Sentential focus affects visual attention toward potential verb arguments

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Introduction

Previous eye-tracking research using sentences like (1) suggested that a dative verb introduces an indirect object (recipient) into the discourse (Boland, 2005).

(1) The house was dirty, but the rotatespwiwsor it easy to fix some nearby wires.

Boland found anticipatory fixations on photographs depicting potential recipients following dative (but not transitive) verbs. Datives also require a direct object (theme), but there were relatively few fixations on photographs depicting themes, even after the pronoun. In the current study, the theme attracts a high proportion of fixations when it is prominent (i.e., focused, Sekirin, 1984) in a sentence’s information structure. This research demonstrates that sentential focus strongly influences visual attention toward event participants, at times minimizing effects of argument structure. In a related experiment, using nearly identical materials in an auditory change-detection paradigm, listeners were less sensitive to dative/transitive verb substitutions when the theme was focused. Taken together, these findings suggest that verb structure (or perhaps argument structure) is processed more deeply or more completely.

Eye-Tracking Study

Methods

Participants

Twenty-one undergraduates at the University of Michigan participated in the experiment to fulfill a requirement for an introductory introductory Psychology class.

Materials

In 15 sets of items we manipulated sentence structure such that, at the verb, the theme was either still in focus (2) or not (3), using the same high frequency dative (e.g., loan), low frequency dative (e.g., sell), and transitive control (e.g., own) verbs in both conditions. We also manipulated the frequency with which the dative verbs occurred with recipient arguments.

Procedure

Participants engaged in a passive listening task, listening to the sentences while looking at an array of photos corresponding to the agent, theme, and potential recipient of the critical verb. The three-way interaction reflects a different time course on looks to the theme across the three conditions of each of the three verb conditions exhibited a main effect of focus on looks to the theme across the 200-1000 ms interval [All F(1,75) < 7.8]. In the control condition, the effect of focus did not interact with temporal bin, with a larger focus effect in later bins [F(1,72) > 4.69, F(1,72) > 4.30, p < .01]. In contrast, the effect of focus did not interact with temporal bin for the low frequency dative (p > 1.0), and for high frequency datives, interacted (marginally) in the opposite direction, with fewer looks to the focused theme in later temporal bins [F(1,72) = 2.80, p < .06, F(1,72) = 3.00, p < .05]. We believe that the decrease in looks to the focused theme at later time points, after dative verbs compared to control verbs, reflect a shift in visual attention to the recipient of the dative verb.

The focus effect highlighted above, participated in a three-way interaction with verb type and temporal bin [F(1,14,252) = 2.49, p < .05, F(1,14,139) = 3.51, p < .01]. The three-way interaction reflects a different time course on looks to the theme across the three verb conditions. Each of the three verb conditions exhibited a main effect of focus on looks to the theme across the 200-1000 ms interval [All F(1, 75) < 7.8]. In the control condition, the effect of focus did not interact with temporal bin, with a larger focus effect in later bins [F(1,72) > 4.69, F(1,72) > 4.30, p < .01]. In contrast, the effect of focus did not interact with temporal bin for the low frequency dative (p > 1.0), and for high frequency datives, interacted (marginally) in the opposite direction, with fewer looks to the focused theme in later temporal bins [F(1,72) = 2.80, p < .06, F(1,72) = 3.00, p < .05]. We believe that the decrease in looks to the focused theme at later time points, after dative verbs compared to control verbs, reflect a shift in visual attention to the recipient of the dative verb.

Conclusions

In Experiment 1, there were clear effects of sentence structure on looks to both the theme and the recipient. Likewise, in Experiment 2, sentence structure influenced accuracy in a change detection task. We interpret both of these sentence structure effects as reflecting differences in the information structure, or focus, of the sentence, which in turn influenced how thoroughly verb argument structure was processed and/or the degree to which argument structure was effective in shifting listener attention to unmentioned sentence participants. While focus has received some attention in the ambiguity resolution literature (e.g., Brown-Schmidt et al., 2000; Jun, 2003; Schacter et al., 2000; Sedivy, 2002), this is the first demonstration of an interaction between argument structure effects and focus.

Open Questions

1. Is the verb-type effect on looks to focused theme an effect of argument structure? If so, why don’t we see it in the recipient figure? 2. Why were the effects of argument structure on looks to the recipient so early and short-lived, compared to previous studies? 3. Why are transitive/intransitive changes easier to detect than dative/transitive changes? 4. Can focus be defined more clearly?

References