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THE INFLUENCE OF PSEUDO-RELATIVES ON ATTACHMENT PREFERENCES IN SPANISH

by

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A master's thesis submitted to the Graduate Faculty in Linguistics in partial fulfillment of the requirements for the
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Abstract

THE INFLUENCE OF PSEUDO-RELATIVES ON ATTACHMENT PREFERENCES IN SPANISH

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This paper presents the results from an off-line experiment on the extent to which the availability of pseudo-relatives modulates attachment preferences in Spanish. Participants were presented with sentences in which different syntactic and semantic factors had been manipulated to allow for either both a pseudo-relative (PR) and a relative-clause (RC) reading or a RC reading only. All the experimental items included two potential antecedents with which the constituents of interest could be associated. The experimental items can be divided into four groups: group 1 consists of stimuli allowing for a double reading in direct object position, and groups 2, 3 and 4 consist of stimuli containing RCs in prepositional complement position, preverbal subject position, and postverbal subject position, respectively. A stronger preference for the “higher” antecedent was expected in the first group of experimental items. The results indicate that the availability of pseudo-relatives seems to influence attachment preferences; however, the results ensuing from the statistical comparison of groups 3 and 4 need further investigation.

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1. INTRODUCTION

It has been agreed in the literature that the human parser universally abides by principles of locality in structure building and gap filling processes (*Right Association* Kimball, 1973; *Late Closure* Frazier, 1978; *Minimal Attachment* Frazier & Fodor, 1978; *Recency* Gibson, 1991; *Merge Right* Phillips, 1996). The universal principle of Late Closure, a strategy by which the parser is prompted to attach incoming material to the phrase or clause being processed, predicts a universal preference to attach locally. The application of strategies of locality in sentences with ambiguous interpretations, such as (1), then predicts that the parser will make the most local associations possible.

(1) Bill told us that Sarah left yesterday.

In (1), *yesterday* could have been interpreted as belonging to the main clause, *Bill told us*, or to the CP, *that Sarah left*. However, the parser prefers to attach incoming material, i.e., *yesterday*, to the clause being parsed, i.e., *that Sarah left*, for locality reasons. Because the main clause is too high up on the syntactic tree, it is less frequent to associate *yesterday* with it.

By extension, importantly for this topic, it follows that a relative clause construction (RC) with two different attachment targets, provided that semantic and morphological cues don't condition the attachment resolution, aims at the closest target in compliance with locality rules. For instance, in sentences like (2), which is ambiguous because the RC, *that was eating a sandwich*, can be interpreted as referring to *the secretary* or *the lawyer*, Late Closure predicts association with the second noun of the complex NP: N2, *lawyer*.

(2) Someone saw the [N1 secretary] of the [N2 lawyer] [RC that was eating a sandwich]

Nonetheless, it has been widely claimed in the literature that the interpretation of (2) varies cross-linguistically. It was first advocated by Cuetos & Mitchell (1988) that, contrarily to English speakers, Spanish speakers are likely to associate the RC of sentences like (2) with N1, i.e., the highest possible antecedent on the tree, thus invalidating the application of a Late Closure strategy. A number of cross-linguistic studies on attachment preferences in languages such as Afrikaans (Mitchell et al., 2000), Croatian (Lovric, 2003), Dutch (Brysbaert & Mitchell, 1996; Mitchell & Brysbaert, 1998; Mitchell et al., 2000), French (Mitchell et al., 1990; Frenck-Mestre & Pynte, 2000; Zagar et al., 1997), Galician (Fraga et al., 2005), Greek (Papadopoulou & Clahsen, 2003), Italian (De Vicenzi & Job, 1993, 1995), and Russian (Sekerina, 1997, 2004), along with other studies for Spanish (Carreiras & Clifton, 1993, 1998; Gibson et al., 1995, 1999; Cuetos et al., 1996; Igoa et al., 1998) and English (Mitchell & Cuetos, 1991; Gilboy et al., 1995; Fernández, 1999, 2003, Frazier and Clifton, 1996) subsequently gave account of results similar to those first reported by Cuetos and Mitchell. The finding has been a main concern for linguists, as it puts the universality of the parser at stake; as Fodor states, “The whole explanatory project (...) based on the hypothesis that the processing mechanism is fully innate (...) is in peril because of the discovery that Late Closure is not universal” (1998).

In an attempt to save the universality of the parser, a number of studies have presented different hypotheses to account for this cross-linguistic asymmetry over the past years (Tuning Hypothesis [Mitchell & Cuetos, 1991], Construal [Frazier & Clifton, 1996], Predicate Proximity [Gibson et al., 1996], Anaphoric Binding [Hemforth et al., 1996], Implicit Prosody Hypothesis

[Fodor, 1998], Pseudo-relative Hypothesis [Grillo & Costa, 2013 *in press*]). This paper presents a summary of the most discussed proposals on the topic, and the results of a questionnaire study testing Grillo & Costa's (2013 *in press*) hypothesis that attachment preferences are modulated by syntactic factors. The proposal derives from the observation that languages such as Spanish, Italian, French, and Portuguese, among others, reportedly high-attaching languages, exhibit a language-specific construction that is string identical to, yet semantically and structurally different from an RC, and only allows for high association: the so-called pseudo-relative construction (PR). Because both constructions are linearly identical, there may be cases in which the same construction enables an RC and a PR reading simultaneously. As a preliminary illustration, (3) allows only for an RC reading, (4) allows for a PR/RC ambiguous reading, and (5) allows only for a PR parse (the elements indicating restrictions on the availability of a certain parse have been underlined). Crucially to Grillo and Costa's hypothesis, PRs are syntactically equivalent to small clauses, and therefore can't be predicated of only a subpart of the constituent that they take as subject, by default (see section 3 for explanations).

