

Adaptation to Unexpected Word-Forms in Highly Predictive Sentential Contexts

Shaorong Yan & Thomas A. Farmer (University of Iowa)

shaorong-yan@uiowa.edu

Readers and listeners possess multiple knowledge bases from which predictions can be generated about multiple aspects of upcoming linguistic input. Predictions foster the generation of error signals upon encountering unexpected input. Error signals feed forward, potentially alerting higher-level units to the detection of anomaly, and/or facilitating the generation of more precise expectancies when encountering similar contextual properties in the future.

Previous work has demonstrated that the magnitude of a garden-path effect elicited by encountering a strongly dis-preferred resolution of a syntactic ambiguity incrementally decreases as readers encounter progressively more instances of the atypical resolution. This result was interpreted as evidence for the continuous updating of higher-level beliefs about distributions of syntactic constructions in the experimental context [i]. It remains unknown, however, whether readers will adjust expectations when error signals cannot be decreased by accommodating an initially dis-preferred resolution of a syntactic ambiguity, e.g., when encountering a context with syntactically unambiguous sentences containing plausible but highly unexpected words. In the current experiment, we monitored eye-movements of 52 undergraduates while they read high-constraint sentences that were strongly predictive of a specific word. Within these sentences (**Ex. 1**), participants encountered the predicted word on half of the trials (“plate”) and a plausible but highly unexpected word in the other half (“spoon”). Target words were controlled for length and frequency, with a 3:1 target: filler ratio.

(**Ex.1**) He scraped the cold food from his dinner **plate/spoon** before washing it.

A predictability effect occurred (i.e., longer reading times on unexpected relative to expected words) for both first-pass eye-movement measures (first-fixation durations and go-past times, marginal for skip rate) and second-pass measures (probability of regressions-in, second-pass and total reading times). We then examined the possibility of adaptation to the presence of unexpected words in highly constraining contexts by testing the interactions between the Predictability effect and Trial Order. A significant decrease in the predictability effect occurred **ONLY** on first fixation durations but not on second-pass measures (Figure 1).

The absence of the adaptation effect for second-pass measures suggests that in contexts where highly unexpected words occur with a high probability, readers do not uniformly update all expectations in a task-specific manner (i.e. they don’t just get used to the presence of unexpected words). Instead, adaptation effects occurred only for first-fixation durations—an eye-movement measure typically most affected by form- and lexical-based properties of words. Thus, adaptation to unexpected words on first fixation durations suggests that the system became gradually more

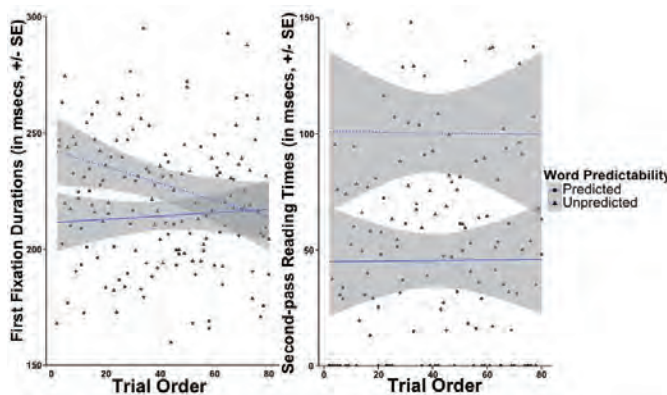


Figure 1. First fixation durations and second-pass reading times for predicted and unpredicted words plotted against trial order.

“confident” upon initially encountering unexpected lexical features, and consequently required less bottom-up information to fully activate the corresponding lexical item [ii]. With respect to models of word recognition in context, these data suggest that changes in the competition dynamics between expected and unexpected features benefitted lower-level perceptual and lexical processing. Adaptive adjustment led to a decrease in time needed for gathering bottom-up information.

References: [i] Fine, A. B., Jaeger, T. F., Farmer, T. A., & Qian, T. (2013). PloS ONE. [ii] Bicknell & Levy (2014). *Proc. Cog. Sci*