

Processing lexically-based dependencies: an eye-tracking study on verbal control

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Background: This eye-tracking experiment investigates the resolution of lexically-driven anaphoric dependencies in Spanish complement control constructions (Table 1). Such dependencies involve an interpretative relation between the null subject (\emptyset) of the non-finite clause and its antecedent: the subject or the object of the matrix clause. Whether it is one or the other depends on lexico-semantic properties of the matrix clause verbs (*promise* = subject control; *order* = object control). Previous eye-tracking studies [1,2] have contended that whereas lexical control information is immediately accessed and used to retrieve an antecedent, distance effects also influence antecedent selection. Here we test their claim that object control dependencies are facilitated over subject control at the point of retrieval (the infinitive verb) due to a “recency effect”. Also, a grammaticality manipulation is introduced in a downstream adjective. Our work represents a close replication of [1] using a more powerful design and better controlled materials that circumvent some confounds observed in their items.

Method: The effects of the factors CONTROL and GRAMMATICALITY on the eye-tracking measures (FP-GP-TT-REGin/out) were analyzed in 4 regions (underlined in Table 1) using LMEM. The materials consisted of 96 item sets. The sample size ($n=44$) was estimated through a power analysis calculated on the basis of the object control facilitation reported in [1].

Results: No differences between subject and object control dependencies were found at the infinitive verb or the following adverb. Main effects of GRAMMATICALITY were observed in GP of the adjective, GP and TT of the spillover region, and TT at the infinitive verb. Significant interactions between the two experimental factors were found in REGout of the spillover region (Figure 1), REGin at the adjective (Figure 2) and TT at the adjective (Figure 3).

Discussion: The lack of differences between subject and object control dependencies at the infinitive verb fails to replicate the “recency effect” reported in [1,2] and the early sensitivity to agreement violations provides evidence that the null subject had been assigned an antecedent when comprehenders reach the adjective. This suggests that lexical control information alone constrains initial antecedent assignment. Nonetheless, after the initial detection of the adjective’s ill-formedness, the interaction effects show that grammatical sensitivity is stronger in object control conditions. This seems to indicate that control-irrelevant antecedents are temporarily considered during late stages of the adjective’s integration in subject control sentences. Such a behavior could be described as a “recency-based interference” effect since the gender of the second noun seems to either facilitate the processing of ungrammatical adjectives (Figure 1) or difficult the processing of grammatical ones (Figures 2 and 3).

Table 1: Experimental materials*

Subject control	
Grammatical	Ana _i le prometió a Pedro _j Ø _i ser más ordenada _{fem} con los apuntes. <i>Ana_i promised Pedro_j Ø_i to be more tidy with the notes.</i>
Ungrammatical	Pedro _i le prometió a Ana _j Ø _i ser más ordenada _{fem} con los apuntes. <i>Pedro_i promised Ana_j Ø_i to be more tidy with the notes.</i>
Object control	
Grammatical	Pedro _i le ordenó a Ana _j Ø _j ser más ordenada _{fem} con los apuntes. <i>Pedro_i ordered Ana_j Ø_j to be more tidy with the notes.</i>
Ungrammatical	Ana _i le ordenó a Pedro _j Ø _j ser más ordenada _{fem} con los apuntes. <i>Ana_i ordered Pedro_j Ø_j to be more tidy with the notes.</i>

*Note that *Ana* is a feminine name and *Pedro* a masculine name. In this example, the sentences become ungrammatical when the feminine adjective *ordenada* (*tidy*) does not agree in gender with the appropriate antecedent of the null subject (Ø). The gender of the adjectives was counterbalanced across trials.

Figures:

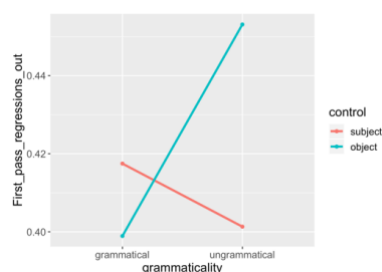


Figure 1: CONTROL by GRAMMATICALITY interaction in the first-pass regressions out of the adjective's spillover region.

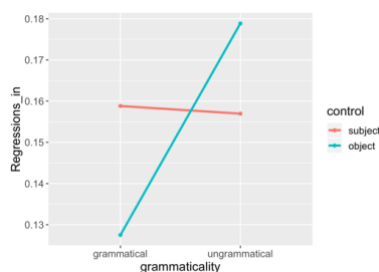


Figure 2: CONTROL by GRAMMATICALITY interaction in the regressions into the adjective region.

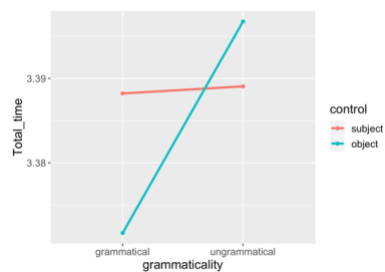


Figure 3: CONTROL by GRAMMATICALITY interaction in total times at the adjective region.

References:

- [1] Betancort, Moises, Manuel Carreiras & Carlos Acuña-Fariña. 2006. Processing controlled PROs in Spanish. *Cognition* 100(2). 217–282.
- [2] Kwon, Nayoung & Patrick Sturt. 2016. Processing Control Information in a Nominal Control Construction: An Eye-Tracking Study. *Journal of Psycholinguistic Research* 45(4). 779–793.