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New evidence on the Pseudorelative-First Hypothesis: Spanish attachment preferences revisited

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Abstract

This paper is aimed at testing the Pseudo Relative-First Hypothesis in Spanish, a proposal that may settle the long-standing question of cross-linguistic variation in attachment preferences. This hypothesis predicts that whenever a Pseudo Relative (PR) is obtainable, it will be preferred for parsing over a genuine relative clause (RC). Assuming that PRs only allow for high attachment (HA), it follows that HA will be obtained when a PR is possible. To test this hypothesis, two experiments previously conducted in Italian will be replicated in Spanish with sentences containing PR-ambiguous and unambiguous RCs. In experiment 1 PR-availability is manipulated by modifying structural conditions, while in experiment 2 the PRs are only manipulated through semantic conditions. The results obtained show that PR-possible contexts do not yield the predicted HA. It will be argued that this finding, together with the data provided by the Italian experiments, only partially support the PR-First Hypothesis.

Key words

attachment preferences, Pseudorelative-First Hypothesis, pseudorelatives, relative clauses, Spanish, language processing, cross-linguistic variation

1. Introduction

When a parser is presented with a string formed by two determiner phrases (DPs)¹ followed by a relative clause (RC), the latter one can be parsed as referring either to DP1 or to DP2, as shown in (1) and exemplified in (2) (Cuetos and Mitchell, 1988):

- (1) V DP1_i of DP2_j $RC_{i/j}$
- (2) Vi a la asistenta de la señora que bajaba la escalera. see.1SG.PST.IND DOM the maid of the lady that go.down.3SG.IPFV.IND the stair 'I saw the maid of the lady that went downstairs.'

'I saw the maid of the lady going downstairs.'

Sequences like (1) are thus the linear representation of a sole string that corresponds to structurally and interpretatively distinct sentences depending on the hierarchical position occupied by the embedded

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¹ All the glosses follow the general guidelines of The Leipzig Glossing Rules. Further abbreviations have been introduced for complementizer phrase (CP), determiner phrase (DP), differential object marking (DOM), embedded clause (EC), embedded verb (EV), gerund (GER), high attachment (HA), matrix verb (MV), low attachment (LA), inflection (I), inflectional phrase (IP), noun phrase (NP), plusquamperfect (PLUS), preposition (P), prepositional phrase (PP), pseudo relative clause (PR), reading time (RT), relative clause (RC), small clause (SC), verb (V) and verbal phrase (VP).

clause (EC) (Cuetos and Mitchell, 1988). The first possible derivation means analysing the RC as an adjunct² of noun phrase 1 (NP1) "*asistenta de la señora*" as shown in (3a), while a second possibility is to consider that the RC is an adjunct of NP2 "*señora*" (3b), which is in turn a complement of the preposition "*de*" inside the DP1 projection:

(3) a. Vi a [DP1la [NP1 asistentai [PP de [DP2 la [NP2 señoraj]]]] [CP que <e>i/*j bajaba la escalera]].
b. Vi a [DP1 la [NP1 asistentai [PP de [DP2 la [NP2 señoraj [CP que <e>*i/j bajaba la escalera]]]]]].

Cuetos and Mitchell (1988) named the first option "high attachment" (HA) and the second option as "low attachment" (LA), in line with the structural properties of these analyses as depicted in the tree-shaped representations below:



Figure 1(A). HA parsing: The gap in the RC is coreferent with the higher N.

 $^{^{2}}$ For the sake of simplicity, an adjunct analysis of RCs will be assumed here. For a deeper discussion on the alternative complement analysis, see Schmitt (2000).



Figure 1(B). LA parsing: The gap in the RC is coreferent with the lower N.

Research has shown that HA is the preferred parsing in a broad group of languages, including Spanish (Carreiras and Clifton, 1993; 1999), French (Mitchell, Cuetos and Zagar, 1990), Italian (De Vincenzi and Job, 1993), Dutch (Brysbaert and Mitchell, 1996; Mitchell and Brysbaert, 1998), Russian (Sekerina, 2002), Afrikaans (Mitchell, et al., 2000), Serbo-Croatian (Lovrić, 2003), Greek (Papadopoulou and Clahsen, 2003), Galician (Fraga, García-Orza and Acuña Fariña, 2005) and European Portuguese (Soares, et al., 2010). As a counterpart, it has been also confirmed that English (Mitchell and Cuetos, 1991), Romanian (Ehrlich, et al., 1999), Basque (Gutiérrez-Ziardegi, Carreiras and Laka, 2004) and Chinese (Shen, 2006) among other languages form a separated group in which LA is mainly chosen. As intermediates, a considerable number of languages including German (Hemforth, Konieczny and Scheepers, 1996a; Augurzky, 2005b),³ Bulgarian (Sekerina, Petrova and Fernández, 2003a, 2003b), Swedish and Norwegian (Ehrlich, et al., 1999a, 1999b) yield mixed results.

The mechanisms driving these attachment preferences have been addressed using several hypotheses, namely Tuning (Mitchell and Cuetos, 1991), Construal (Frazier and Clifton, 1996), Predicate Proximity (Gibson, et al., 1996), Anaphoric Binding (Hemforth, Konieczny and Scheepers, 1996) and Implicit Prosody (Fodor, 2002), none of which has offered a successful account. For the purpose of shedding some light on this, the present study retests, in Spanish, a recent proposal on attachment variation known as the Pseudo Relative-First Hypothesis, which has been tested with positive results in Italian (Grillo and Costa, 2014) and French (Pozniak, et al., 2019). If substantiated, it would finally elucidate the attachment mechanisms not on the basis of individual preferences but on universal parsing principles, thus settling a long-standing problem in language processing.

To address this issue, Section 2 presents the new Pseudo Relative-First Hypothesis and its predictions, followed by an introduction to the distinguishing features of pseudo-relatives (PRs) and a brief description of the original tests. Section 3 focuses on the experimental methods used for the Spanish replica and Section 4 presents the results, followed by a discussion. The final section summarises the findings, and outlines some possible guidelines to be used in future research regarding attachment preferences.

³ ^aStudies reporting HA preference; ^bStudies reporting LA preference.

2. Rethinking the attachment preferences: the PR-First Hypothesis

2.1 The PR-First Hypothesis

2.1.1 Formulation

Irrespective of parsing preferences, English RCs may attach both high and low when more than one attachment site is available. Prima facie, Spanish RCs seem to behave quite similarly, allowing for both HA (4a) and LA (4b) analyses:

(4) a. Vi a [DP1la [NP1 asistentai [PP de [DP2la [NP2 señoraj]]]] [CP que <e>i/*j bajaba la escalera]].
b. Vi a [DP1 la [NP1 asistentai [PP de [DP2 la [NP2 señoraj [CP que <e>*i/j bajaba la escalera]]]]]].

Grillo and Costa (2014) found, however, that not all RCs behave equally across languages and neither do complementizers (COMP). Specifically, they observed the two first possibilities as well as the following third available parsing in (5) in a broad group of languages, including Italian and Spanish, but not English, which never uses an RC but an *ing*-construction to communicate this meaning:

(5) *Vi* $a \left[\text{sc} \left[\text{DP1} la \left[\text{NP1} asistenta_i \left[\text{PP} de \left[\text{DP2} la \left[\text{NP2} señora_j \right] \right] \right] \right] \right] \left[\text{cP} que < e^{-j_{i} + j_{i}} bajaba la escalera \right] \right]$.

What distinguishes sentences (4a) and (4b) from (5) is that the former sentences contain both a genuine RC, which attaches to DP1 (i.e. HA) in the first case and to DP2 in the second (i.e. LA). As for the latter sentence, there is no RC, but a different structure in which a whole small clause (SC) acts as a complement inside the verbal phrase (VP). This SC is formed in turn by a DP ("*la asistenta de la señora*"), which is the head, plus a RC as the predicate ("*que bajaba la escalera*"). From the point of view of attachment preferences, this type of clauses, called Pseudo-Relatives (PRs), only allows for HA, so that the empty category hosted in the specifier of the embedded inflectional phrase (IP) can exclusively be coindexed with DP1, as schematized in (5) and depicted in Figure 2:⁴



Figure 2. PR parsing of "Vi a la asistenta de la señora que bajaba la escalera".

