STRUCTURAL PARALLELISM AIDS ELLIPSIS AND ANAPHORA RESOLUTION: EVIDENCE FROM EYE MOVEMENTS TO SEMANTIC AND PHONOLOGICAL NEIGHBORS

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Anaphors (Arnold et al., 2000) and ellipsis constructions (Shapiro et al., 2003) cause reactivation of their antecedents. However, different types of anaphora and ellipsis constructions predict different types of parallelism with their antecedent. VP ellipsis (1) requires structural parallelism with the antecedent structure (Arregui et al., 2006; Merchant, 2010), so reactivation of the semantics AND form of the antecedent nominal is expected. On the other hand, VP ("do-it") anaphors (2) only require a similar event in their antecedent (Tanenhaus & Carlson, 1990), so the nominal referents involved should activate only the semantics of the antecedent. In two experiments, we show that both the semantic and phonological neighbors of antecedent words were reactivated during processing of VP ellipsis, as evidenced by eye movements, but only semantic neighbors were reactivated with VP anaphora. We also demonstrate a more statistically appropriate way of analyzing eye tracking data, by modeling state and temporal dependencies in eye movements using regression.

We monitored participants’ eye movements (Exp1: 21 participants, 24 items; Exp2: 29, 20) to four pictures on screen (from Yee & Sedivy, 2006) as they listened to one of four ellipsis, anaphora (do-it and pronoun), or control sentences ((1)-(4)) . The Target picture was the object of the antecedent clause, the Related was semantically related (Exp1) or a phonological cohort (Exp2) of the target, and the others were distractors. Participants clicked on a fixation cross on a blank screen between the antecedent and second clauses. Using mixed logistic regression, we model how the likelihood of fixation varies over time, controlling for state dependencies on the previous sample (Frank et al., 2008), during a 450ms window starting 150ms after the offset of the verb. Effects of the intercept (predictive eye movements at the beginning of the analysis region) and the slope of eye movements (effects after the ellipsis or anaphor) were analyzed, as well as their interaction with the conditions. Eye movements to Target and Related after hearing the antecedent object replicated previous results from the literature (Huettig & Altmann, 2005; Allopenna et al., 1998).

Results
Exp1: significantly more predictive eye movements in the second clause to the Target and semantically Related in the Ellipsis condition (T: p<<0.001, R:p<.05), and the Do-it condition (T:p<0.1, R:p<0.05); no significant interaction between the conditions and time: looks to the Target did not significantly change over time for any condition relative to the Intransitive and Pronominal baselines.

Exp2: eye movements significantly increased over time to the Target in the Do-it (p<0.05), and pronoun (p<0.001) conditions, and marginally in the Ellipsis condition (p<0.1); significantly increasing eye movements to the phonologically Related ONLY in the Ellipsis condition (p<0.05); no predictive eye movements.

Antecedent nominals and their semantic neighbors were reactivated in VP ellipsis and anaphora constructions, but phonological neighbors were reactivated only in ellipsis. This is contrary to the predictions of theories claiming only semantic parallelism in ellipsis structures (Dalrymple et al., 1991; Hardt, 1993), and indicates some structural parallelism is required.

Examples:
The security guard opened the lock, (Antecedent) and the night watchman ...
(1) did, too. (Ellipsis)
(2) did it, too. (Do-it)
(3) dropped it. (Pronoun)
(4) slept. (Intransitive control)

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