- (3) Alguien atentó contra (*preposition*) la sirvienta que estaba en el balcón (RC parse)
Someone attempted an attack against the servant that was on the balcony
- (4) Alguien miró a la sirvienta que cosía en el balcón (RC/PR ambiguous parse)
Someone saw the servant that was sewing on the balcony
- (5) Vi a Rosa (*proper name*) que venía corriendo (PR parse)
I saw Rosa running my way

2. PREVIOUS HYPOTHESES

Mitchell and colleagues (Mitchell & Cuetos, 1991; Mitchell et al., 1995; Cuetos et al., 1996) put forward a hypothesis to account for attachment asymmetries rooted in the idea that the early attachment resolutions carried out by the parser when processing ambiguous constructions are conditioned by the attachment resolutions resulting from forced disambiguation encountered in the past. Therefore, an individual shows a preference to attach high when decoding sentences like (2) if and only there is a higher frequency of high attachments in his or her language history, which could provide a satisfactory explanation not only for cross-linguistic asymmetries, but also for individual differences. According to this hypothesis, the so-called Tuning Hypothesis, attachment preferences in production and in perception should match. However, different studies on Dutch have presented evidence pointing to contradictory results. On the one hand, perceptual experiments confirm the status of Dutch as a high-attaching language (Brysbaert & Mitchell, 1996); yet on the other, studies with Dutch corpora have found a preference for low attachment (Mitchell & Brysbaert, 1998; Mitchell et al., 2000). Another explanatory problem for the hypothesis has to do with the prediction that the parser's ultimate preferences are conditioned by its early attachment resolutions (Fernández, 2003), and is directly associated with the type of methodology used in the experiments on the topic. On-line tasks, comprising self-paced reading and eye-tracking measures, are often designed to yield conclusions about early attachment resolutions, whereas off-line tasks, such as untimed questionnaire studies, are conceived as tapping late processing phases. It has been shown that there is a lack of convergence in the findings ensuing from the use of on-line methods, presumably due to ascribing incomparable methods to the "on-line" category (Fernández, 2003). To illustrate, different on-line experimental

studies for Spanish have reported both high attachment preferences (Carreiras, 1992; Mitchell & Cuetos, 1991) and low attachment preferences (Fernández, 2000).

Gibson and colleagues (1996, 1999) advocate that a locality principle such as Recency, consisting of attaching structures for incoming lexical items to structures built more recently (Gibson et al., 1996), ensues universally along with a second factor that interacts with it: Predicate Proximity. This second factor prompts the parser to “attach as close as possible to the head of a predicate phrase” (Gibson et al., 1996), which may account for high attachment biases in certain languages. Under this proposal, Predicate Proximity is parameterized cross-linguistically, being strong in languages with freer word order, given the governing power of their predicates, and weak in languages with rigid word order. Gibson and colleagues’ hypothesis is sustained by the results of two on-line experiments in which participants gave grammaticality judgments for a series of sentence fragments where the RC was forced to be attached to one of three potential antecedents. Because N3, the site closest to the RC, was the easiest to attach, and N2 (not N1), the hardest, it was demonstrated that Recency and Predicate Proximity do not operate on their own, but actually interact with each other. Whereas the same findings were replicated in later experiments (see Gibson et al., 1999), more recent evidence for Brazilian Portuguese has pointed to contradictory results: despite the rigidity of word order in this language variety, supposing low implementation of Predicate Proximity, a high attachment bias was found (Finger & Zimmer, 2000; Maia & Maia, 2001).

Frazier & Clifton (1996) propose an explanation to account for attachment asymmetries that rests on the distinction between primary and non-primary phrases: the Construal Hypothesis. Primary phrases include the subject and main predicate of finite clauses, and their complements and obligatory constituents, whereas non-primary phrases are understood as phrasal constituents

that are not obligatory, such as RCs. Importantly for their hypothesis, Frazier and Clifton claim that primary and non-primary constructions are processed differently, the former being governed by universal principles or locality and the latter being associated, or “construed”, hinging on non-structural principles. This association is to be made within the current thematic processing domain (the extended maximal projection of the last thematic theta assigner), and the associated non-primary constituent is to be interpreted taking pragmatic and discourse factors into consideration. In interpreting sentences like (2), a referential principle seemingly plays a key role in determining high attachment preferences, i.e., the presence of the definite article *the*. Similarly, pragmatic principles such as the Gricean maxim of clarity (Grice, 1975) are believed to influence association preferences (Gilboy et al., 1995) with complex NPs; English, but not Spanish, allows genitive relations to ensue in two distinct forms: in the form of a Norman genitive (*NP1 of NP2*) and in the form of a Saxon genitive (*NP2's NP1*). Vivially, the availability of an unambiguous alternative to *NP1 of NP2* strings, where incoming material can only be interpreted as related to what corresponds to NP1, may prompt English speakers to show a preference for low attachment when presented with the Norman form, reserving the Saxon option for high attachment for clarity purposes in compliance with Gricean principles. This pragmatic principle, however, has been called into question by cross-linguistic studies for Greek (Papadopoulou & Clahsen, 2003), Dutch (Brysbaert & Mitchell, 1996; Mitchell et al., 2000), Afrikaans (Mitchell et al., 2000), and Croatian (Lovric et al., 2000; Lovric 2002, 2003), languages which allow for both types of genitives, yet reportedly favor high attachment. On the other hand, Romanian, which only allows for the Norman genitive, has been shown to favor low attachment (Ehrlich et al., 1999).

