypothesize that readers generate prosodic representations of silently read material (Fodor, 1998; Bader, 1998). Prior work from garden-path sentences demonstrates that readers interpret commas as implicit prosodic boundaries (Steinhauer, 2003; Hwang & Steinhauer, 2011). In spoken production, the probability of a prosodic boundary at a sentence location increases as the size of the material that has been produced (left-hand side—LHS), and the size of the material that will be produced (right-hand side—RHS) increases (Watson & Gibson, 2004; Breen, Watson & Gibson, 2010). Here, we investigated the hypothesis that, in unambiguous sentences, the presence of a comma facilitates silent reading when the size of preceding (LHS) and/or following (RHS) material increases.

In Experiment 1, readers' eye movements were recorded while they silently read sentences like those in (1), where three factors were manipulated: a) the length of a sentence-initial adverbial phrase (LHS), b) the length of the main clause (RHS), and c) the presence of a comma between the clauses. Comma presence facilitated reading, such that on both the pre- and post-comma regions (*party, we went*), early and late reading-time measures (first-pass, total-time) were shorter when the comma was present. However, there were no clear interactions with sentence length, perhaps because the sentences were generally long enough that readers imposed implicit prosodic boundaries at the critical location in all conditions.

Experiment 2 items were similar to Experiment 1, but LHS material was shortened, as in (2). We now observed two interactions of LHS length with comma presence: On the post-comma region (*we went*), go-past times were shorter after a comma only when the LHS was long ($t_{\text{interaction}}=2.24$). On the following region (*to the park*), first-pass times were *longer* after a comma only when the LHS was short ($t_{\text{interaction}}=2.18$). These results demonstrate that readers preferred a boundary after the initial adverbial phrase only when it was long, mirroring results from production.

In Experiment 3, participants read sentences like those in (3), where commas between the clauses are considered optional. Once again, reading times demonstrated interactions of length and comma presence. Specifically, go-past times on the post-comma region (*and I'll*) were shorter after a comma only when the RHS was long ($t_{\text{interaction}}=2.19$). This influence of RHS length on reading time suggests that readers made use of parafoveal and peripheral information about sentence length. In addition, go-past times on the final region (*when you're done*) were shorter after a comma only when the LHS was short ($t_{\text{interaction}}=2.11$).

Although the current results raise questions about the specific conditions under which LHS and RHS length affect implicit prosodic representations, they provide clear evidence that readers are sensitive to both prior and upcoming constituent length in their implicit phrasing of non-ambiguous sentences, consistent with results from overt production. Moreover, the late appearance of these effects in the eye-movement record suggests that readers engage in prosodic reanalysis upon encountering unexpected or missing commas.

- 1) After the| (annual holiday)| party(,)| we went| to the park| (to play with our children).|
- 2) After the| party/Yesterday|(,)| we went| to the park| (to play with our children).|
- 3) You will wash the| (pasta-encrusted)| dishes(,)| and I'll| dry them| (when you're done).|