

## Processing multiple dependencies: Predicates' and reflexive pronouns' agreement

[Authors]

In many sentence configurations, multiple elements must agree with the same target noun. Previous studies suggested that directly associated agreement sites use unified agreement representations. This was suggested for the production of auxiliary verbs and their predicates (Antón-Méndez et al., 2002, based on internal consistency of attraction patterns), and for the processing of direct object reflexives (Molinaro et al., 2008, based on P600 effects when the pronoun mismatched the verb, but matched the subject). The current study aims to (i) provide additional evidence for this interplay from Hebrew, where gender is morphologically marked on multiple types of syntactic categories, including nouns, verbs and pronouns; and (ii) test for such interplay when the first agreement site does not directly predict the second. Experiment 1 tests whether unified agreement representations block attraction errors. Experiment 2 tests whether verbal agreement affects the processing of picture NP reflexives. Experiment 3 tests the effect of verbal agreement on attraction at the predicate of another clause.

**Experiment 1** (forced-choice completion, N=60, 28 sets): Participants chose the gender of a direct object reflexive, which followed either a grammatical verb, an ungrammatical verb (mismatching the subject in gender), or a non-finite verb that bears no agreement marking. We used a noun following a preposition within the subject phrase as a distractor and manipulated whether it matched or mismatched the gender of the target subject. We found that the proportion of ungrammatical completions was affected by the verb, the distractor and their interaction, with lower rates of attraction when the verb showed agreement cues, both grammatical (interaction  $p = .02$ ) and ungrammatical (interaction  $p = .002$ ) (see Figure 1). The results suggest that verbal agreement affects the choice of the reflexive pronoun, to the degree that it reduces the pronoun's vulnerability to distractors.

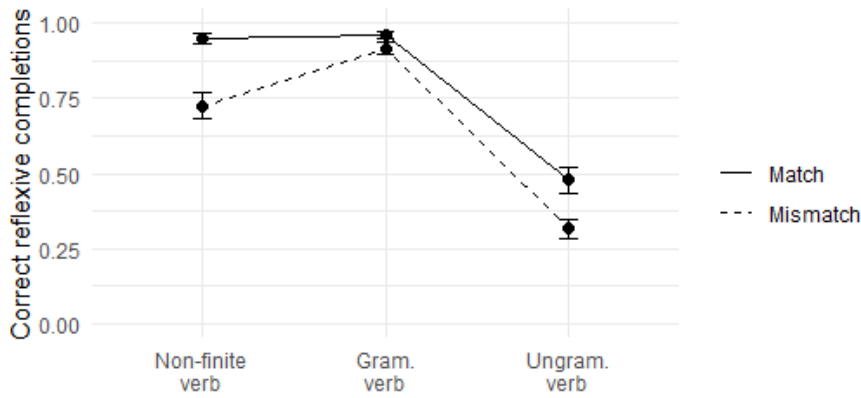
**Experiment 2** (self-paced reading, N=60, 28 sets): Participants read sentences with reflexives embedded within picture NPs. We manipulated the grammaticality of the reflexive (matching or mismatching the subject) and that of the preceding verb (matching or mismatching the subject). The results revealed that after an ungrammatical verb, a reflexive that matched the subject incurred higher reading times ( $p = .03$ ), while the reverse was observed in the grammatical verb conditions ( $p < .001$ ; interaction  $p < .001$ ) (see Figure 2). The results suggest that verbal agreement carries a high weight (relative to the subject's features) in the processing of a reflexive even when the pronoun is not directly dominated by the verb.

**Experiment 3** (forced-choice completion, N=80, 24 sets): Participants chose the gender of a matrix predicative adjective, separated from the subject by a relative clause. We used the noun in the relative clause as a distractor (matching or mismatching the subject in gender) and manipulated verbal agreement by contrasting subject gaps (where the verb agrees with the matrix subject) and object gaps (where the verb agrees with the distractor), and using verb tenses which mark or do not mark gender features. We found a significant effect of distractor, but no effects of or interaction with the verbal agreement manipulations (see Figure 3).

**Conclusions:** Agreement cues at a preceding verb modulate preferences for the features of an additional element agreeing with the same subject. Namely, verbal agreement can counteract the susceptibility to the agreement of a structurally irrelevant noun, and initiate an updating of predictions as to gender features in subsequent dependencies. However, the effect of one agreement site on another is limited, either by clause boundaries, or based on hierarchical structure (i.e., higher sites affect lower ones, but not vice versa).