Based on the cross-linguistic asymmetry of the elements used to introduce RCs,

Hemforth and colleagues (1996, 1998, 1999) pose that the anaphoric interpretation of modifiers may be crucial in understanding the underlying parsing processes of high-attaching languages. Their hypothesis is born from the observation that there are languages, such as German, whose RCs necessarily need to be introduced by relative pronouns carrying morphological features, while the RCs of other languages, such as English, can be headed by either pronouns without agreement features or complementizers (or even null elements). Languages whose RCs are obligatorily headed by relative pronouns are more sensitive to anaphoric information, and languages that exhibit optionality in this respect are less sensitive to anaphoric effects. The claim being made is that, because anaphoric processes aim to bind the RC to a salient discourse referent, i.e., N1 due to its association with the matrix clause, languages with a higher degree of anaphoric sensitivity are more likely to attach high. To prove their proposal, Hemforth and colleagues undertook experiments using unspeeded and speeded methods contrasting RCs and PPs that yielded corroborative results for German: parsing processes favor high attachment for RCs, since these are subject to anaphoric factors, and low attachment for PPs, in which anaphoric processes do not apply. Nevertheless, the experimental data do not support this proposal for languages such as Romanian and Croatian, the former exhibiting low attachment preferences, yet having an obligatory relative pronoun with agreement features (Ehrlich et al., 1999), and the latter indistinctively exhibiting high attachment preferences for RCs introduced by either a complementizer or a pronoun.

Another hypothesis attempting to shed light on the behavior of the human parser has to do with prosodic segmentation (Fodor, 1998, 2000, 2001, 2002). Fodor ascribes attachment asymmetries to cross-linguistic and cross-structural prosodic variance; she claims that the sound patterns projected onto sentences of varied nature can influence syntactic decisions (Fodor, 2001,

2002). Specifically, a prosodic break before the RC is thought to induce high attachment (Gilboy & Sopena, 1996), while the absence of a prosodic break prompts the parser to attach low (Fodor, 1998). This postulation is derivative from the distinction between heavy and light constituents, captured in the *anti-gravity law*: “a heavy constituent seeks out an equally heavy left sister to associate with; a light constituent looks for a light left sister (...) the net effect of the same-size-sister principle is to favor high attachment for heavy attachées and low attachment for light ones” (Fodor, 1998, p. 302). Because heavy constituents are more likely to form a single prosodic unit than lighter ones, a prosodic break is thought to occur before a prosodically heavy RC as indicative of prosodic segmentation. Additionally, Fodor (see 6 below) postulates that even in silent reading (accounting for the results drawn from questionnaire studies), prosodic factors are taken into account by the parser.

(6) Implicit Prosody Hypothesis (IPH):

In silent reading, a default prosodic contour is projected onto the stimulus, and it may influence syntactic ambiguity resolution. Other things being equal, the parser favors the syntactic analysis associated with the most natural (default) prosodic contour for the construction

(Fodor, 2002).

Although Fodor’s proposal does not fully provide an explanation for cross-linguistic attachment asymmetries (Fernández, 2003), several studies focusing on the length of the RC and pitch accent, i.e., prosodic weight, have provided evidence in support of the Implicit Prosody Hypothesis (Schafer et al., 1996; Maynel, 1999; Abdelghany & Fodor, 1999; Walter et al., 1999;

Igoa, 1999; Quinn et al., 2000; Lovric & Fodor, 2000; Lovric et al., 2000; Lovric, 2002).

3. THE PSEUDO-RELATIVE CLAUSE HYPOTHESIS

In recent work, Grillo & Costa (2013 *in press*) put forward a pro-universalist hypothesis to account for the high/low attachment cross-linguistic parsing asymmetry, based on purely syntactic principles. They call attention to the fact that many high-attaching languages allow for pseudo-relatives (PRs), a language-specific construction that is not available in the structural inventory of languages that reportedly abide by Late Closure (see Table 1 for a cross-linguistic comparison of attachment preferences and the availability of pseudo-relatives).

LANGUAGE	ATTACHMENT	PSEUDO-RELATIVES
English	Low	No
Romanian	Low	No
Basque	Low	No
Chinese	Low	No
German (?)	High/Low	No
Russian (?)	High	No
Bulgarian (?)	High/Low	No
Norwegian (?)	Low	Yes
Swedish (?)	Low	Yes
Spanish	High	Yes
Galician	High	Yes
Dutch	High	Yes ¹
Italian	High	Yes
French	High	Yes
Serbo-Croatian	High	Yes
Japanese	High	Yes
Korean	High	Yes
Greek	High	Yes
Portuguese	High	Yes

Table 1: Attachment Preferences and PR Availability (taken from Grillo & Costa, 2013 *in press*)

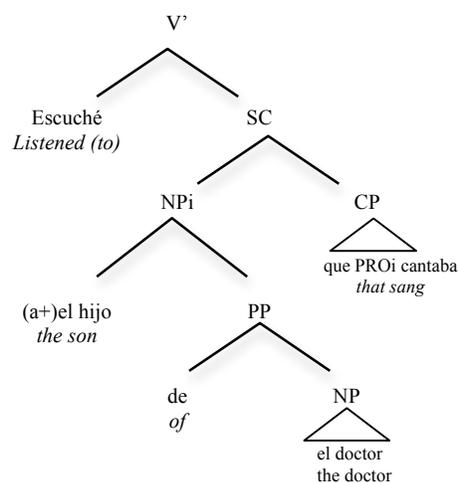
Their claim is based on the fact that PRs, despite being string identical to RCs, behave like small clause predicates (SCs) that take the whole complex NP as their subject, and consequently, can't be predicated of only a subpart of the *NP1 of NP2* string. Under Cinque's

¹ It should be noted that Dutch does NOT allow PR constructions. The table needs to be revised for accuracy.

(1992) account, PRs are treated as small clauses on observation that they share significant structural and semantic properties with English SCs of the Acc-ing type. Accordingly, just like the SC construction in (7), a PR can only take the complex NP as its subject (8).

