“Did I read that right?” Thematic role assignment in first- and second-pass reading

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Thematic role reversal errors have been reported in numerous studies with sentences like (1-4) (e.g., Christianson et al., 2010; Ferreira, 2003; Lim & Christianson, 2013a,b; Zhou & Christianson, 2016). In response to comprehension questions of various forms and paraphrase verifications (as in 5), readers show worse comprehension to implausible sentences in which the NP with the patient thematic role precedes the NP with the agent role (4).

1) The bird that ate the worm yesterday was small (subject-relative, plausible)
2) The worm that ate the bird yesterday was small (subject-relative, implausible)
3) The worm that the bird ate yesterday was small (object-relative, plausible)
4) The bird that the worm ate yesterday was small (object-relative, implausible)
5) The bird/worm ate the worm/bird. The bird/worm was small. (T/F)

Under the Good-Enough (GE) processing account (Ferreira et al., 2002), the algorithmic (i.e., syntactic) parse is fragile and prone to be intruded upon by a concurrent heuristic parse. The heuristic parse applies probabilistic heuristics such as “Agent-first” and “favors plausible interpretations” to generate an interpretation online that can conflict with the correct one derived from the algorithmic parse. A more recent explanation (Bader & Meng, 2018; Meng & Bader, 2020) holds that the algorithmic parse is always completed accurately and returns an interpretation that is faithful to the input. Under this view, the incorrect responses to post-hoc comprehension probes are due to post-interpretive retrieval errors from memory. Few of these studies have used eye-tracking, however (aside from Zhou & Christianson, 2016), so any relationship between disruptions during online reading, recovery processes, and ultimate comprehension has not been adequately examined.

We collected data from 170 participants as they read 40 sentences as in (1-4) and 96 fillers and responded to paraphrase verifications (5) in an eye-movement contingent boundary-change paradigm. In half the critical trials, the NPs were swapped after the eyes fixated the main verb (*was*). The post-interpretive memory retrieval account predicts little rereading in any of the sentences in (1-4), as this account claims the algorithmic parse should be faithful and veridical on first-pass. If any rereading does occur, all changes—plausible to implausible and implausible to plausible—should be equally disruptive, as the content is changed on second-pass. Furthermore, under the post-interpretive memory account syntax alone should influence first-pass reading times (subject-relatives < object-relative; cf. Gibson, 1998). Under the GE account, first-pass reading should show an additive interaction of structure and plausibility, such that slowest reading times should be in implausible object-relatives (cf. Zhou & Christianson, 2016). More rereading is predicted in this condition as well by GE. Furthermore, in trials in which there is a change, GE predicts rereading should be disrupted when the change is plausible → implausible more than when it is implausible → plausible. The reason for this is because GE predicts that in some proportion of trials, heuristic parsing will “flip” thematic roles on first-pass. On these trials, rereading will serve to confirm this reversal error. With respect to accuracy, the pre-change interpretation is coded as “correct.” As such, the post-interpretive memory account predicts change trials to be less accurate than no-change trials. The GE account predicts that accuracy on implausible → plausible change trials will be about the same as no-change plausible and plausible → implausible trials that are not reread; no-change implausible trials and plausible → implausible that are reread should be least accurate if rereading is confirmatory of initial interpretations derived from heuristics (Christianson et al., submitted).

All data have been collected and are being cleaned now. Bayesian hierarchical models will be used to analyze all data, using informative priors from Zhou & Christianson (2016). Results will be interpreted using a BF to quantify evidence for the interaction effect predicted by GE and posterior distributions & 95% Credible Intervals to illustrate effect probabilities.

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