A shift in gap manifestation incurs processing cost: Evidence from Hebrew

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Background
Processing costs due to reanalysis are mainly explored in cases of an initial attachment of the input proves to be incorrect as more material is revealed, necessitating structural and/or semantic-tematic reanalysis, for example:

- Garden Path (Perreia & Henderson, 1991; Frazier & Rayner, 1982; Trueswell et al., 1993)
- Filled-gap Effect (Stowe, 1996; Wagers & Phillips, 2009)

The present study
Explores the processing effects of a reanalysis which does not involve structural or semantic change, but rather the realization of an optionally overt element

- Specifically, does the need to integrate a direct object resumptive pronoun (RP) appearing after the verb in Hebrew incurs an observable processing cost?

Resumption in Hebrew
- Optional in direct object (DO) relative clauses (RCs), obligatory in indirect object (INDO) RCs
- DO RCs with resumptives show reduced acceptability compared to their gapped equivalents (Farbi et al., 2010; Meltzer-Asscher et al., 2015)

Hypothesis: The lower acceptability of direct object RCs as compared to gaps reflects a processing cost

Why would this be costly?
- Comprehenders resolve the dependency immediately at the verb by positing a gap
- When a post verbal RP is revealed, they have to reanalyze the already-resolved dependency (see Han et al., 2012, for a similar proposal about English)
- This shift in gap manifestation incurs a processing cost

Prediction: If the integration of a post-verbal RP incurs a processing cost due to its redundancy, post-verbal RPs will be more difficult to integrate than pre-verbal ones

Experiments 1 and 2
- Contrasted reading times (RTs) of post-verbal and pre-verbal RPs
- To tease apart the location of the RP from its redundancy for dependency resolution, the phrasal category of the RP was manipulated between NP and PP
  - Hebrew pronouns embedded under PPs are bound morphemes
  - Given a verb with an obligatory PP argument, a dependency with INDO position cannot be resolved before the RP is encountered
- Hence, if the processing cost we predict is related to a shift in gap manifestation, prolonged RTs of post-verbal RPs should be observed only for the NP condition

Materials
- Embedded 2-place verbs taking an obligatory NP/PP were chosen based on an elicitation pretest (n=200)
- Location (pre-/post-verbal) and Category (NP/PP) were fully crossed to create 20 sets, matched for embedded verb RTs (n=18) and embedded clause plausibility (n=26), presented in 4 lists
- 40 filler sentences included gapped subject and DO RCs
- Participants: Two different groups of 40 adults Hebrew speakers

Procedure: Moving-window self-paced reading
- Exp 1: y/n questions on third of the items
- Exp 2: acceptability rating (1-7) for each item

Results: Experiment 1
- Model: log RT of RPs ~ Location*Category as fixed effects, log RT of the previous word and trial as predictors, and subject and item random effects

Significant Location*Category interaction (p = .025)
- Post-verbal RPs slowed RTs for NP RPs (p = .006), but not for PP ones (p = .83)

Results: Experiment 2
- Reading times:
  Replication of Location*Category interaction (p = .01)
  - Main effect of Location: Post-verbal RPs were read slower than pre-verbal ones (p = .003), due to contrast in NP RPs (p = .001), but in not PP ones (p = .4)

Acceptability:
- Z-transformed data, mixed-model regression
  Significant Location*Category interaction (p = .036)
  - Post-verbal occurrence was more detrimental for NP RPs (p = .02), relative to PP RPs (p = .4)
  - Main effect of category: NP sentences were rated lower than PP ones (p = .024), due to contrast in post-verbal RPs only

Discussion
- Integration of an optional post-verbal RP into the parse incurs a processing cost even though it does not involve structure reassignment, or a change in the dependency
- This supports the hypothesis that the effect is due to a shift in dependency resolution, triggered by the need to integrate an RP into the parse after the dependency has already been resolved by positing a gap
- This might suggest that dependency formation mechanisms are rapidly inhibited once a potential gap is identified, such that an immediate change in its realization incurs a processing cost
- In addition, this suggests that in some cases, RPs not only do not aid processing (e.g., Hawkins, 1994) but actually hinder it.

References