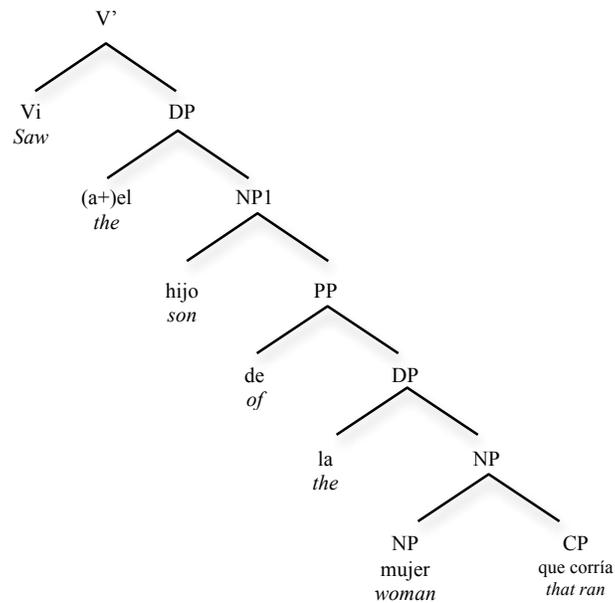
(7) Considero [sc al hijo del doctor inteligente]
I consider the son of the doctor smart

(8) Escuché al hijo del doctor que cantaba
I listened to the son of the doctor that sang



On the other hand, RCs differ from PRs/SCs on syntactic and semantic grounds (Cinque, 1992; Guasti, 1993; Grillo & Costa, 2013 *in press*). RCs are CPs that attach to the NP of the noun associated with them, and are allowed to associate with either the whole complex NP or NP2 in this case, yet are more likely to attach to the latter in compliance with locality rules. (9) is the syntactic configuration of a low-attaching RC.

(9) Vi al² hijo de la mujer que corría
I saw the son of the woman that ran



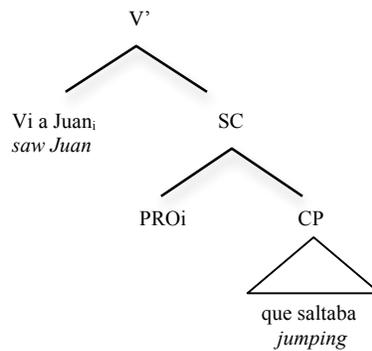
A PR and an RC readings can both be available in the same construction under the necessary conditions relating to the syntactic and semantic properties of these clauses; for example, (8) also allows for an RC reading, thus enabling the syntactic configuration of (9). It is then expected that when processing syntactically ambiguous constructions that admit a double reading, high attachment preference will be favored on the assumption that the parser will project PRs at times, *NP1 of NP2* being the only available subject in this case. It must be borne in mind that principles of locality are maintained throughout under this hypothesis, for the most local, only accessible subject for a small-clause predicate is the whole complex NP (see 5). Consequently, referring to high attachment here is rather illusory, but this reference is used in this paper to present an account on the topic consistent with the previous ones. Grillo and Costa claim that while the PR/RC grammatical dissimilarity has been overlooked in all previous studies

² It should be noted that in Spanish, the preposition *a* is used to introduce [+ human] objects (*Juan besó a Laura*, but not **Juan besó Laura*, e.g.).

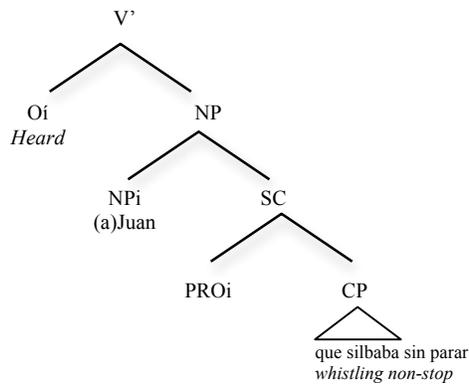
on attachment preferences, it is pivotal in understanding the high-attachment tendency exhibited in some of the languages of Table 1, and in preserving universal locality principles.

Cinque (1992) proposes that, just like SCs, PRs are of three types. First, the PR in (8) is treated as the complement of the matrix verb *escuché*, with *el hijo del doctor* in [Spec, PR]. PRs can also appear in adjunct positions, attached to the V-bar projection of the matrix verb, as in (10), and within NPs, as in (11).

(10) *Vi a Juan que saltaba*
I saw Juan jumping



(11) *Oí a Juan que silbaba sin parar*
I heard Juan whistling non-stop



The structural asymmetries discussed above directly condition the language-internal distribution of PRs and RCs. While the distribution of PRs is identical to that of SCs, RCs are CPs within an NP that can manifest themselves in as many environments as an NP can. Namely, RCs can occur in subject position, object position, indirect object position and in prepositional complements:

(12) El niño que sabe cantar es rubio (*subject*)
The boy that can sing is blond

(13) Vi al niño que sabe cantar (*object*)
I saw the boy than can sing

(14) Di un regalo al niño que sabe cantar (*indirect object*)
I gave a present to the boy that can sing

(15) Quedé con el niño que sabe cantar (*prepositional complement*)
I met with the boy that can sing

Another way in which pseudo-relatives contrast with restrictive relative clauses is in the properties of their antecedents. Whereas the noun heading a pseudo-relative construction can be a proper noun, the antecedent of a restrictive relative must be a common noun, as displayed in (16).

(16) Conozco a la niña/ *Rosa que está sentada en el banco
*I know the girl/*Rosa that is sitting on the bench*

On semantic grounds, PRs denote propositions and events, whereas RCs denote individuals or entities. (17) more than likely refers to the perception of the event consisting of slaughtering the pigs (with the butcher included in the act) rather than to the individual. The

sentence *Alguien escuchó la matanza de los cerdos* (*Someone heard the slaughter of the pigs*) can be treated as semantically equivalent to (17).