Crucially, Grillo and Costa (2014) noticed that those languages allowing for PR are precisely those that favour HA, a correlation that could account for the attachment variation if the hypothesis in (6) is true:

(6) **PR-First Hypothesis**

When PRs are available, they will be preferred over RCs, everything else being equal.

⁴ For a thorough discussion about the syntactic configuration of PRs, see Moulton and Grillo (u.r.).

In an attempt to account for this, Grillo and Costa (2014) call upon the simpler structure and interpretative properties that PRs generate to explain that, when both PRs and RCs are available, a principle of linguistic economy comes into play establishing a preference for the PR. Firstly, PRs are structurally simpler as a consequence of restrictive features that do not apply to RCs (see Section 2.2). Secondly, from an interpretative approach, the prototypical eventive meaning of PRs does not demand a context as complex as a restrictive RC,⁵ apart from the fact that, in terms of discourse saliency, PRs codify additional information to the antecedent, while RCs limit it.

With regard to processing, this implies that comprehenders are no longer dealing with an issue of RC-attachment, but whether to interpret the string as a PR –giving rise to only HA – or as a RC (Grillo and Costa, 2014). The crucial point is that this choice is determined by universal principles (Frazier, 1978) and that these principles are not of the *Late Closure* type (7) but akin to *Minimal Attachment* (8):

(7) Late Closure

When possible, attach incoming material into the clause or phrase currently being parsed.

(8) Minimal Attachment

Attach incoming material into the phrase-marker being constructed using the fewest nodes consistent with the well-formedness rules of the language.

Frazier (1978) proposes that the principles in (7) and (8) universally direct the parsing and are sequenced in such a way that, when they come into conflict, *Minimal Attachment* prevails over *Late Closure* – a prevalence consistent with the preference for PRs over RCs defended by Grillo and Costa (2014) for the sake of facilitating the parsing.

2.1.2 Predictions

The PR-First Hypothesis claims that when PRs are available, with everything else being equal, they will be preferred over RCs. From this hypothesis, the following predictions can be derived (Grillo and Costa, 2014):

- Whenever a PR is possible, it will be parsed.
- Since a PR only allows high attachment, HA will be found when a PR is available.

Before testing these predictions, and so as to properly understand the properties of PRs, the following section is devoted to the discussion of their distinguishing features.

2.2 The basics of PRs

PRs do not constitute a relative construction in the same way that bona fide RCs do, in spite of the fact that both are spelled out in identical strings. Roughly, a PR can be characterized as a single constituent formed by a DP, which is the head, and an EC introduced by a C, between which there is a relationship of predication (Aldama, 2016). Works on the syntax of PRs (Cinque, 1992; Brito, 1995; Rafel, 1999; Angelopoulos, 2015; Moulton and Grillo, 2015) unlock some structural and semantic features that define a PR and that are relevant to the goals of this paper. For this reason, the most prominent characteristics will be briefly reviewed in the paragraphs below (for a more detailed analysis see the relevant references):

(9) Feature 1

PRs display a situational reading, not a stative one.

⁵ Consider the string "*Vi a la mujer que bailaba*" ('I saw the woman that danced') and compare in this sense its PR parsing ('I saw the woman dancing') and its RC reading ('I saw the woman who danced'). While in the former analysis only one woman is supposed to dance, in the latter the existence of a set of women must be assumed, among which only one is dancing.

A PR compels the parser to interpret it as an event and not as a property of its antecedent, this being the usual restrictive reading of a RC. If (10a) is compared to (10b), only (10a) allows for an eventive interpretation:

- (10) a. *Vi a la asistenta de la señora que bajaba la escalera*. see.1SG.PST.IND DOM the maid of the lady that go.DOWN.3SG.IPFV.IND the stair 'I saw the maid of the lady going downstairs.'
 - b. *Llamé* a la asistenta de la señora que bajaba la escalera. call.1SG.PST.IND DOM the maid of the lady that go.DOWN.3SG.IPFV.IND the stair 'I called the maid of the lady that was going downstairs.'

What I saw in (10a) is the event of the maid going downstairs, while in (10b) I am limiting the possible referents of the antecedent (I called the maid of the lady that went downstairs and not of any other lady). Note that, when isolated in a pseudo-cleft, PRs and RCs resort to different configurations (Rizzi, 2000; Moulton and Grillo, u.r.) as respectively shown in (11a), where the clausal pro-form "*lo*" resumes the whole EC, and (11b), where only the restrictive pronoun "*quien*" is tolerated:

(11) a. Lo que vi fue a la asistenta de la señora that which see.1SG.PST.IND be.3SG.PST.IND DOM the maid of the lady que bajaba la escalera. that go.down.3SG.IPFV.IND the stair 'What I saw was the maid of the lady going downstairs.'

b. *A quien llamé fue a la asistenta de la señora* DOM who call.1SG.PST.IND be.3SG.PST.IND DOM the maid of the lady

que bajaba la escalera. that go.down.3SG.IPFV.IND the stair 'Who I called was the maid of the lady that was going downstairs.'

(12) Feature 2

The matrix verb (MV) selecting for a PR must be perceptual.

PRs must be introduced by direct perception verbs. Any epistemic interpretation of those predicates impedes an analysis such as PR (Rizzi, 2000), e.g. when using a Spanish perceptual verb like "ver" ('see') with the sense of 'deduce'. Consider again examples (10a) and (10b). In the first example, the PR is obtainable thanks to the perceptual use of "ver" ('see'). In contrast, the verb "*llamar*" ('call'), which lacks any perceptual interpretation, precludes the PR derivation in (10b).

(13) Feature 3

The embedded verb (EV) must be conjugated in imperfective aspect and, preferably, in the same tense as the MV.

PRs are allowed only when the EV receives imperfective aspect (Guasti, 1988; Grillo and Moulton, 2016), as exemplified below:

- (14) a. *Vi* a la asistenta de la señora que bajaba la escalera. see.1SG.PST.IND DOM the maid of the lady that go.down.3SG.IPFV.IND the stair 'I saw the maid of the lady going downstairs.'
 - b. *Vi* a la asistenta de la señora que bajó la escalera. see.1SG.PST.IND DOM the maid of the lady that go.down.3SG.PST.IND the stair 'I saw the maid of the lady going downstairs.'

In example (14a), the past verbal form "*bajaba*" codifies imperfective aspect and implies an action in process. As an alternative, the perfective aspectual correlate "*bajó*" in (14b) does not refer to an ongoing event but to a concluded one incompatible with the eventual reading that singularizes PRs.

Apart from these aspect and tense restrictions, PRs tend to appear in the progressive form in many languages (Guasti, 1988; Cinque, 1992; Grillo and Costa, 2014), of which Spanish is included,⁶ but not Italian. Let us now consider the Italian example (15a) and its translation into Spanish with no explicit progressive aspect (15b) and with a progressive periphrasis (15c):

- (15) a. *Ho* visto l'assistente della signora che ballava. have.1SG.PRS.IND see.PTCP the-maid of.the lady that dance.3SG.IPFV.IND 'I saw the maid of the lady dancing.'
 - b. *Vi a la asistenta de la señora que bailaba*. see.1SG.PST.IND DOM the maid of the lady that dance.3SG.IPFV.IND 'I saw the maid of the lady dancing.'
 - c. *Vi a la asistenta de la señora que estaba bailando.* see.1SG.PST.IND DOM the maid of the lady that be.3SG.IPFV.IND dance.GER 'I saw the maid of the lady dancing.'

(16) Feature 4

The gap in the PR is often a subject, rarely an object.

Several studies (Kayne, 1975; Guasti, 1988; Rafel, 1999; Moulton and Grillo, 2015) have pointed out that PRs are subject-gap (17a) and not object-gap (17b):

(17) a. Vi a $[[la \ asistenta_i \ de \ [la \ señora]_i]$ see.1SG.PST.IND DOM the maid of the lady

> [*que bajaba la escalera*]*i*/*j*]. that go.down.3SG.IPFV.IND the stair 'I saw the maid of the lady going downstairs.'

b. Vi a [la asistenta_i de [la señora_j [que arrestó see.1SG.PST.IND DOM the maid of the lady that arrest.3SG.PST.IND

la policía]**i*/*j*]].
the police
'I saw the maid of the lady that the police arrested.'

