Detecting the antecedent complexity on VPE resolution: effects of semantic plausibility

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Previous studies of the processing of verb phrase ellipsis (VPE) consistently showed the absence of a retrieval-target complexity effect - the representational complexity of the antecedent does not seem to affect the processing cost at the ellipsis site (Frazier & Clifton 2001; Martin & McElree 2008; Paape 2017; but see an exception in Murphy 1985). This is in contrast with studies on other filler-gap dependencies, which have shown that a more complex target reduces retrieval difficulty (Hofmeister 2011; Hofmeister & Vasishth 2014; Troyer et al. 2016; Karimi et al. 2020), possibly because a complex target has more elaborate and distinctive encoding than a simpler one, but the findings are a bit mixed (Lam & Xiang 2022). Since the experimental tasks in previous studies either require no semantic integration of the subject and the elided VP, or do not require retrieval of the full VP antecedent, it is possible that previous studies did not engage participants with "deep processing" of the ellipsis site. The current study adopts a design that requires participants to pay more attention to the semantic compatibility of the elliptical sentence, which requires semantic integration of the subject and the full VP antecedent. The results show that complex VP antecedent facilitates, rather than hamper, the processing at the ellipsis site, but the facilitation effect only arises when participants were paying attention to semantic implausibility.

Design: A self-paced reading experiment with a plausibility judgment task following each trial (Item=24; filler item=24; participants = 41) was conducted with a 2x2 design: sentence plausibility (plausible vs implausible) and antecedent complexity (simple vs complex VP antecedent) (see an example in (1)). The complex VP antecedent was formed by adding a verb modifier and two noun modifiers to the simple VP condition. Crucially, the plausibility difference between conditions was fully determined at the critical ellipsis region "did too", due to the compatibility of the retrieved VP and the subject NP. In the complex implausible condition, the sentence is implausible because of the additional modifiers in the antecedent. Without these modifiers, the sentence would be plausible. In this way, participants must retrieve the full antecedent to make the plausibility judgment. To confirm the plausibility of the sentences, in a separate norming experiment (Item=24; participant=47), we removed the spill-over regions after the ellipsis site "did too" of all conditions, and asked participants to judge the plausibility of each condition on a 1-7 scale (7 being the most plausible). The mean plausibility rating was shown in (1) as well. An additional plausibility norming experiment on sentences with the spill-over regions did not change the rating results.

Results: Figure 1 presents the mean logRT from the critical region "did too" for each condition. A bayesian statistical analysis implemented using the *brms* package (Bürkner, 2017) showed evidence for a Complexity effect (est=-0.06, se=0.02, 95%CI=[-0.10, -0.02]) and a Complexity x Plausibility interaction (est=-0.12, se=0.04, 95%CI=[-0.20, -0.03]). The complex antecedent condition was read faster at the ellipsis site, but only when the conditions are implausible (t=-4.12, p<0.001). There was no complexity effect for the two plausible conditions (t=-0.73, p=0.47). We did a separate analysis taking the Plausibility predictor as a continuous instead of a categorical variable, by using the plausibility rating results from the norming experiment (see Figure 2). The same conclusion holds. There is evidence for a Complexity effect (est=0.19, se=0.06, 95%CI=[0.08, 0.30]) and a weakly significant Complexity x Plausibility interaction (est=-0.03, se=0.01, 95%CI=[-0.05, 0]).

Discussion and conclusion: Results of this experiment agree with previous literature that complex retrieval targets could actually facilitate memory retrieval and integration (Hofmeister 2011, Hofmeister & Vasishth, 2014), but with the qualification that the facilitation effect only arises in the presence of implausibility. A possible explanation is that a complex VP antecedent provides more cues for participants to detect the incompatibility between the VP and the subject NP of the ellipsis clause. Such a facilitation effect could reflect a strategic effect in sentence comprehension when participants were more engaged in semantic processing. The current findings also suggest antecedents with complex structures do not lead to processing cost at the ellipsis (contra to the "copying" hypothesis in Murphy 1985), supporting the "pointer" mechanism of antecedent retrieval in VPE resolution (Martin & McElree 2008).

(1) An example of the stimuli. Slashes indicate chunks in self-paced reading. The mean plausibility rating for each condition is in parenthesis.

Simple plausible: The doctor / handled / the / diagnosis. / The / expert / specialist / **did too** / in / the / busy / hospital. (mean=5.47)

Simple implausible: The doctor / handled / the / diagnosis. / The / young / salesperson / **did too** / in / the / busy / hospital. (mean=2.49)

Complex plausible: The doctor / skillfully / handled / the / tragically / incurable / diagnosis. / The / expert / specialist / **did too** / in / the / busy / hospital. (mean=5.11)

Complex implausible: The doctor / skillfully / handled / the / tragically / incurable / diagnosis. / The / trainee / nurse / **did too** / in / the / busy / hospital. (mean=3.76)
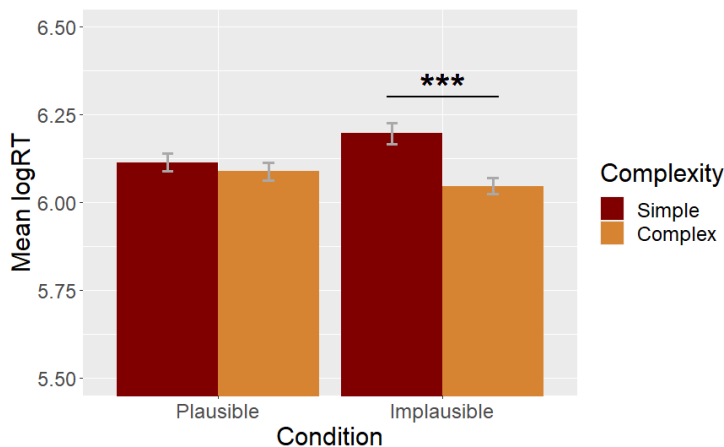

Figure 1. Mean logRT for each condition, at the critical ellipsis region "did too".
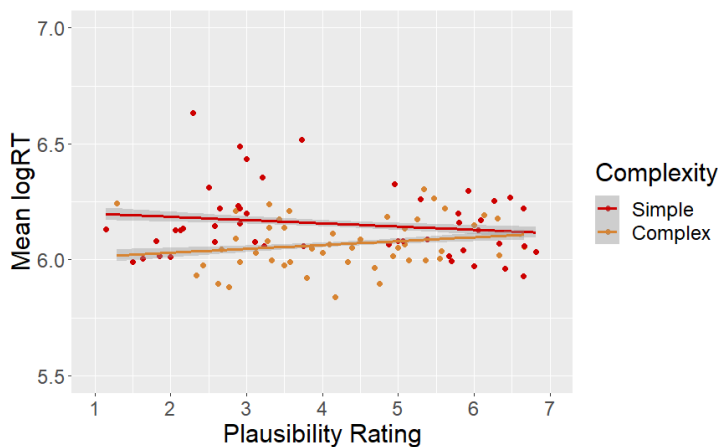

Figure 2. By-item mean logRT for the critical ellipsis region, with Plausibility as a continuous variable.