UNIVERSITY OF THE BASQUE COUNTRY (UPV/EHU)

DOCTORAL DISSERTATION

ATTACHMENT PREFERENCES AND THEIR PROCESSING COST: EVALUATING THE VALIDITY OF THE PSEUDORELATIVE-FIRST HYPOTHESIS IN SPANISH AND ITALIAN

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Abstract

Strategies for attachment resolution in double-antecedent relative clauses ('NP1 of NP2 that/who EV') have been widely studied since the seminal works by Frazier (1979) and Cuetos and Mitchell (1988). None of the hypotheses proposed in the years following the latter's publication have explained the wide range of variation in the preferences for RC attachment.

In 2014, Grillo and Costa proposed the Pseudorelative-First (PR-First) Hypothesis, which states that the availability of pseudorelative clauses (PRs) must be the reason why some languages attach the embedded clause high, despite it being allegedly the costliest option.

In this dissertation, I test the Pseudorelative-First Hypothesis and determine the cognitive cost of either strategy of attachment — high or low — in Spanish and Italian by using the self-paced reading method.

Results show that the Pseudorelative-First Hypothesis cannot account for the high attachment preference in Spanish. Furthermore, in the Italian data, I find a modulation in the attachment based on the availability of pseudorelative clauses.

In sum, the results offered in this dissertation do not find support for the Pseudorelative-First Hypothesis, but rather suggest that pseudorelative availability must be taken into account as one of the many modulating factors in attachment preferences, at least in Italian.

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Hic ne sunt leones, Appae sunt!

(Che continua ad amarmi, suo malgrado)

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Abbreviations and acronyms

art: article

aux: auxiliary

CE: centre embedded

COMP: complementizer

DP: determiner phrase

EV: embedded verb

IMPF: imperfective

INF: infinitive

L1: first language (mother tongue)

L2: second language

MV: matrix (main) Verb

NP: noun phrase

PP: prepositional phrase

PIC: prepositional infinitival construction

PR: pseudorelative (clause)

pre: preposition

PROG: progressive

RB: right branching

RC: relative clause

SD: standard deviation

VP: verb phrase

Nik gauza zail batzuk

Sarri egiten ditut

A Selvaggia

y a todas sus hermanas

1. Introduction

1.1 Aims and outline of the dissertation

In this dissertation, I will address the issue of relative clause (RC) attachment with a double antecedent and the variation in attachment preferences in such type of sentences. This issue has yet to be resolved: the existence of cross- and intra-linguistic differences in attachment preferences that do not stem from grammatical characteristics of a specific language goes against the idea of language processing as a universal mechanism. This is why I tested the Pseudorelative-First (PR-First) Hypothesis proposed by Grillo and Costa (2014), which claims to have found the reason for such a variation in attachment preferences: the availability of pseudorelative clauses (PRs) in languages such as Italian and Spanish.

In the following Section of this chapter, I will first describe the issue of relative clause attachment in detail. I will then proceed to describe the proposal of Late Closure and Minimal Attachment by Frazier (1979). I will provide an overview of the seminal work by Cuetos and Mitchell (1988), that was the first evidence that did not support Frazier's proposals in Spanish, and was then followed by many other works in other languages — such as Italian, Portuguese, French etc. I will highlight how these differences in attachment preference are not only crosslinguistic, but also vary intralinguistically, depending on the methodology used by the researchers. Furthermore, I will consider the many grammatical and lexical factors that have been found to modulate attachment preferences. Finally, I will briefly illustrate the hypotheses that have been proposed over the years to explain such variations.

In the third Section of this chapter, I will introduce the Pseudorelative-First Hypothesis (Grillo & Costa, 2014) and its predictions. This hypothesis is based on the language-dependent feature of the availability of pseudorelative clauses.

The fourth Section of this chapter focusses on the works carried on during the past ten years, directly testing the Pseudorelative-First Hypothesis. I will describe each work in detail and emphasise their methodological problems.

The following chapters are devoted to the description of two norming studies and four self-paced reading experiments that I run in Spanish — Experiments 1 and 2 — and Italian — Experiments 3 and 4 —, which were designed to directly investigate the Pseudorelative-First Hypothesis. The complete set of materials used

in the studies can be found in the appendices. In my experiments, I took into account the caveats described in the previous Sections, and controlled for a variety of lexical features — lexical frequency, verb plausibility for each attachment, and pseudorelative availability — by means of two norming studies in each language. The aim of the experiments is to answer the following research questions:

i) Can the Pseudorelative-First Hypothesis explain high attachment preferences in Spanish and Italian? (Experiments 1 and 2 in Spanish and Experiments 3 and 4 in Italian)

ii) What are the attachment preferences in Spanish and Italian? (Experiment 2 in Spanish and Experiment 4 in Italian)

iii) Is high attachment costlier than low attachment in Spanish and Italian? (Experiment 1 in Spanish and Experiment 3 in Italian)

iv) Are there any differences in attachment preferences between Spanish and Italian? (Experiments 1 and 2 in Spanish and Experiments 3 and 4 in Italian)

The results of my experiments do not support the Pseudorelative-First Hypothesis in either language. However, in Italian, I found a modulation towards high attachment based on the availability of pseudorelative clauses.