This restriction works quite well for a great number of languages (e.g. Italian) in which object-PRs are not possible, but not for languages that tolerate clitic-doubling phenomena, such as Spanish (Aldama, 2016) or Greek (Angelopoulos, 2015):

(18) Vi a [la asistentai de [la señora]i] [que *(la) traían see.1SG.PST.IND DOM the maid of the lady that her.ACC carry.3PL.IPFV.IND
en coche]i/*i].
in car
'I saw the maid of the lady being carried by someone by car.'

Example (18) differs structurally from (17b) in that the RC contains the resumptive pronoun "la", which is correferential with the antecedent and indispensable for assuring the grammaticality of the

⁶ Specifically, Grillo and Costa (2014) point this out for English, Brazilian Portuguese, Spanish and Sardinian.

derivation. This structure, which is more likely to be found in the spoken language and is in fact common in Spanish, is quite special in terms of attachment preferences. On the one hand, remember that whenever a prototypical PR is available, the RC always remains possible. However, in the presence of a PR with doubled clitics, the RC is promptly cancelled. On the other hand, in these constructions there is no room for preference, since only HA is obtainable. This occurs in the same way that LA is the sole parsing in cases of object extraction lacking doubled clitics and the possibility for choice.

(19) Feature 5

PRs are always part of the VP to which they complement.

PRs are only available when they stay in a position lower than the VP. Conversely, when the EC is outside the verbal domain, PRs are not available. Compare (20a) and (20b):

[[la asistenta_i de [la señora]_i] [que bajaba (20) a. Vi а see.1SG.PST.IND DOM the maid of the lady that go.down.3SG.IPFV.IND *la* escalera] $_{i/i}$]. the stair 'I saw the maid of the lady going downstairs.' b. [La asistenta_i de [la señora_i] que bajaba *la* escalera] $*_{i/i}$]] of the lady the maid that go.down.3SG.IPFV.IND the stair española. es

be.3SG.PRS.IND Spanish 'The maid of the lady that was going downstairs is Spanish.'

As shown above, the eventive reading that singularizes a PR is only allowed in (20a), where the EC is right-branching and inside the VP. In (20b), by contrast, this same clause is centre-embedded (i.e. within the subject), which hampers PR derivation and, as such, a bias for HA.

In any case, it must be stressed that PR-availability fluctuates cross-linguistically and that these divergences must be taken into account when designing experimental materials to test the PR-First Hypothesis. In this regard, Italian is, as compared to Spanish, a good example of a language in which these structures manifest greater availability, owing not only to their high frequency but also to the multiplicity of syntactic environments where they are tolerated.⁷

2.3 Looking for evidence in support of the PR-First Hypothesis

With the purpose of testing the PR-First Hypothesis, Grillo and Costa (2014) created two offline questionnaires that manipulate PR availability. Experiment 1 focused on the role of structural limitations in accordance with Features 4 and 5 of Section 2.2 (i.e., extraction site and position of the RC). As a result of combining both parameters in a 2x2 design, 4 possible structural conditions emerged, as shown in Table 1 (the attachment predicted by the PR-First Hypothesis is specified in brackets):

Table 1. Structural condi	tions on PRs availabili	ty (Grillo and Costa, 2014)
	Subject	Object
Right-branching	Condition A (HA)	Condition B (LA)
Centre-embedded	Condition C (LA)	Condition D (LA)

The PR-First Hypothesis predicts HA only in condition A, which is the only one that allows for PRs, and LA in the rest of conditions, RCs being the only possible parsing. In this questionnaire, individuals were presented with several *DP1 of DP2 RC* strings which met one of the four conditions above. Each

⁷ Even though PRs have been attested in a considerable number of languages besides Italian, they do not always present such vitality, since their availability is more strongly subject to regional, generational or even individual variation (Grillo and Costa, 2014).

sentence was followed by a double-choice comprehension question that allowed the participant's attachment bias for every condition to be determined:

(21)	Il	dottore	ha	chiamato	il	figlio	del	signore	che
	the	doctor	have.3SG.PRS.IND	call.PTCP	the	son	of.the	man	that

veniva attacato dai polizzioti. come.3SG.IPFV.IND attack.PTCP by.the police.men 'The doctor called the son of the man (that was) being attacked by the police men.'

Chi era attaccato? 'Who was attacked?'

A. Figlio B. Signore 'A. Son B. Man'

The results obtained showed a bias for attaching high when PRs were available, albeit HA was not the only outcome in those contexts.⁸ Further details concerning the experimental design will be provided in Section 3.

As pointed out by Grillo and Costa (2014), different structural conditions are associated with diverse working memory demands. In this line, previously published reports established that object extraction⁹ (King and Just, 1991; Gibson, 1998; Gordon, Hendrick and Johnson, 2001) and centre-embedding¹⁰ (Gibson, et al., 2005) impose a higher memory load in processing, which suggests that conditions B, C and D should be harder to parse in terms of memory demand with respect to condition A (subject extraction and right-branching).

Based on these assumptions, Grillo and Costa (2014) chose to conduct a second experiment in which only the semantic properties of the MV were manipulated, so as to avoid the eventual impact of structural constraints in attachment preferences. In this questionnaire, targets were all structurally identical and differed only in the perceptual vs. non-perceptual meaning of the MV. As defined in Feature 2, PRs are only available in SCs that are complements of a perceptual MVs. Each target was equally followed by a double-choice comprehension question as in (22):

(22) Gianni ha visto il figlio del medico Gianni have.3SG.PRS.IND see.PTCP the son of.the doctor

che correva la maratona. that run.3SG.IPFV.IND the marathon 'Gianni saw the son of the doctor (that was) running the marathon.'

Chi correva la maratona? 'Who ran the marathon?'

A. Figlio B. Medico 'A. Son B. Doctor'

⁸ Condition A: 56.6; Condition B: 44.0; Condition C: 32.8; Condition D: 40.1 (Grillo and Costa, 2014).

⁹ Carreiras, et al. (2010) show, however, that processing costs do not actually depend on notions like subject or object but on argument marking classes. In this sense, nominative and absolutive gaps are easier to process than accusative and ergative gaps.

¹⁰ As qualified in Grillo and Costa (2014), literature addressing the complexity of processing is actually divided between those claiming that memory load is expected to be higher in centre-embedding (Gibson, et al., 2005) and those considering that right-branching is more demanding for syntactic processing (Santi, et al., 2011).

The results showed a significant (but not full) preference for HA when PRs were obtainable.¹¹ Further details about the experimental design will be provided in Section 3.

In the light of these results, Grillo and Costa (2014) concluded that the HA preference found in PRcontexts was sufficient evidence to support the PR-First Hypothesis, even if HA does not occur at ceiling when predicted. A Spanish replica of both experiments is now presented with the aim of retesting the hypothesis.

3. Testing the PR-First Hypothesis: experimental design

This section discusses the main characteristics of the experiments as well as the adjustments introduced during the process of adapting the materials to Spanish. In both experiments, the participation of speakers from varieties other than the European standard was restricted so as to prevent an eventual variation resulting from a dissimilar availability of PRs in other dialects;¹² all of them were recruited by printed and online advertisements asking for unpaid participation in a university research project. All subjects were properly informed about the academic nature of the research and they gave their consent before taking part in the study. To avoid conditioning participants' responses, they were all naïve as to the specific purposes of the experiments.

Before starting, individuals were presented with a training item that fit the same structure of the experimental ones so that they became used to the dynamics of the task. Both questionnaires were elaborated using the software Ibex Farm,¹³ and finally administered via an internet link. Experiment 2 started once all the participants had completed Experiment 1, and the same link was used to avoid the situation where the same participant took part in both experiments.

3.1 Experiment 1

In this task, participants are presented with different experimental items bound together in 20 sets composed of 4 sentences, each of them meeting one of the 4 conditions A, B, C and D described above. Only condition A allows for PRs and, in consequence, HA is predicted by the PR-First Hypothesis. In conditions B, C and D, only a RC is available and hence a bias for LA is expected, albeit HA is not prevented from being chosen. With regard to reading times (RTs), which this replica does examine, lower values are predicted for condition A compared to B, C and D since it is expected that PRs will be processed faster than RCs due to their greater structural and interpretative simplicity.