**References:** Antón-Méndez, I., Nicol, J. L., & Garrett, M. F. (2002). The relation between gender and number agreement processing. *Syntax*, 5(1), 1-25.

Molinaro, N., Kim, A., Vespignani, F., & Job, R. (2008). Anaphoric agreement violation: An ERP analysis of its interpretation. *Cognition*, 106(2), 963-974.



ITEM GLOSS  
 EXAMPLE:  
 We+asked the-agent.M  
 of {the-actress | the-actor} {to+present| will+present.M | will+present.F} officially  
**[himself / herself]**

Figure 1. By condition accuracy of reflexive choice in Experiment 1.

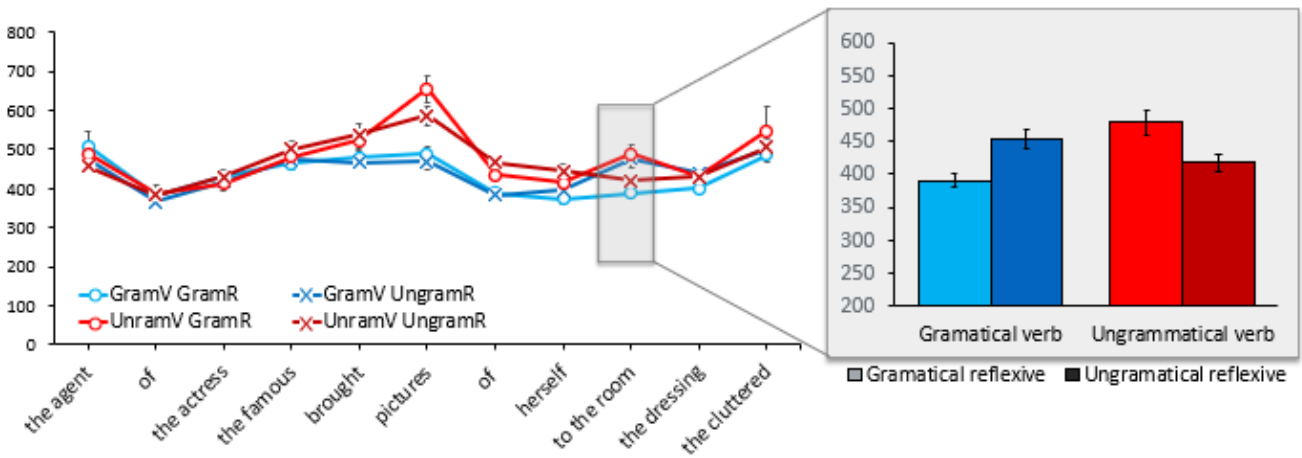


Figure 2: By condition reading time in Experiment 2, word by word and at the spillover region.  
 ITEM GLOSS EXAMPLE: The-agent.M of the-actress brought{M|F} pictures of {**himself | herself**} to the dressing room

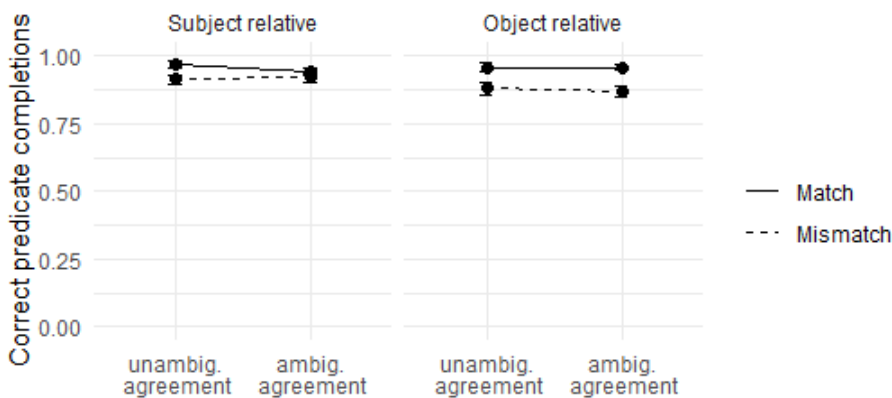


Figure 3. By condition accuracy of predicate choice in Experiment 3.

ITEM GLOSS EXAMPLE:

The-agents.M that-

hire.M ACC the-**{models.F|M}**  
 hired.AMBIG ACC the-**{models.F|M}**  
 the-**{models.F hire.F | the models.M hire.M}**  
 the-**{models.F|M} hired.AMBIG**

were **[arrogant.M / arrogant.F]**