The outline of the dissertation is the following. Chapter 2 will present Experiments 1a and 1b, aiming to determine the processing costs of PRs, high- and low-attaching RCs in Spanish. The materials were non-ambiguous relative clauses so as to measure the baseline processing cost of each structure in terms of accuracy, reading and response times. Results show an overall facilitation for high attachment, regardless of the PR availability, in all measures. Therefore, no support for PR-First was found.

Chapter 3 will describe Experiments 2a and 2b, with the intent to investigate attachment preferences in Spanish. The materials were ambiguous relative clauses so as to measure the attachment preferences of the participants, as well as the processing cost of each structure by means of response and reading times. Results show an overall preference and facilitation for high attachment, regardless of the PR availability, in all measures. Therefore, no support for PR-First was found.

Chapter 4 will describe Experiments 3a and 3b, which were close replicas of Experiments 1a and 1b designed to determine the cognitive costs of PRs, high- and low-attaching RCs in Italian. The materials were non-ambiguous relative clauses, so to measure the baseline processing cost of each structure in terms of accuracy, reading and response times. Results show an overall facilitation of high attachment in the accuracy and response times. However, in the accuracy, this facilitation was modulated by the availability of pseudorelative structures. However, I argue that this modulation does not provide support for the Pseudorelative-First Hypothesis.

Chapter 5 will describe Experiments 4a and 4b, which were close replicas of Experiments 2a and 2b intended to investigate the attachment preferences in Italian. The materials were ambiguous relative clauses, so to measure the attachment preferences of the participants, as well as the processing cost of each structure by means of response and reading times. Results show an overall preference for high attachment, albeit modulated by the availability of pseudorelative structures. However, I argue that this modulation does not provide support for the Pseudorelative-First Hypothesis.

Chapter 6 compares the results from Experiments 1 and 3, in order to ascertain whether there are any differences between Spanish and Italian in terms of the cognitive costs of PRs, high- and low-attaching RCs; and the results from Experiments 2 and 4, in order to investigate whether Spanish and Italian differ in their attachment preferences. Results show that high attachment is facilitated and preferred to a greater extent in Italian than in Spanish. Furthermore, I found that the availability of pseudorelative clauses only modulates attachment in Italian.

Chapter 7 contains the overall discussion and conclusions, taking into account the results from all the experiments and the previously mentioned literature. Overall, we see a consistent preference and facilitation for high attachment, both in off- and online measures. This preference, in some cases, is modulated by the availability of pseudorelatives, but, as already noted, this only occurs in Italian. The analysis for the conjoined data from Spanish and Italian also shows a partial modulation based on the availability of PRs. I contend that the modulation found in the data does not provide support for the Pseudorelative-First Hypothesis, since it claims that the PR availability *determines* attachment preferences in both Italian and Spanish. Instead, I suggest that PR availability is one of the many modulating factors in attachment preferences, and should be treated as such (see also Alonso-Pascua, 2020).

1.2 The attachment issue

In this dissertation, I test the Pseudorelative-First (*henceforth,* PR-First) Hypothesis (Grillo & Costa, 2014) in a series of experiments in Spanish and Italian. This hypothesis had been proposed in order to solve a pivotal question in linguistic and psycholinguistic research: Are parsing mechanisms universal? Do we develop different parsing strategies depending on the characteristics of one's own language or languages? If so, which of these parsing mechanisms are universal, and which are language-specific?

In order to understand this issue, as well as the PR-First Hypothesis and its predictions, it is necessary to introduce a few core concepts about parsing and relative clause attachment, and describe how researchers became aware of the problem.

Here I refer to parsing as the cognitive process by which a sentence is analysed and its syntactic structure is determined. It involves assigning a class to each word and determining the hierarchical relationships between them, creating a structured representation of the sentence processed. The cognitive function that serves as the tool (or algorithm) that carries out this process is called a "parser" (Kempen, 1999). Taking as an example the parsing of a relative clause — which is the first piece of the puzzle that I am investigating —, a successful parser would interpret the sentence "The girl who was wearing a red hat ate an apple at the cafeteria" as "There was a girl at the cafeteria who ate an apple; of all the girls at the cafeteria, I am talking about the one who was wearing a red hat". The parser is correctly interpreting the relationship between the girl and the apple — the former is eating the latter, and not vice versa —; it is correctly assigning the characteristic of wearing a hat to the girl — and not to the apple —; and it is also correctly assigning the colour red to the hat — not to the apple —. The creation and interpretation of relationships and interdependencies between words is the main goal of a parser.