3.1.1 Participants and methods

Spanish native speakers (N = 32) took part in the experiment. Although the original experiment was conducted as an offline questionnaire, a self-paced online reading task was finally set up as follows: once a word had been displayed, the subject pressed the space bar and it was immediately replaced by a dash while the subsequent words appeared to its right one by one to avoid giving emphasis to any of the DPs. In so doing, it was possible to measure (RTs), heeding the call of Grillo and Costa (2014) for further investigation regarding the effects of PR-availability on online results and paving the way for forthcoming developments concerning this research. Likewise, a moving window task resembles more closely the incrementality of the linguistic input, a property that has been largely proved to have an impact on syntactic processing, since parsers update their beliefs and expectations as they process incoming sentences, most closely resembling natural reading (Lewis and Phillips, 2015; Just, Carpenter and Woolley, 1982).

3.1.2 Materials and design

Following Grillo and Costa (2014), 20 sets of target sentences with 4 versions for each one were designed, so that the number of stimuli totalled 80. Conditions A, B, C and D were fixed pursuant to the parameters *position* (right-branching vs. centre-embedding) and *extraction_site* (subject vs. object).

¹¹ Condition A: 78.6; Condition B: 24.2 (Grillo and Costa, 2014).

¹² The indiscriminate recruitment of Spanish speakers is precisely one of the causes to which Grillo and Costa (2014) attribute the difficulty of evaluating the results of previous experiments in which dialectal variation was not considered (Gibson, et al., 1996; Gibson, Pearlmutter and Torrens, 1999).

¹³ http://spellout.net/ibexfarm

Recall that PRs are only available when both right-branching and subject-gap are met.¹⁴ For each set of sentences, the meaning was kept constant using passives so as the theta-roles distribution did not vary across the 4 conditions. A comprehension question was formulated after reading each sentence:

(23) Sample of an experimental set

CONDITION A: RB + SUBJECT hijo del concejal Carmen vio al *que* $\langle e \rangle$ *estaba* Carmen see.3SG.PST.IND DOM.the son of the councillor that be.3SG.IPFV.IND siendo insultado por los manifestantes. be.GER insult.PTCP by the protesters. 'Carmen saw the son of the town councillor that was being insulted by the protesters.' CONDITION B: RB + OBJECT Carmen vio hijo del concejal que habían al Carmen see.3SG.PST.IND DOM.the son of the councillor that have.3PL. IPFV.IND insultado <e> los manifiestantes. the protesters. insult.PTCP 'Carmen saw the son of the town councillor that the protesters had insulted.' CONDITION C: CE + SUBJECT El hijo del concejal que $\langle e \rangle$ estaba siendo insultado por los the son of the councillor that be.3SG.IPFV.IND be.GER insult.PTCP by the manifestantes tiene quince años. have.3SG.PRS.IND fifteen years protesters 'The son of the town councillor that was insulted by the protesters is fifteen years old.' CONDITION D: CE + OBJECT concejal que habían El hijo del *insultado* <*e*> *los manifestantes* the son of the councillor that have.3PL.IPFV.IND insult.PTCP the protesters tiene quince años. have.3SG.PRS.IND fifteen years 'The son of the town councillor that the protesters had insulted is fifteen years old.' ¿A quién insultaron los manifestantes? 'Who did the protesters insult?'

1. Al concejal 2. *Al hijo* '1. The councillor 2. The son'

Five adult native speakers of Spanish independently evaluated the materials. Based on their complaints with respect to interpretative complexity, the type of at least one of the three DPs of each target was varied for conditions A and B so as to avoid similarity effects that made the processing of those items harder (Gordon, Hendrick and Johnson, 2001; 2004). Since the meaning and structure of the first DP is irrelevant to the goals of this study, it was substituted when possible by a proper noun in the interests of focusing the participant's attention on the DPs occupying the attachment sites as shown below ("*el reportero*" is replaced by "*Luis*"):

¹⁴ Clitic-doubling object-gap structures are not tested in this study (see Section 2.2).

(24) <u>El reportero</u> > Luis entrevistó al portavoz del diputado the reporter > Luis interview.3SG.PST.IND DOM.the spokesperson of the senator

estaba siendo golpeado por los insurgentes. be.3SG.IPFV.IND be.GER hit.PTCP by the protesters. 'The reporter > Luis interviewed the spokesperson of the senator that was being hit by the protesters.'

Given that in PRs both the matrix and the embedded event unfold within the same temporal window and that many languages (including Spanish) tend to make that relation explicit (see Section 2.2), targets were reformulated using EVs in the progressive form. To this end, the periphrastic structure *estar* + *gerund* was incorporated as follows: "que era golpeado por los insurgentes" > "que estaba siendo golpeado por los insurgentes."

Semantically, just 5 of the 20 selected MVs allowed for PRs ("*mirar*", "*observar*", "*ver*", "*escuchar*", "*oir*"), 3 could take PR adjuncts ("*admirar*", "*odiar*", "*interceptar*") and the remaining 12 disallowed PRs. According to Grillo and Costa (2014), the reasons of using such a small number of PR-taking verbs have to do with measuring the impact of PRs on attachment preferences: if a reduced number of cases produce significant effects on the results, the PR-First Hypothesis will be reinforced.

The experimental sentences were interspersed with a list of 80 fillers so as to avoid the participants from detecting an underlying common pattern. The fillers did not contain either RCs or PRs and were suited to the same question/answer model described for the targets. Considering that each experiment contained 20 targets, each participant was finally tested on 100 items. Before running the task, targets and fillers were pseudo-randomized so that a target would never be displayed immediately following another experimental item. Furthermore, it was ensured that the participants would not see different versions within the same set (i.e. a single experimental sentence for each set) and would be presented with 5 sentences for each of the 4 conditions above. For this purpose, 4 lists of targets were created, each one including a single sentence from each set meeting the specific condition. Given that a concrete sentence did not repeat itself in the rest of the sequences, and that every list was read by 8 participants, each of the 80 targets was finally tested by 8 individuals. The answers to the comprehension questions were displayed so that DP1 appeared first in 50 % of the cases and DP2 in the remaining 50 %.

3.2 Experiment 2

For this replica, the structural parameters of the position and extraction site are no longer taken into account as experimental factors. In contrast, the semantic properties of the MV (perceptual vs. stative) are the only independent variable. On this account, PRs' availability is induced or restricted only by manipulating the MV, while structural conditions are equal. In this questionnaire, targets were bound together in 24 sets, each composed of 2 sentences; the first incorporates a (quasi-)perceptual verb and the second a stative verb. The prediction is that HA will arise in the first context (i.e. when the verb is perceptual and PRs are obtainable) and LA in the second (i.e. when the verb is stative and RCs become the only reading). As for RTs, if PRs are available only under condition A, lower measures are predicted in this context owing to the simpler structural and interpretative characteristics of PRs.

3.2.1 Participants and methods

Spanish native speakers (N=30) took part in the experiment. As for the previous questionnaire, online methods were used in the form of a self-paced reading task.

3.2.2 Materials and design

Twenty-four sets of targets with two versions for each sentence were designed using Grillo and Costa (2014) items as a model. Only two conditions were observed in every set. Condition A contained a perceptual or quasi-perceptual verb allowing for a PR reading. Condition B, on the other hand, incorporated a stative verb disallowing for PRs. As in the first experiment, a comprehension question was asked after reading the item:

(25) Sample of an experimental set

CONDITION A: PERCEPTUAL VERB

María oyó a la abuela de la chica que gritaba. María hear.3SG.PST.IND DOM the grandmother of the girl that shout.3SG.IPFV.IND 'María heard the grandmother of the girl shouting.'

CONDITION B: STATIVE VERB

María trabaja con la abuela de la chica que gritaba. María work.3SG.PRS.IND with the grandmother of the girl that shout.3SG.IPFV.IND 'María works with the grandmother of the girl that was shouting.'

> ¿*Quién gritaba?* 'Who was shouting?'