- (17) Alguien escuchó al [sc carnicero [CP que estaba matando a los cerdos]]
Someone heard the butcher slaughtering the pigs

Ensuing from the semantic property outlined above, PRs, like other types of clausal complements, are selected by a restricted subset of verbs. PR-taking verbs are perceptual verbs (see, hear, watch, listen...) almost exclusively, but can also be non-perceptual in some contexts, as shown in (18) and (19). Moreover, stative and modal verbs cannot occur in PRs, as shown in (20) and (21).

- (18) Me encontré (*non-perceptual vb*) a Juan que lloraba
I found Juan crying
- (19) Pillé (*non-perceptual vb*) a Juan que bailaba sin parar.
I caught Juan dancing non-stop
- (20) *Vi a Juan que era (*stative verb*) estudiante
**(I) saw Juan that was a student (literal translation)*
- (21) *He visto a Juan que podía (*modal verb*) nadar
**(I) have seen Juan that could swim (literal translation)*

Lastly, there are also restrictions on the temporal relation between the matrix verb and the verb in the PR. Commonly observed in clausal complementation, SoT (sequence of tenses) effects are also in play in PRs: if the main verb is in the present or past tense, the verb in the complement must also be in the present or in the past tense, respectively, as in (22) and (23).

(22) He visto a Juan que corría/*corre mucho
*I have seen Juan that ran/*runs a lot (literal translation)*

(23) Veo a Juan que corre/*corría mucho
*I see Juan that runs/*ran a lot (literal translation)*

4. EXPERIMENT

According to Grillo and Costa's hypothesis, native speakers of Romance languages may exhibit high attachment preferences in cases where both a pseudo-relative and a relative reading are obtainable given the same string of words. Here, we understand that a sentence is structurally ambiguous when, under the necessary syntactic and semantic conditions, the parser has the option to project a pseudo-relative structure as well. High attachment is expected if the parser chooses a pseudo-relative reading.

First, a relative-clause reading becomes available when a pseudo-relative construction in argument position, this is, as the complement of a perception verb, is headed by an *NPI + of + NP2* string consisting of common nouns, as displayed in (24) and (25):

(24) Vi al hijo del señor que corría mucho (*PR and RC readings available*)
I saw the son of the gentleman that ran a lot/ running a lot

(25) Vi al hijo de Juan que corría mucho (*RC reading available in association with NI*)
*I saw the son of Juan (Juan's son) running a lot/*that ran a lot*

Second, a relative clause reading is also accessible when a pseudo-relative construction manifests itself in adjunct position.

(26) Golpeé al hijo del señor que saltaba (PR and RC readings available)
I hit the son of the gentleman while he was jumping/that was dumping

(27) Golpeé al hijo de Juan que saltaba (RC reading available in association with NI)
I hit the son of Juan (Juan's son) while he was jumping/who was jumping

It is worth emphasizing that PRs are subject to the semantic conditions outlined in section 3. Should these conditions not be met, the parser will only be able to project a relative clause construction, hence blocking an ambiguous interpretation. For instance, a pseudo-relative interpretation is nonexistent due to the tense mismatch between the matrix and the subordinate verb in (28), the use of a modal verb in the subordinate clause in (29), and the use of a stative verb in the subordinate clause in (30):

(28) Oí al hijo del señor que gritaba (PR reading not available)
I hear the son of the gentleman that was shouting

(29) Oí al hijo del señor que podía hablar ruso (PR reading not available)
I heard the son of the gentleman that could speak Russian

(30) He visto al hijo del señor que poseía una mansión (PR reading not available)
I have seen the son of the gentleman that owned a mansion

4.a. Method and Participants

(N=60) native speakers of Iberian Spanish participated in an offline questionnaire designed to shed more light on the extent to which the availability of pseudo-relatives modulates attachment preferences in Spanish. Participants were never made knowledgeable of the purpose of the experiment.

4.b. Materials and Design

Each questionnaire consisted of 51 sentences in Spanish followed by a double-choice *a/b*

question. Two versions of the questionnaire were distributed via online platforms. Both versions included the same experimental items and fillers in a pseudo-randomized order: first, four ice-breaking fillers, and then 24 experimental items, each presented separated by one distractor sentence. The only difference between versions A and B is to be found in the randomization of the order in which the items were presented on the questionnaire.

All 24 items included constructions of the form *NP of NP + RC/PR*. Fillers were a combination of RC/PR constructions to be associated with non-complex NPs, and constructions with complex NPs of the form *NP of NP* followed by non-finite small clauses. (31) is a sample experimental item and (32) is a sample filler:

(31) Alguien miró a la sirvienta de la actriz que cosía en el balcón.

¿Quién cosía en el balcón? A. La sirvienta; b. La actriz.

(31)' Someone saw (*looked at*) the servant of the actress that was sewing on the balcony.

Who was sewing on the balcony? A. The servant; b. The actress.

(32) Marta escuchó a la hija de la mujer hablar.

¿Quién hablaba? A. La hija de la mujer; b. La mujer.

(32)' Marta heard the daughter of the woman talk.

Who was talking? A. The daughter of the woman; b. The woman.

The experimental items can be divided into four groups of 6 items on the basis of the language-internal distribution of the RC/ PR constructions in the sentence. The first group of items includes structurally ambiguous clauses headed by *NP of NP* strings in direct object (DO) position, where both PR clauses and RCs can occur. The verb of the matrix clause of each of the

items for this condition was always a perception verb to fully allow for a PR reading. Because both a pseudo-relative and a relative reading are available simultaneously in the each of the items of this group, a higher rate of attachment preferences for the higher NP is expected in view of the fact that the parser can, at times, project a pseudo-relative clause reading (see section 3 for review). Table 2 contains the experimental inventory of the DO group.

