

On the processing of object relative clauses

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<https://doi.org/10.36505/ExLing-2019/10/0014/000376>

Abstract

This study investigates the effect of featural mismatch in the processing of object relative clauses (ORCs). A self-paced reading experiment is reported in which the matching of formal and semantic number features of the head noun and the RC subject is manipulated. The predicted full mismatching intervention/interference effect was not obtained but collective nouns gave rise to the shortest reading times in both the subject and the RC verb regions. A follow-up suggests that it is subject-verb agreement in both the RC and the main clause that is vulnerable to semantic interference.

Key words: relative clauses, featural intervention, interference

Introduction

The asymmetry between subject and object relative clauses (RCs) is well-documented (Gibson, Desmet, Grodner, Watson, Ko, 2005; Wanner, Maratsos, 1978). Object RCs (ORCs) impose greater demands than subject RCs (SRCs). These demands can be nevertheless minimized in particular conditions. It has been demonstrated that dissimilarity between the RC head (N1) and subject (N2) can facilitate processing (Gordon, Hendrick, Johnson, 2004; Gordon, Hendrick, Levine, 2002). Mismatching effects can be due to encoding interference (Villata, Tabor, Franck, 2018), to retrieval interference, in a cue-based approach (Van Dyke, McElree, 2006) or to both effects (Villata et al., 2018). From a linguistic perspective, structural dissimilarity could be interpreted as reflecting featural intervention (Adani, 2011; Grillo, 2009; Villata, Rizzi, Franck, 2016), in the light of the Relativized Minimality principle, which blocks object movement under identity of features (Rizzi, 1990). The more similar N1 and N2 are, the more likely it is for this principle to apply.

The present study investigates the featural mismatching effect in the processing of ORCs by manipulating the syntactic and semantic number features of N1 and N2 in a self-paced reading comprehension task. Featural intervention would predict faster reading times in the plural condition and similar times for singular and collective nouns, since it applies to formal features only. Memory interference might allow semantic effects and would predict a gradient from full to partial mismatching. Two experiments were conducted with adult native speakers of Portuguese, in which the number features of N2 and N1 were manipulated, respectively.

In Experiment 1 (n=42, 34 females; mean age 24 years old), the critical stimuli were distributed in three conditions: full matching (singular) (1); full mismatching (plural) (2); partial mismatching (collective) (3). 3 stimuli per condition and 18 fillers were presented, in a Latin square design, followed by a comprehension question. The critical regions were the RC subject (N2) (region 1) and the RC verb (region 2). Both raw and residual reading times were computed for each region. The task was conducted on a Windows based laptop running the software Linger.

- (1) singular-N2: *O empresário que [o jogador REGION 1] de futebol [contratou REGION 2] aposta na renovação da equipe.* (The manager that the player of soccer hired bets in the renewal of the team.)
- (2) plural-N2: *O empresário que [os jogadores REGION 1] de futebol [contrataram REGION 2] ...* (The manager that the players of soccer hired ...)
- (3) collective- N2: *O empresário que [o time REGION 1] de futebol [contratou REGION 2] ...* (The manager that the team of soccer hired...)

For Experiment 2 (n=30, 26 females; mean age 22), design and procedure were similar to those of experiment 1, except for the independent variable (number) on the head noun (N1). The 18 critical sentences were distributed in the same 3 conditions of experiment 1 (4-6) with 36 fillers. The main clause verb region (region 3) was added. Residuals were computed for this region only.

- (4) singular-N1: *O jogador que [o empresário REGION 1] [contratou REGION 2] [aposta REGION 3] na renovação da equipe.* (The player that the manager hired bets in the renewal of the team.)
- (5) plural-N1: *Os jogadores que [o empresário REGION 1] [contratou REGION 2] [apostam REGION 3] ...* (The players that the manager hired bet)
- (6) collective-N1: *O time que [o empresário REGION 1] [contratou REGION 2] [aposta REGION 3] ...* (The team that the manager hired bet...).

Results

The data were analysed by means of a three-way ANOVA in which *number* was a within-subject factor (see Table 1 for the mean reading times).

In experiment 1, the effect of number was significant in both regions and the direction of the means was similar for the raw and the residual measures. Raw on N2 ($F(2,82) = 5.10$ $p < .01$; on RCV ($F(2,82) = 3.58$ $p = .03$; residual on N2 ($F(2,82) = 5.31$ $p < .01$); on RCV ($F(2,82) = 6.40$ $p < 0.01$). This effect was not in the predicted direction: Full mismatching (plural) was not significantly different from the full matching (singular) in any analysis. The shortest reading times were obtained with collective nouns (partial mismatch), which rules out a featural intervention effect on RCV. The difference between collective and plural was significant in all analyses but a gradient with faster times in the plural condition was not obtained. The effect captured on the collective condition on N2 is compatible with encoding interference, due to the mismatch of the syntactic/semantic number features of N1 and N2. The effect on the RC verb is compatible with retrieval interference, if a collective noun affects the reactivation of a partially feature sharing object, with encoding interference and with an effect on subject-verb agreement within the RC. Subject-verb agreement can be vulnerable to collective words (Kreiner, Garrod & Sturt, 2013) and a semantic effect has been captured in ORCs (Fedorenko, Gibson & Rohde, 2006).

Conditions	Experiment 1 (N1 sing.)				Experiment 2 (N2 sing.)			
	N2 raw**	res.**	RCV raw*	res.**	N2 raw †	RCV raw	MCV raw††	res††
N2 sing.	1004	- 1.5	1194	195				
N2 pl.	1115	- 88.7	1202	152				
N2 coll.	885	- 228	989	-96.2				
N1 sing.					728	1026	890	150
N1pl.					808	929	893	74
N1 coll.					725	934	770	24

Table 1. Mean reading times (msec) per condition and region in each experiment (*Effect of number: * $p < .05$; ** $p < .01$; † $p = .05$; †† $p < .1$)

Experiment 2 was a follow-up intended to clarify this point. The pattern of the results of Experiment 1 was maintained. The marginally significant effect on N2 was compatible with an encoding interference effect of collective nouns. Retrieval interference in the reactivation of the moved object would be expected to affect the RC verb due to a plural feature in N1 (Wagers, Lau & Phillips, 2009). It was, however, the main clause verb that was weakly affected (particularly due to sing. vs coll. on residual responses ($t(29)=2.28$ $p = .03$). Even though a spill-over effect of the RCV cannot be ruled out, the effect on MCV supports the view that it is the subject-verb agreement by itself that is vulnerable to partial number mismatching.

Final remarks

The present results suggest that Portuguese-speaking adults are not likely to be affected by number intervention or retrieval interference in the syntactic processing of ORCs, at least when no additional material is included between the RC subject and verb. The semantic effect obtained does not seem to bear on the actual processing of the object displacement in the RC. It is more likely to apply to subject-verb agreement. Both the embedded clause and the main clause are vulnerable to the encoding of a collective subject, which affects subject-verb number agreement.

Acknowledgements

CNq PQ-309499/2016-0 and CAPES-PRINT 88881.310705/2018-01

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