1. La abuela 2. La chica '1. The grandmother 2. The girl'

As for the previous task, DPs' complexity was slightly facilitated by keeping all the predicates included in the original design constant. However, to change the simple embedded verbal form into the progressive periphrasis *estar* + *gerund* was discarded, considering that, in the absence of other factors favouring a PR interpretation, the whole attention would be paid to the impact of the semantics of the MV. The targets were also interspersed with the same set of 80 fillers to ensure that subjects did not detect a common pattern in the experimental items. In this case, 24 targets were displayed to each participant, 12 of them fulfilling Condition A and the remaining half meeting Condition B. Targets and fillers were likewise pseudo-randomized so that each participant could only watch one of the two versions of each set and so that an experimental item would never be shown immediately following another one of the same type. Once again, the double-choice answers to the comprehension question were displayed so DP1 was presented first in 50 % of times and DP2 in the remaining 50 %.

4. Results and analysis

The PR-First Hypothesis predicts HA as the only outcome in both experiments in Condition A, which is the sole context where PRs are obtainable. Conversely, LA is predicted in Conditions B, C and D of Experiment 1 and in Condition B of Experiment 2, all of which are unambiguous RC contexts where PRs are not a syntactic choice, albeit there does exist the possibility of also obtaining HA responses. In general terms, neither the results of the first experiment nor those of the second one meet these predictions.

4.1 Experiment 1 4.1.1 Results

One experimental subject was excluded from the analysis due to lack of accuracy and anomalously long RTs in his/her responses compared to the overall average. The number of participants considered decreased, in consequence, from 32 to 31. The data were fitted with mixed effects logistic regression employing the glmer () function of the *lme4: Linear Mixed-Effects Models using 'Eigen' and S4* package (Bates, et al., 2018) of the R analysis program. In the main model *position* and *extraction_site* were fitted as mixed factors, and *participants* and *items* as random factors. Random slopes were fitted for both fixed effects and their interactions. The maximal random effects structure justified by the design was finally selected. No significant effects of *position* (coefficient = -0.27817, SE = 0.27567, *z*-score = -1.009, p < 0.313), *extraction_site* (coefficient = -0.45644, SE = 0.29284, *z*-score = -1.559, p < 0.119) and interaction *extraction_site*position* (coefficient = 0.03397, SE = 0.37137, *z*-score = 0.091, p < 0.927) were found.

The results reveal that mean HA is over 50 % just for Condition A. In the rest of the contexts, LA is preferred, albeit only by a few points in Condition B and by an exiguous percentage in Condition C. Finally, Condition D is the most reluctant syntactic context to attach high. The percentages of HA per condition are reported in Table 2 and depicted in Figure 3:



Figure 3: % HA preference in experiment 1.

In general terms, these percentages agree with those obtained in the first experiment by Grillo and Costa (2014) (see Table 3) except for Condition C, for which the Italian participants expressed the lowest HA preference.

Table 3. % HA per conditi	on in experiment 1 (Grillo and Costa, 2014)
	Subject	Object
Right-branching	(A) 56.60	(B) 44.00
Centre-embedded	(C) 32.80	(D) 40.10

As for reading measures, it is observed that subjects spent more time in disambiguating attachment under Condition A than under the rest of the possible scenarios and that right-branching seems to have been more demanding for processing compared to centre-embedded. Significantly, HA disambiguation was more quickly processed (947 ms) than LA under the sole condition allowing for PRs. Mean RTs per condition and disambiguation strategy are reported in Table 4:

Table 4. Mean RTs (ms)	per condition and disambigu	uation strategy in experiment
	Subject	Object
D: 14 1	(A) 7121	(B) 6387
Right-branching	(HA) 6693 / (LA) 7640	(HA) 6404 / (LA) 6373
Contro omboddod	(C) 5468	(D) 5827
Centre-embedded	(HA) 5215 / (LA) 5718	(HA) 5450 / (LA) 6091

4.1.2 Discussion

The PR-First Hypothesis (Grillo and Costa, 2014) predicts that whenever PRs and RCs are available, PRs will be preferred. Consequently, responses for Condition A should mainly be HA. The results above partially meet this prediction since, even if HA is mainly preferred in Condition A, it is not the overwhelmingly preferred choice, with LA constituting a large part of the responses (42.38 %). Even

though Grillo and Costa (2014) consider their results conclusive enough to fully support the PR-First Hypothesis, the fact is that neither theirs (56.6 % of HA in Condition A) nor the present ones (54.80 %) categorically confirm the predictions.

However, it must be remembered that these values have been achieved with a restrictive use of PRtaking verbs, a limitation deliberately introduced in the Italian materials to measure how strong the impact of PR-availability is on attachment preferences. Only 8 of the MVs were (quasi-)perception verbs and, as such, entirely allowed for PRs, while the remaining 12 only tolerated RCs. Taken separately, the data reveal that the HA preference with PR-taking verbs decreases to 53.96 % in Condition A (a fall in average HA of 0.84 %). These results suggest that HA would be preferred in this structural condition regardless of the perceptual meaning of the MV, and diverge from the values obtained by Grillo and Costa (2014), who crucially found that HA preference dropped below 50 % in Condition A when PRverbs were not taken. On the other hand, it was found that non-perceptual verbs lead to HA in 55.43 % of cases in Condition A, meaning an increase in average HA of 0.63 %. Compared to the results obtained for the non-perceptual MVs in Condition A, the percentage of HA is not higher when using PR-verbs.¹⁵

In accounting for these results, notice that several tentatively RC-only predicates, such as "*reconocer*" ('recognize'), are not completely deprived of a purely perceptual interpretation, and that others, such as "*advertir*", are harmfully tricky as they can be read in both Italian and Spanish at least according to two different meanings: a perceptual one ('note', 'realize') and a non-perceptual one ('warn'). It is suggested that these possible interpretations may underlie the considerable number of HA decisions with theoretically RC-only predicates.

The partial fulfilment of the predictions has also been analysed in the light of eventual design faults. A detailed review of the targets in which LA is preferred in PR-contexts (i.e., A8, A16 and A20) does not reveal any factor impeding a reading such as PR. From the viewpoint of the logic interpretation of the sentence, both DPs are equally fit to attach to the RC, so the increase in LA does not appear to abide by facilitation effects in interpretation. Nor does it seem likely to look for a cause in the length of the experimental sentences, since all 3 contain 14 words on average. Similarly, it would not be fair to attribute the lack of compliance to the structural complexity of the targets, arguing that as the complexity of the DPs increases so does the memory load required during the processing. This could be the case for sentence A20, since it is introduced by a complex DP ("*el comisario*", 'the police inspector'), but not for items A8 and A16, both of which are headed by a proper noun. All of the remaining PR-features defined in Section 2.2. were properly observed in the Spanish targets, thus design faults seem not to underlie the results of the replica.

With regard to the analysis of RTs, the expected lower measures are not met under Condition A. The slower processing in this syntactic environment could be attributable to the fact that participants are faced with three available interpretations (PR, HA RC and LA RC). However, faster mean RT for HA is found when PRs are allowed, which is coherent with the prediction that the structural and interpretative simplicity of PRs result in lower processing costs. It is indeed observed that the same difference becomes narrower when the remaining structural conditions in which PRs are not obtainable are considered.¹⁶ Seemingly, and in the absence of other targeted online studies on the processing of PRs, these measures are in line with the predictions regarding the processing of these sentences.

Either way, the general observation is that neither the results of the present experiment nor those of Grillo and Costa (2014) show high rates of HA in the only context in which it is predicted. The statistical treatment of the data above underscores the absence of significant effect of position, extraction site and their interaction in the Spanish replica. What arises in both experiments is a preference for HA when PRs are available, but that bias does not constitute enough evidence to support a hypothesis that predicts a majoritarian choice for HA whenever PRs are obtainable. Moreover, the increment of HA in Condition A, whether in this replica or in the original experiment, is not as significant as pointed out by Grillo and Costa (2014) if compared to the remaining conditions, in which HA has been obtained despite having restricted the PR-parsing.

¹⁵ The full list of HA mean percentage per item/condition can be found in Appendix A.

¹⁶ Anyhow, right-branching seems to have been more demanding for processing compared to centre-embedded, which is in line with Santi, et al. (2011).

4.2 Experiment 2

4.2.1 Results

One participant was discarded owing to extremely long RTs¹⁷ and two outliers were detected and excluded,¹⁸ so the number of participants decreased to 29. Due to a human typing error that could have conditioned the participants' decisions, set 8 was eliminated from the results. The rest of the values obtained were fitted with mixed effects logistic regression using the glmer () function of the *lme4: Linear Mixed-Effects Models using 'Eigen' and S4* package (Bates, et al., 2018). In the main model, *verb-type* was fitted as fixed factor and *participants* and *items* as random factors. Intercept and random slopes were fitted for the fixed effect. The analysis shows no significant effect of *verb-type* (coefficient = -0.5186, SE = 0.3683, *z*-score = -1.408, p < 0.159152) in attachment decisions.