DO1	Alguien miró a la sirvienta de la actriz que cosía en el balcón <i>Someone saw (looked at) the servant (FEM.) of the actress that was sewing on the balcony</i>
DO2	Alguien oyó al hijo del señor que estornudaba sin parar <i>Someone heard the son of the man that was sneezing non-stop</i>
DO3	Rosa contempló al gato del hombre que jugaba con el llavero <i>Rosa watched the cat of the man that was playing with the keychain</i>
DO4	Juan vio al secretario del abogado que venía borracho <i>Juan saw the secretary (MAS.) of the lawyer (MAS.) that arrived drunk</i>
DO5	Estás oyendo al hijo de la vecina que está cantando en voz alta <i>You're hearing the son of the neighbor (FEM.) who was singing aloud</i>
DO6	Alguien vio al esposo de la mujer que corría que se las pelaba <i>Someone saw the husband of the woman that was running very fast</i>

Table 2: Direct Object Position

The second group of items is formed by relative clauses headed by *NP of NP* strings in prepositional complement (PC) position, where PR clauses can't possibly occur (see Table 3 below). Because syntactic rules force a RC reading, a higher rate of low attachment preferences is expected for the items of this group.

PC1	Alguien atentó contra la sirvienta de la actriz que estaba en el balcón <i>Someone attempted an attack against the servant (FEM.) of the actress that was on the balcony</i>
PC2	Alguien contactó con el hijo del señor que comía sin parar <i>Someone got in contact with the son of the man that was eating non-stop</i>
PC3	Rosa tiró la pelota hacia el gato del hombre que jugaba con el llavero <i>Rosa threw a ball towards the cat of the man that was playing with the keychain</i>
PC4	Juan comenzó a conversar con el secretario del abogado que llegaba borracho <i>Juan began to talk to the secretary (MAS.) of the lawyer (MAS.) that arrived drunk</i>
PC5	Has discutido con el hijo de la vecina que estaba cantando en voz alta <i>You've argued with the son of the neighbor (FEM.) that was singing aloud</i>
PC6	Alguien cruzó miradas con el esposo de la mujer que corría mucho <i>Someone traded glances with the husband of the woman that ran a lot</i>

Table 3: Prepositional Complement Position

The third group is formed by sentences with RCs headed by a complex NP of the *NP of*

NP type in preverbal subject position, and the sentences of the last group consist of RCs headed by a *NP of NP* string in post-verbal subject position. Lower attachment preference is expected in view of the fact that PR constructions are not allowed in subject positions. If syntactic factors do, in any sense, play a decisive role in attachment resolutions, the attachment decisions of the parser should not be altered when the subjects with embedded RCs are presented post-verbally in the sentence. However, based on pre-experimentally elicited intuitions of a small group of native Spanish speakers, an increased rate of high attachment is expected in the post-verbal case. Tables 4 and 5 list the experimental stimuli of the preverbal and postverbal subject groups.

PRE1	La sirvienta de la actriz que corría apresuradamente vino a la cena <i>The servant (FEM.) of the actress that was running hastily came to dinner</i>
PRE2	El hijo del señor que saltaba sin parar es americano <i>The son of the man that jumped non-stop is American</i>
PRE3	El esposo de la mujer que corría mucho es gordo <i>The husband of the woman that ran a lot is fat</i>
PRE4	La mujer del doctor que miraba constantemente el reloj llegó a la estación <i>The wife of the doctor (MAS.) that kept looking at the clock arrived at the station</i>
PRE5	El hijo del profesor que no paraba de llorar juega a fútbol <i>The son of the professor (MAS.) that was crying non-stop plays soccer</i>
PRE6	El hijo del doctor que bebía agua me dijo que iba a llover <i>The son of the doctor (MAS.) that was drinking water told me that it was going to rain</i>

Table 4: Preverbal Subject Position

POS1	Vino a la cena la sirvienta de la actriz que corría muy lentamente <i>She came to dinner, the servant (FEM.) of the actress that was running very slowly</i>
POS2	Es americano el hijo del señor que saltaba sin parar <i>He's American, the son of the man that jumped non-stop</i>
POS3	Es gordo el esposo de la mujer que corría mucho <i>He's fat, the husband of the woman that ran a lot</i>
POS4	Llegó a la estación la mujer del doctor que comía sin parar <i>She arrived at the station, the wife of the doctor (MAS.) that ate non-stop</i>
POS5	Juega a fútbol el hijo del profesor que no para de llorar <i>He plays soccer, the son of the professor (MAS.) that doesn't stop crying</i>
POS6	Me dijo el hijo que no el hijo del doctor que comía cacahuets <i>He said no, the son of the doctor (MAS.) that ate peanuts</i>

Table 5: Postverbal Subject Position

For consistency purposes, the length of the experimental items has been held constant throughout to the extent possible, and every noun of interest, i.e., every noun potentially establishing an association with the RCs/PRs, has been given the same status in terms of animacy

and referentiality.

4.c. Results and Discussion

The distinction between versions A and B of the questionnaire is to be ignored because these differed only in their pseudo-randomization of items. Table 1 shows the mean percentage of high attachment preference per item.

For each of the comparisons of interest, i.e., direct object position vs. prepositional complement position, preverbal subject position vs. postverbal subject position, two paired t-tests were conducted over the data. Those tests were a subject-based analysis, collapsing over the 6 item exemplars constituting any condition, and an item-based analysis, collapsing over the 60 subjects providing judgments for any condition. It is only when both subject- and item-based t-tests are significant that the claim be made that a difference between conditions has been demonstrated.

