Thematic fit and grammatical constraints in good enough parsing

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Debate regarding whether sentence processing primarily depends on sentences' syntactic structure [1-2] or on semantic and lexical information [3-4] is ongoing. For example, [5] showed that participants fixated on images of police officers when they heard the word *arrest*, even though the agent role in the sentence was already filled. This suggests that the lexical information in *arrest* primed participants to look for associated nouns, regardless of whether the plausible position for that noun was already filled. This and other studies suggest that lexical information can influence syntactic constructions. However, the distinction between how lexical association and plausibility each affect sentence processing is under-explored. The current study takes a step towards filling that gap by investigating how lexical association and plausibility affect the processing of garden-path sentences. Our results indicate that plausibility and lexical association do not have distinct effects on sentence processing.

We manipulated plausibility and lexical association using a garden-path structure in which a NP is temporarily interpreted as the direct object of the verb. The critical conditions contained either a NP that was a plausible theme of the verb (Plausible Theme), a NP that was an implausible but lexically associated theme (Plausible Instrument) or an implausible and lexically unrelated argument (Implausible Argument). Our control conditions contained a disambiguating comma so that the NP could not be interpreted as the direct object of the verb. If the processor distinguishes between lexical association and plausibility, then we predict a significant difference in reading times between the Plausible Instrument condition (*While John hunted the rifle*…) and the Implausible Argument condition (*While John hunted the fireworks...*).

	±Garden Path	Thematic Fit	
(1)	While John hunted (,)	the bear the rifle the fireworks	made a very loud noise.

Experiment. We conducted a word-by-word self-paced reading study, in which we manipulated ±Garden Path and Thematic Fit (Plausible Theme, Plausible Instrument, Implausible Argument: *bear, rifle, fireworks*). The –Garden Path sentences contained a disambiguating comma after the verb, whereas the +Garden Path sentences temporarily admitted an analysis in which the NP was interpreted as an argument of the verb *hunted*. Thirty of 36 planned participants read 36 sets of sentences and 90 fillers of varying complexity. Mixed effects models fit to the log residual time [6] were constructed at the critical noun region (*bear/rifle/fireworks*) and the spillover verb (*made*). We found a main effect of Garden Path ($\beta = 0.029\pm0.0076$, $t = 3.9$, $p < 0.01$) and an interaction between Garden Path and Thematic Fit ($\beta = 0.024\pm0.011$, $t = 2.2$, $p = 0.03$). Pairwise comparisons of each level of Thematic Fit within each level of Garden Path revealed no differences in the –Garden Path sentences (all ps > 0.50). But, in the +Garden Path sentences, Plausible Theme NPs were read faster than Implausible Argument NPs ($\beta = 0.065\pm0.026$, t-ratio = 2.5, $p = 0.04$), and marginally faster than Implausible Theme NPs ($\beta = 0.055\pm0.026$, t-ratio = 2.1, $p = 0.10$). There was no difference between the Implausible Theme NPs and Implausible Argument NPs ($p = 0.92$). We take this to suggest that though comprehenders are sensitive to the wellness of thematic fit, the processor does not significantly distinguish between lexical association and plausibility.
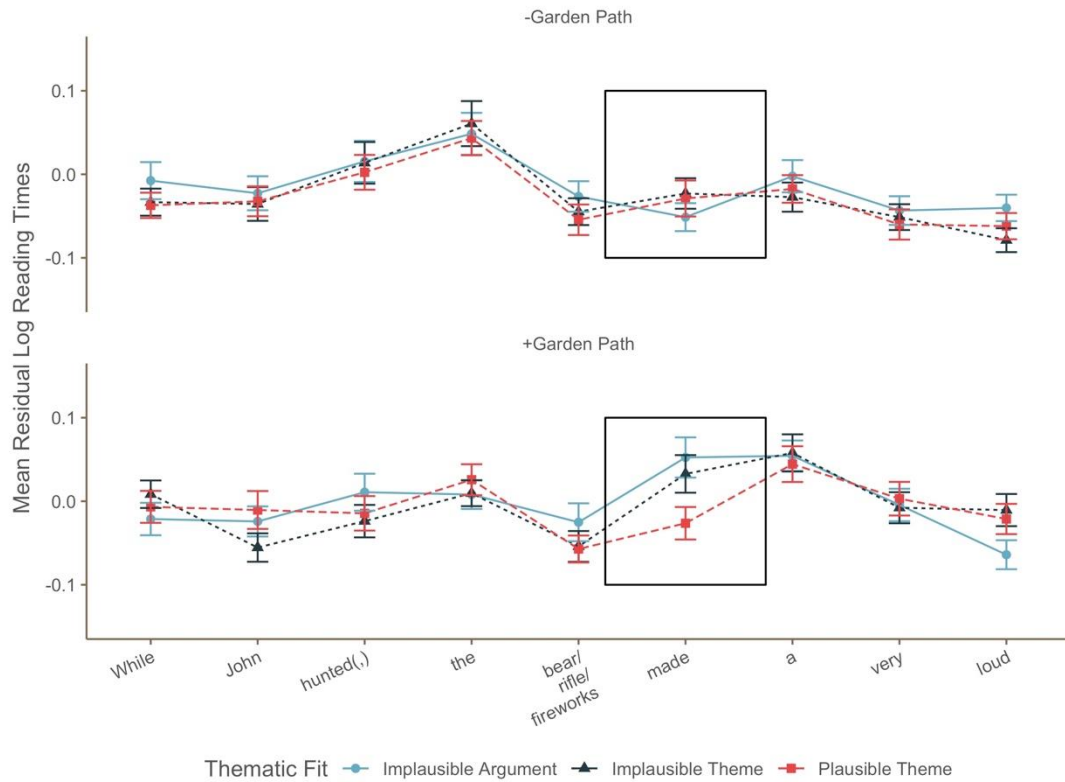
Figure 1. Mean log residual reading times by word and condition.

References. [1] L. Frazier & J.D. Fodor (1978). *Cognition* 6. [2] L. Frazier & K. Rayner (1982). *Cognitive Psychology* 210. [3] M. J. Spivey-Knowlton, J.C. Trueswell, & M.K. Tanenhaus (1993). *Canadian Journal of Experimental Psychology* 47. [4] R. Taraban & J. McClelland (1988). *JML* 27. [5] A. Kukona et al. (2011). *Cognition* 119. [6] https://hlplab.wordpress.com/2008/01/23/modeling-self-paced-reading-data-effects-of-word-length-word-position-spill-over-etc/