The results reveal a general LA preference (67.14 %) that is stronger than the percentage of HA (32.85 %). A detailed examination of the data shows that HA is not the preferred option in any condition and that HA is higher in Condition A than in Condition B, where PRs are not allowed and, as expected, HA decreases. The percentages of HA per condition are reported in Table 5 and depicted in Figure 4:



Figure 4. % HA preference in experiment 2.

These percentages differ from those of the second experiment by Grillo and Costa (2014) (see Table 6), but neither their findings nor the ones presented here show full HA in Condition A.

Table 6. 9	% <u>HA</u>	per condition in	experiment 2 (Grillo and	Costa,	2014)
	Р	erception verb	Non-perce	otion verb	_	
		(A) 78.60	(B) 24	.20		

The analysis of RTs shows no significant effects regarding the use of perception MVs, although it is conceded that reading measures are slightly higher in this case. Anyhow, HA choices under Condition A, which is the only one allowing for PRs, do not lead to lower RTs as predicted. Mean RTs per condition and disambiguation strategy are reported in Table 7:

¹⁷ He/she often exceeded 30000 ms per item while mean RT is 5309 ms.

¹⁸ A cut-off point was fixed in 50 % of wrong answers. If any of the subjects exceeded this percentage, he/she was immediately discarded, as was the case of these two outliers.

Table 7. Mean RTs (ms) per condition and disambiguation strategy in experiment 2

	0 01
Perception verb	Non-perception verb
(A) 5445	(B) 5173
(HA) 5556 / (LA) 5369	(HA) 6180 / (LA) 4837

4.2.2 Discussion

The PR-First Hypothesis predicts that whenever PRs are obtainable, full HA will arise. The results of the second experiment do not support this prediction because the preference for LA is significantly higher than that of HA when PRs are available.

An individual analysis of the PR-taking predicates shows that, even if LA is broadly speaking the most frequent option regardless of the meaning of the MV, there exists a group of verbs that move away from the prevailing trend and favour HA. This is so for predicates like "*ver*" ('see'), "*escuchar*" ('listen to') and "*sorprender*" ('surprise') and, less pervasively, for "*mirar*" ('look at'), "*observar*" ('observe') and "*fotografiar*" ('photograph').¹⁹ Note that the first 3 verbs coincide in codifying a direct perception meaning that, significantly, is not as evident in other PR-taking verbs, such as "*imaginarse*" ('fancy'), "*retratar*" ('portray') or "*grabar*" / "*filmar*" ('film'), with which HA is never preferred. Still, the fact that other direct perception predicates, such as "*oir*" ('hear'), present a clear tendency towards LA does not tally with a possible variation pattern rooted on the prototypically perceptual meaning of the MV; this possibility was therefore discarded. On the other hand, what is evident in the light of the results and the statistics is that predicates lacking a direct perception sense (i.e. those ones used in Condition B) do not favour HA,²⁰ which is consistent with what was observed in Section 2.2.

It should not be disregarded either that in this experiment the aspectual periphrasis *estar* + gerund was excluded in an attempt to remain as close as possible to the design conditions of the original study. The absence of an explicitly codified progressive notion can inhibit PRs more often than thought (see Section 2.2), which could arguably be responsible for the reduced number of HAs in the Spanish replica. This suggests that setting up specific tasks to measure the impact of the progressive versus non-progressive aspect of the EV in the attachment choices is advisable. Furthermore, Grillo and Costa (2014) also highlight the need for additional research aimed at clarifying the availability of PRs across languages and, importantly, across syntactic environments, since not all languages that allow for PRs favour them in the same contexts as was previously shown.²¹ Lastly, the analysis of RTs shows that, when PRs are available because of a perceptual MV and participants are presented with three possible interpretations, an increase in disambiguation times is observed in the same way as when PRs are facilitated in Experiment 1. However, when HA is interpreted under Condition A, lower RTs are not obtained, which would point to HA RC readings in these cases. The results met do not support the predictions since no lower RTs were found when HA was obtained with PR-taking verbs.

4.3 General discussion

A joint interpretation of the present results together with those of the Italian original experiments (Grillo and Costa, 2014) shows that the evidence obtained only partially supports the PR-First Hypothesis, at least in the terms used by its authors. To my mind, and in the light of the results achieved by other recent studies (Pozniak, et al., 2019), the fact that PRs are not decisive does not, however, preclude that their properties play a role in driving attachment preferences. The results met in both studies recommend rewording the hypothesis so that the role of PRs in attachment decisions is observed as a contributing but not determining factor. Further researches carried out by Grillo, et al. (2015) argue, indeed, for a restatement of the original approach in terms not of PR-availability but of eventivity. In other words, attachment possibilities would be subject to the eventive versus non-eventive interpretation of the clause rather than to the availability of PRs. As a matter of fact, HA can even be found in many LA languages provided that event-taking MVs are used. An English replica of Grillo and Costa (2014) experiment 2

¹⁹ The percentages of HA per item are detailed in Appendix B.

²⁰ It is true that the item 2B, which contains the MV "*vivir*" ('live'), present a bias for HA that curiously raises to 53.33 %. However, this same MV, when used in the target 12B, produces a HA preference of just 21.42 %, what reports an average HA for "*vivir*" clearly below 50 %.

²¹ It should be noted anyway that progressive aspect is a tendency but not a defining feature of Spanish PRs and that its absence does not prevent indeed a PR interpretation.

crucially showed that if reduced RCs are used instead of genuine RCs,²² the alternation between eventtaking versus non-eventive predicates gives rise to grammatical ambiguity (SC vs. RC). It was predicted that when SCs are facilitated, a HA preference would emerge. Conversely, in the unambiguous RC contexts, LA should be the most widespread parsing. As predicted, significant (but again non-full) HA occurs when English SCs are possible, as a consequence of introducing an event-taking predicate in the main clause.

A reanalysis of the data in light of the latest findings by Grillo, et al. (2015) implies that the use of perceptual (i.e. event-taking) MVs does not necessarily lead to an eventive interpretation that favours HA. However, an analysis of the possible readings of the items used in the Spanish replicas is required to assess this claim. More precisely, it may be wondered whether – in accordance with what has been pointed out above – the absence of progressive aspect in the Spanish EVs thwarts the probability of an eventive interpretation in a similar way to how the perceptual versus non-perceptual alternation of the MV does. In this sense, one could join with Grillo, et al. (2015) in suggesting that attachment preferences are actually contingent on guaranteeing the eventive interpretation of the clause, irrespective of the mechanisms that each language deploys to achieve this. This is in fact consistent with a universalist approach, since this proposal challenges the traditional (and, by the way, problematic) classification of HA versus LA languages by claiming that parsing preferences do not vary across languages, but that it is the different grammatical environments which favour either choice (Grillo, et al., 2015).

It remains to be determined whether this proposal can shed light on one key question, namely: which mechanisms trigger a HA disambiguation with genuine RCs? In Section 2.1, it was shown that HA can be reached either by PR parsing, where HA is the only solution, or by a RC analysis, where HA rivals LA and where there is still room for preference (as clearly evinced by the results obtained in the original experiments and the replicas). Whether eventive or non-eventive interpretation of the RCs is responsible for this particular attachment preference still remains unclear.

5. Conclusion

A Spanish replica has been run to test the PR-First Hypothesis (Grillo and Costa, 2014), which predicts that when a PR is available it will be preferred to a RC, and HA will occur. To this end, the availability of PRs has been manipulated in two online Spanish replicas by modifying the structural conditions of the RCs (extraction site and position) and the semantics of the MV (perceptual vs. stative meaning). The results do not support the PR-First Hypothesis as worded by the authors, since a considerably high rate of HA was not found in either experiment whenever PRs were available.