DIRECT OBJECT POSITION			PREPOSITIONAL COMPLEMENT POSITION		
1	83.3	la sirvienta de la actriz <i>the servant (FEM.) of the actress</i>	1	70.0	contra la sirvienta de la actriz <i>against the servant of the actress</i>
2	66.7	el hijo del señor <i>the son of the man</i>	2	45.0	con el hijo del señor <i>with the son of the man</i>
3	58.3	el gato del hombre <i>the cat of the man</i>	3	48.3	hacia el gato del hombre <i>towards the cat of the man</i>
4	76.7	el secretario del abogado <i>the secretary (MAS.) of the lawyer (MAS.)</i>	4	78.3	con el secretario del abogado <i>to the secretary (MAS.) of the lawyer (MAS.)</i>
5	91.7	el hijo de la vecina <i>the son of the neighbor (FEM.)</i>	5	75.0	con el hijo de la vecina <i>with the son of the neighbor (FEM.)</i>
6	65.0	el esposo de la mujer <i>the husband of the woman</i>	6	41.7	con el esposo de la mujer <i>with the husband of the woman</i>
PREVERBAL SUBJECT POSITION			POSTVERBAL SUBJECT POSITION		
1	61.7	la sirvienta de la actriz <i>the servant (FEM.) of the actress</i>	1	45.0	la sirvienta de la actriz <i>the servant (FEM.) of the actress</i>
2	56.7	el hijo del señor <i>the son of the man</i>	2	53.4	el hijo del señor <i>the son of the man</i>
3	35.0	el esposo de la mujer <i>the husband of the woman</i>	3	21.7	el esposo de la mujer <i>the husband of the woman</i>
4	58.3	la mujer del doctor <i>the wife of the doctor</i>	4	43.4	la mujer del doctor <i>the wife of the doctor</i>
5	60.0	el hijo del profesor <i>the son of the professor (MAS.)</i>	5	55.0	el hijo del profesor <i>the son of the professor (MAS.)</i>
6	56.7	el hijo del doctor <i>the son of the doctor (MAS.)</i>	6	58.3	el hijo del doctor <i>the son of the doctor (MAS.)</i>

Table 6: Mean Percentage of High Attachment Preference per Item

4.c.1. Direct Object Position vs. Prepositional Complement Position

High Attachment to the entire complex NP was more strongly preferred when the construction of interest was a direct object (73.6%) rather than a prepositional complement (59.7%). That difference in attachment preference was significant both in the subject-based analysis, $t_1(59) = 5.60$, $p < .0001$, and the item-based analysis, $t_2(5) = 3.74$, $p < .025$. Figure 1 shows the mean high attachment preference for each of the conditions, i.e., direct object vs. prepositional complement, that were compared.

That the difference in high attachment is not significant in item 4 may be ascribable to semantic and pragmatic factors related to the nature of the verb of the matrix clause. It could be posited that the periphrastic construction *comenzar a conversar* (*started to talk*) in item 4 of the PC group may bear a particular semantic nuance in the context in which the sentence is set. This

semantic nuance, to be found specifically in the verb *comenzar* (*start*), could be interpreted as adding a sense of difficulty to the action depicted, and may be triggered when connected with the semantic features of the RC *que llegaba borracho* (*that arrived drunk*). To illustrate, participants could have interpreted the sentence as “Juan started to talk to the secretary of the lawyer to check if a coherent conversation could ensue, keeping in mind the drunkenness of the subject”, thus creating a stronger connection between the object of the matrix clause and the RC. My intuition is that attachment preferences for item 4 would have followed the general tendency exhibited in the DO/PC comparison, had a non-periphrastic verbal form been used instead.

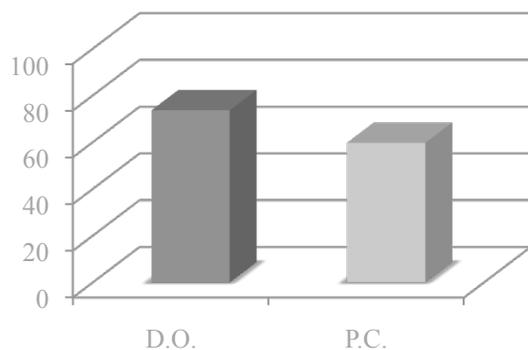


Figure 1: Mean HA Preference for DO and PC Constructions

The results yielded from comparing the first two conditions (direct object position vs. prepositional complement position) with statistical measures support Grillo and Costa’s proposal. High attachment was significantly preferred when the items of interest contained syntactically ambiguous constituents, which could be parsed as either PR or RC constructions. High attachment was significantly dispreferred when the items of interest contained

unambiguous constituents, which could only be parsed as RC constructions. The results show a higher rate of high attachment for constituents which, in compliance with syntactic rules, can attach to either the whole complex NP if they are parsed as PRs, or to NP2 if they are parsed as RCs. I would like to remind the reader that the level of animacy of the nouns forming the complex NPs and the length of the attachee and the attacher were held constant in the stimuli of both conditions. It follows that the results here presented support the universality of the parser, as associating to the whole complex NP is the shortest move in the derivation for PRs, and attaching to NP2 is the most local move for RCs.

4.c.2. Preverbal Subject Position vs. Postverbal Subject Position

High attachment was more strongly preferred when the *NP of NP + RC* construction was a preverbal subject (54.7%) rather than a post-verbal subject (46.1%). Once again, that difference in attachment preference was significant both in the subject-based analysis, $t(59) = 3.55$, $p < .001$, and in the item-based analysis, $t(5) = 2.85$, $p < .05$. Figure 2 shows the mean high attachment preference for each of the conditions, i.e., preverbal vs. postverbal subject, that were compared.

This time around, item 6 doesn't seem to show the tendency described above, and for items 2 and 5 the effect seems to be weaker. Again, pragmatic factors may have contributed to a higher attachment bias in favor of *el hijo (the son)*. It is likely that the context of the sentences has influenced participants to establish a stronger relationship between *el hijo* and the activities depicted in the RCs, i.e., eating peanuts, jumping non-stop, and crying non-stop. When given

two potential individuals with whom to associate the RC, one younger and one older, participants may establish connections as biased by age-related factors in relation to the nature of the events or actions depicted in the RC.

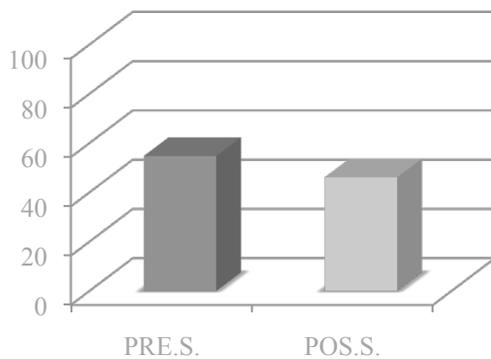


Figure 2: Mean HA Preference for Preverbal and Postverbal Subject Constructions

The results yielded from the statistical comparison of the second two conditions (preverbal subject position vs. postverbal subject position) unexpectedly show that placing subjects with embedded RCs in postverbal position lowers the rates of high attachment significantly.

The motivations behind these data are yet to be explored. As a preliminary observation, one might state that none of the previous hypotheses on the topic can provide a transparent explanation for the results here observed, mainly because most of them were put forward to accommodate cross-linguistic differences and not cross-structural attachment asymmetries. To illustrate, Gilboy and colleagues' distinction between primary and non-primary phrases is irrelevant for the present discussion because RCs, the only structure being tested in this set of stimuli, are always non-primary constituents; similarly, the Gricean maxim of clarity, if active,

can't account for language-specific issues; Gibson and colleagues' Predicate Proximity proposal cannot shed light on this particular issue, as the head of the predicate phrase and the RC are equidistant in every item being tested (namely, there is always one noun amid the head of the predicate phrase and the attaching constituent); finally, the Tuning Hypothesis and the Anaphoric Binding account also give little room to accommodate language-specific dilemmas (see section 2 for details).

The only well-known study to date that provides explanations for language-specific asymmetries is Fodor's prosody-based hypothesis (1998, 2000, 2001, 2002). To recapitulate, Fodor maintains that, on the one hand, there is a prosodic constraint (the same-size-sister constraint) playing a decisive role in attachment preferences by which incoming constituents attach to antecedents of similar prosodic weight, and on the other hand, cross-linguistic attachment dissimilarities may be attributable to the distinct prosody of languages. While the same-size-sister constraint fails to explicate the set of data discussed here, for the attachees and the attachers share equal prosodic weight in each stimulus of both conditions (pre-verbally and post-verbally), there may be room for other prosodic considerations.

It has been endorsed in the literature that the prosodic contour of preverbal and postverbal constituents in Spanish is distinct due to factors relating to information structure (Chomsky, 1971; Jackendoff, 1972; Zubizarreta, 1998), which coupled with studies on prosodic prominence deriving from Fodor's proposal, could provide first-stage explanations for the results here discussed. Quinn and colleagues (2000) report results from experiments testing fundamental frequency (F0) that conclude that short sentence-final RCs show a tendency to be prosodically non-prominent, characterized by a gradual F0 decline over the course of the sentence; a lack of prominence resulted in low attachment bias. On the other hand, prosodically prominent

constituents, understood as independent prosodic units, were more likely to attach non-locally. This observation could, in principle, account for the preverbal/postverbal attachment asymmetry of the present study provided that an implicit prosody is indeed in play; however, it is unsuccessful in accommodating the motivations behind the percentual difference between the postverbal subject group and the prepositional complement group, in which the RCs are also in sentence-final position³.

5. CONCLUDING REMARKS

For the most part, the results drawn from this study seem to lend support to Grillo and Costa's (2013 *in press*) hypothesis that attachment preferences are modulated by the availability of PRs in certain languages, including Spanish. Support for the hypothesis is to be found in the percentage of high attachment in all conditions tested in the study, being significantly higher (73.6%) only in the group whose stimuli allowed for both an RC and a PR readings. However, the statistically significant asymmetry in attachment preferences between the preverbal and the postverbal subject group needs further investigation. Following Fodor's (1998) proposal that prosodic aspects are in play in parsing processes, along with studies using fundamental frequency measures, I pose that prosodic prominence (or powerlessness) is likely to be a factor modulating attachment biases. Further prosody-based experimental studies on the distribution of complex subjects with embedded RCs in free word order languages will elucidate the results drawn from this study.

³ The direct object group is excluded here because its stimuli allow PRs.

Furthermore, one would like to investigate the role of RC-extraposition in the determination of attachment preferences. Extraposition is a syntactic phenomenon by which a heavy constituent, such as a RC, is moved to the right of its canonical position (33 below is a standard sentence, and 34 is the extraposed version).

(33) A friend of a journalist who had just returned from Ukraine appeared in the news.

(34) A friend of a journalist appeared in the news who had just returned from Ukraine.

Wagner (2010) acknowledges the interplay between syntax and prosody by proposing that an RC that is prosodically separated from its head is also syntactically separated from its head (string-vacuously sometimes), and posits that string-vacuous RC-extraposition triggers a prosodic break prior to the RC. In turn, the presence of a prosodic break before the RC renders the RC prosodically independent, which, in accordance with the results of Maynell's (1999) experiment, may be indicative of a high attachment bias. Further studies of RC-extraposition in connection with attachment preferences are encouraged to shed more light on the nature of the human parser.

This paper is a contribution to the ongoing research devoted to retrieving the different factors triggering cross-linguistic asymmetries in attachment preferences.

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