Similarly, what Grillo and Costa (2014) actually find is a preference for HA when PRs are possible, especially when they are obtainable because of the perceptual meaning of the MV. However, this mere preference does not give rise to a hypothesis that predicts a bias for PRs whenever they are available. If this prediction had been correct, full HA would have been found in these contexts, either in the Italian experiments or in the Spanish replica. For this reason, a rewording of the PR-First Hypothesis is recommended so as to underscore its character as a contributing but not determining factor in attachment preferences, in exact alignment with Grillo and Costa (2014) when they call attention to the need for considering other factors in RC-attachment, especially if PRs are not an option.

On these bases, it is recognized that PR-availability plays a role in favouring HA, but this role still needs to be clearly defined without losing sight of its possible interaction with other previous hypotheses on attachment preferences, namely Tuning, Anaphoric Binding or Implicit Prosody. Recent findings regarding attachment variation also point to an eventivity effect on the disambiguation of RCs that requires a more detailed analysis. In sum, additional research is still needed into the mechanisms governing attachment variation.

²² Reduced RCs are RCs lacking the COMP and the auxiliary if any as the following contrast illustrates:

⁽a) I saw the maid of the lady that was going downstairs.

⁽b) I saw the maid of the lady going downstairs.

In the light of this contrast, what is assumed by Grillo, et al. (2015) is that in the presence of a sentence like (b) both a (reduced) RC or a SC can be parsed.

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Appendices

Appendix A: Targets experiment 1

Set 1	HA %
A. Juan llamó al hijo del vigilante que estaba siendo atacado por los perros.	62.50
B. Juan llamó al hijo del vigilante que habían atacado los perros.	12.50
C. El hijo del vigilante que estaba siendo atacado por los perros ha superado la prueba.	42.85
D. El hijo del vigilante que habían atacando los perros ha superado la prueba.	50.00

¿A quién atacaron los perros? 1. Al hijo 2. Al vigilante

Set 2

НА %

A. Manuel miró al compañero del policía que era sorprendido por los huelguistas.	75.00
B. Manuel miró al compañero del policía que habían sorprendido los huelguistas.	50.00
C. El compañero del policía que era sorprendido por los huelguistas es muy bueno.	12.50
D. El compañero del policía que habían sorprendido los huelguistas es muy bueno.	57.14

¿A quién sorprendieron los huelguistas? 1. Al policía 2. Al compañero

Set 3	HA %	
A. El abogado desconfió del amigo del acusado que estaba siendo traicionado por los testigos.	85.71	
B. El abogado desconfió del amigo del acusado que habían traicionado los testigos.C. El amigo del acusado que estaba siendo traicionado por los testigos está muy triste.D. El amigo del acusado que habían traicionado los testigos está muy triste.		
¿A quién traicionaron los testigos? 1. Al amigo 2. Al acusado		
Set 4	HA %	
A. Luis entrevistó al portavoz del diputado que estaba siendo golpeado por los insurgentes.	50.00	
 B. Luis entrevistó al portavoz del diputado que habían golpeados los insurgentes. C. El portavoz del diputado que estaba siendo golpeado por los insurgentes es muy correcto. 	42.85 50.00	
D. El portavoz del diputado que habían golpeado los insurgentes es muy correcto.	12.50	
¿A quién golpearon los insurgentes? 1. Al diputado 2. Al portavoz		
Set 5	HA %	
A. Un policía ayudó a la criada de la señora que estaba siendo agredida por los ladrones.	50.00	
B. Un policía ayudó a la criada de la señora que habían agredido los ladrones.	37.50	
C. La criada de la señora que estaba siendo agredida por los ladrones es francesa.	28.57	
D. La criada de la señora que habían agredido los ladrones es francesa.	37.50	

¿A quién agredieron los ladrones? 1. A la criada 2. A la señora

Set 6	HA %		
A. Juan reconoció al hijo del artista que era acomodado por el conserje.B. Juan reconoció al hijo del artista que había acomodado el conserje.C. El hijo del artista que era acomodado por el conserje estaba nervioso.D. El hijo del artista que había acomodado el conserje estaba nervioso.	62.50 75.00 87.50 85.70		
¿A quién acomodó el conserje? 1. Al artista 2	2. Al hijo		
Set 7	HA %		
A. Tomás conoció al sobrino del empresario que estaba siendo apoyado por el Gobierno.	57.14		
B. Tomás conoció al sobrino del empresario que había apoyado el Gobierno.C. El sobrino del empresario que estaba siendo apoyado por el Gobierno es muy guapo.D. El sobrino del empresario que había apoyado el Gobierno es muy guapo.	50.00 37.50 12.50		
¿A quién apoyó el Gobierno? 1. Al sobrino 2. Al er	npresario		
Set 8	HA %		
 A. María observó a la cuidadora de la niña que era protegida por los policías. B. María observó a la cuidadora de la niña que habían protegido los policías. C. La cuidadora de la niña que era protegida por los policías tiene gripe. D. La cuidadora de la niña que habían protegido los policías tiene gripe. 	12.50 42.85 37.50 25.00		
¿A quién protegieron los policías? 1. A la niña 2. A la cuidadora			
Set 9	HA %		
A. Carlos admiró al doble del futbolista que estaba siendo ovacionado por la afición.B. Carlos admiró al doble del futbolista que había ovacionado la afición.C. El doble del futbolista que estaba siendo ovacionado por la afición es argentino.D. El doble del futbolista que había ovacionado la afición es argentino.	62.50 75.00 71.42 37.50		
¿A quién ovacionó la afición? 1. Al doble 2. Al	futbolista		
Set 10	HA %		
A. Carmen vio al hijo del concejal que estaba siendo insultado por los manifestantes.B. Carmen vio al hijo del concejal que habían insultado los manifestantes.C. El hijo del concejal que estaba siendo insultado por los manifestantes tiene quince años.	62.50 25.00 25.00		
D. El hijo del concejal que habían insultado los manifestantes tiene quince años.	28.57		
¿A quién insultaron los manifestantes? 1. Al concejal 2	2. Al hijo		
Set 11	HA %		
A. Manuela odió al hijo del directivo que era premiado por la empresa.B. Manuela odió al hijo del directivo que había premiado la empresa.C. El hijo del directivo que era premiado por la empresa saltaba de alegría.D. El hijo del directivo que había premiado la empresa saltaba de alegría.	100.00 50.00 62.50 25.00		

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¿A quién premió la empresa? 1. Al hijo 2. Al directivo

Set 12	HA %
A. Aquella desequilibrada disparó al entrenador del tenista que era aplaudido por los espectadores	12.50
B. Aquella desequilibrada disparó al entrenador del tenista que habían aplaudido los espectadores.	14.28
C. El entrenador del tenista que era aplaudido por los espectadores está enfermo. D. El entrenador del tenista que habían aplaudido los espectadores está enfermo.	50.00 25.00
¿A quién aplaudían los espectadores? 1. Al tenista 2. Al e	ntrenador
Set 13	HA %
A. Alfredo le echó una mano al ayudante del camarero que estaba siendo llamado por los clientes.	75.00
B. Alfredo le echó una mano al ayudante del camarero que habían llamado los clientes.C. El ayudante del camarero que estaba siendo llamado por los clientes es griego.D. El ayudante del camarero que habían llamado los clientes es griego.	62.50 85.71 50.00
¿A quién llamaron los clientes? 1. Al ayudante 2. Al	camarero
Set 14	HA %
 A. El infiltrado advirtió al hijo del partisano que estaba siendo espiado por la policía. B. El infiltrado advirtió al hijo del partisano que había espiado la policía. C. El hijo del partisano que estaba siendo espiado por la policía es rubio. D. El hijo del partisano que había espiado la policía es rubio. 	87.50 62.50 37.50 57.14
¿A quién espió la policía? 1. Al partisano	2. Al hijo
Set 15	HA %
A. La dependienta escondió al compinche del ladrón que era perseguido por la policía.B. La dependienta escondió al compinche del ladrón que había perseguido la policía.C. El compinche del ladrón que era perseguido por la policía ha pasado la frontera.D. El compinche del ladrón que había perseguido la policía ha pasado la frontera.	57.14 50.00 50.00 50.00
¿A quién persiguió la policía? 1. Al compinche 2.	Al ladrón
Set 16	HA %
A. Alberto escuchó al apoderado del jugador que estaba siendo interrumpido por los periodistas.	37.50
 B. Alberto escuchó al apoderado del jugador que habían interrumpido los periodistas. C. El apoderado del jugador que estaba siendo interrumpido por los periodistas es muy astuto. 	25.00 37.50

D. El apoderado del jugador que habían interrumpido los periodistas es muy astuto. 57.14

¿A quién interrumpieron los periodistas? 1. Al jugador 2. Al apoderado

Set 17	HA %
A. Javier oyó al hermano del frutero que estaba siendo interrogado por el juez.B. Javier oyó al hermano del frutero que había interrogado el juez.C. El hermano del frutero que estaba siendo interrogado por el juez está endeudado.D. El hermano del frutero que había interrogado el juez está endeudado.	62.50 62.50 57.14 75.00
¿A quién interrogó el juez? 1. Al hermano 2. A	Al frutero
Set 18	HA %
A. El taxista atropelló a la hija de la vendedora que estaba siendo distraída por los clientes.	37.50
B. El taxista atropelló a la hija de la vendedora que habían distraído los clientes.C. La hija de la vendedora que estaba siendo distraída por los clientes estudia Medicina.D. La hija de la vendedora que habían distraído los clientes estudia Medicina.	37.50 37.50 57.14
¿A quién distrajeron los clientes? 1. A la vendedora 2.	A la hija
Set 19	HA %
A. Pablo saludó al representante del cabecilla que estaba siendo elegido por los sindicalistas.	42.85
B. Pablo saludó al representante del cabecilla que habían elegido los sindicalistas.C. El representante del cabecilla que estaba siendo elegido por los sindicalistas es aragonés.	37.50 87.50
D. El representante del cabecilla que habían elegido los sindicalistas es aragonés.	62.50
¿A quién eligieron los sindicalistas? 1. Al representante 2. Al	cabecilla
Set 20	HA %
A. El comisario interceptó al secretario del político que estaba siendo corrompido por la mafia.	25.00
B. El comisario interceptó al secretario del político que había corrompido la mafia.C. El secretario del político que estaba siendo corrompido por la mafia tiene depresión.D. El secretario del político que había corrompido la mafia tiene depresión.	28.57 37.50 25.00
¿A quién corrompió la mafía? 1. Al político 2. Al s	ecretario

Appendix B: Targets experiment 2

Set 1	HA %
A. Juan vio al hijo del médico que corría el maratón.	71.42
B. Juan vive con el hijo del médico que corría el maratón.	53.33

¿Quién corría el maratón? 1. El médico 2. El chico

Set 2		HA %
A. María oyó a la abuela de la chica que gritaba.		40.00
B. María trabaja con la abuela de la chica que gritaba.		21.42
	¿Quién gritaba? 1. La abuela 2.]	La chica
Set 3		HA %
A. Pedro oyó al maestro del chico que cantaba.		28.57
B. Pedro entrena con el maestro del chico que cantaba		6.66
	¿Quién cantaba? 1. El chico 2. El	maestro
Set 4		HA %
A. El escritor miraba a la tía de la chica que saltaba.		6.66
B. El escritor se ha casado con la tía de la chica que salt	aba.	7.14
	¿Quien saitada? 1. La tia 2. 1	La chica
Set 5		HA %
A. Teresa escuchaba a la hija del policía que hablaba.		64.28
B. Teresa trabaja para la hija del policía que hablaba.		20.00
	¿Quién hablaba? 1. El policía 2	. La hija
Set 6		HA %
A. Paula observaba al amigo del señor que cocinaba.		20.00
B. Paula está prometida con el amigo del señor que coci	inaba.	7.14
	¿Quién cocinaba? 1. El amigo 2.	El señor
Set 7		HA %
A. Mario sorprendió a la asistenta de la actriz que robab	ba.	78.57
A. Mario sorprendió a la asistenta de la actriz que robabB. Mario está muy apegado a la asistenta de la actriz qu	ba. e robaba.	78.57 40.00

Set 8 ²³	HA %
A. El abogado pilló al chófer del vecino que fumaba.	
B. El abogado practica con el chófer del vecino que fumaba.	

¿Quién fumaba? 1. El chófer 2. El vecino

Set 9	HA %
A. Lucía observaba al vecino del secretario que jugaba al baloncesto.	64.28
B. Lucía está enamorada del vecino del secretario que jugaba al baloncesto.	40.00
¿Quién jugaba al baloncesto? 1. El secretario 2.	El vecino
Set 10	HA %
A. Jorge miraba al sobrino de la enfermera que comía.	26.66
B. Jorge está emparentado con el sobrino de la enfermera que comía.	13.33
¿Quién comía? 1. El sobrino 2. La	enfermera
Set 11	HA %
A. Carlos fotografió al compañero del empleado que robaba.	50.00
B. Carlos odia al compañero del empleado que robaba	
¿Quién robaba? 1. El empleado 2. El c	ompañero
Set 12	HA %
A. Sara vio al amigo del juez que conducía.	53.33
B. Sara vive con el amigo del juez que conducía.	21.42

¿Quién conducía? 1. El amigo 2. El juez

²³ This set was discarded owing to a typing error that could have influenced participants' decisions.

Set 13	HA %
A. Fernando se imaginaba a la amiga de la peluquera que trabajaba.	14.28
B. Fernando está cenando con la amiga de la peluquera que trabajaba.	33.33

¿Quién trabajaba? 1. La peluquera 2. La amiga

Set 14	HA %
A. Ana vio en sueños al amigo del primo que bebía.	26.66
B. Ana está casada con el amigo del primo que bebía.	14.28

¿Quién bebía? 1. El amigo 2. El primo

Set 15	HA %
A. Ángel retrató a la hermana de la señora que fumaba.	21.42
B. Ángel trabaja para la hermana de la señora que fumaba.	26.66

¿Quién fumaba? 1. La señora 2. La hermana

Set 16	HA %
A. Felipe grabó al agente del jugador que roncaba.	40.00
B. Felipe se ve con el agente del jugador que roncaba.	28.57

¿Quién roncaba? 1. El agente 2. El jugador

Set 17	HA %
A. María grabó al primo del abogado que hablaba.	35.71
B. María trabaja para el primo del abogado que hablaba.	20.00

¿Quién hablaba? 1. El abogado 2. El primo

Set 18	HA %
A. Marta miró al amigo del cocinero que bailaba.	33.33
B. Marta quiere al amigo del cocinero que bailaba.	21.42

¿Quién bailaba? 1. El amigo 2. El cocinero

Set 19	HA %
A. Clara fotografió al vecino de la enfermera que estudiaba.	35.71
B. Clara colabora con el vecino de la enfermera que estudiaba.	33.33
¿Quién estudiaba? 1. La enfermera 2. El vecino	
¿Quién estudiaba? 1. La enfermera 2. E	l vecino
Set 20	HA %
A. Miguel miraba al hermano del manager que escalaba.	53.33
B. Miguel estudia con el hermano del manager que escalaba.	
¿Quién escalaba? 1. El hermano 2. El r	nanager
Set 21	HA %
A. Antonio filmó a la hermana de la amiga que escribía.	0.00
A. Antonio filmó a la hermana de la amiga que escribía.B. Antonio se ha casado con la hermana de la amiga que escribía.	0.00 26.66
A. Antonio filmó a la hermana de la amiga que escribía.B. Antonio se ha casado con la hermana de la amiga que escribía.¿Quién escribía? 1. La amiga 2. La h	0.00 26.66 Iermana
 A. Antonio filmó a la hermana de la amiga que escribía. B. Antonio se ha casado con la hermana de la amiga que escribía. ¿Quién escribía? 1. La amiga 2. La h 	0.00 26.66 hermana
 A. Antonio filmó a la hermana de la amiga que escribía. B. Antonio se ha casado con la hermana de la amiga que escribía. ¿Quién escribía? 1. La amiga 2. La h Set 22 	0.00 26.66 hermana HA %

B. Pablo trabaja con la amiga de la compañera que bailaba. 21.42

¿Quién bailaba? 1. La amiga 2. La compañera

Set 23		HA %
A. José vio a la profesora de la amiga que conducía.		21.42
B. José salió con la profesora de la amiga que condu	ıcía.	20.00
	¿Quién conducía? 1. La amiga 2. La p	rofesora

Set 24	HA %
A. Alicia escuchaba al hijo del vecino que cantaba.	60.00
B. Alicia estudia con el hijo del vecino que cantaba.	21.42

¿Quién cantaba? 1. El hijo 2. El vecino