Still, for us to understand how parsing exactly works in our minds, it is necessary to determine *how* the parser correctly assigns and connects elements in the sentence – that is, how it *parses* the sentence correctly. Since the human mind is limited in terms of computational power, it needs to employ some principles and strategies, in order to minimise effort and maximise results, even when posed with ambiguous

sentences (Frazier, 1979; Kempen, 1999). Here is where I came across the first piece of the puzzle that I am investigating. In 1979, Lyn Frazier, in her doctoral dissertation, proposed two basic principles of parsing in her doctoral dissertation:

> MINIMAL ATTACHMENT: "Attach incoming material into the phrase-marker being constructed using the fewest nodes consistent with the well-formedness rules of the language under analysis" (Frazier, 1979, p. 111);
>
> LATE CLOSURE: "When possible, attach incoming material into the phrase or clause currently being parsed", (Frazier, 1979, p. 111).

The core meaning of these principles is easy[1] and economical: they state that whenever the parser faces an ambiguous sentence, these principles will help disambiguate the sentence into the easiest, least cognitively costly option possible. This would apply to all kind of syntactic structures. Let us take as an example the case of an ambiguous relative clause with two possible antecedents:

(1) a. *Marta conoce al hijo del panadero que corría*
Marta knows the son of the baker that was running

b. Low Attachment:
Marta conoce a [DP el hijo [PP del panadero [RC que corría]]]
Marta knows [DP the son [PP of the baker [RC that was running]]]

c. High Attachment:
Marta conoce a [DP el hijo [PP del panadero] [RC que corría]]
Marta knows [DP the son [PP of the baker] [RC that was running]]

The example in (1)a is structurally ambiguous and has two possible meanings. On the one hand, one could attach the embedded verb (EV) to the second antecedent ('the baker', which, in this case, is also the linearly closest element) and read the sentence as "Marta knows the son of the baker. Of all the bakers she knows, I am referring to the baker who was running". This parsing option is called "Low Attachment" (LA[2], see (1)b), because the relative clause 'that was running' attaches

[1] Frazier (1979, p. 26) herself describes them as "two very general strategies".
[2] This classification can be found in (Frazier & Rayner, 1982)

to the lowest node possible (Figure 1). On the other hand, one could attach the embedded verb to the first antecedent ('the son') and read the sentence as "Marta knows the son of the baker. Of all the sons that the baker has, I am referring to the son that was running". This parsing option is called "High Attachment" (HA, see (1)c), because the relative clause 'that was running' attaches to the highest node possible (Figure 2). Both interpretations are grammatical, but, according to Frazier (1979, specifically p. 58 f. and, more generically, Chapter 4), (1)b would be the structure that burdens our memory the least because it complies with Minimal Attachment — it has the least number of syntactic nodes — and Late Closure.

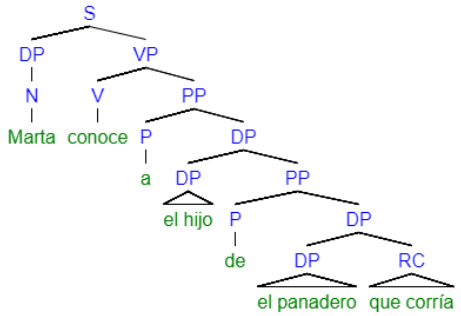

Figure 1. Syntactic tree for a low-attaching Marta conoce al hijo del panadero que corría *('Marta knows the son of the baker that was running').*

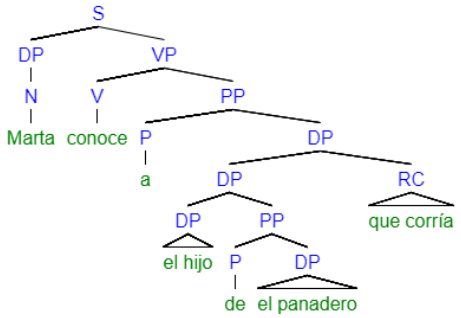

Figure 2. Syntactic tree for a high-attaching Marta conoce al hijo del panadero que corría *('Marta knows the son of the baker that was running').*

This search for guidelines and parsing strategies, such as Minimal Attachment and Late Closure, stems from the hypothesis that the principles that govern parsing are universal and apply to all languages (see Fodor, 1998; Frazier, 1979, 1987b, 1987a; Grillo & Costa, 2014; Hawkins, 2014; Mitchell & Brysbaert, 1998; Mitchell

& Cuetos, 1991). Accordingly, the mechanisms and structures underlying each language would be shared across languages, even if they differ in their actual realisation and form (Grillo & Costa, 2014; Hawkins, 2014; Mitchell & Cuetos, 1991). In fact, Frazier provided evidence that both strategies are consistently applied in English with a number of different structures (Frazier, 1979; Frazier & Rayner, 1982; Rayner et al., 1983), as well as in Dutch and Japanese (Frazier, 1987b, 1987a) as far as Minimal Attachment is concerned.

As an example of the empirical evidence provided by Frazier for Late Closure in a variety of English structures — not only in relative clause attachment —, let us take Experiments 1 to 3 described in chapter 3 in Frazier (1979). These experiments were designed to test Late Closure in five different structure types, as shown in (2). Each type of structure (2)ABCDE had three conditions (2)abc. Conditions (2)a and (2)b were locally ambiguous up to the third to last word (that is, the third to last word disambiguated towards one or the other condition). Conditions (2)a followed Early Closure: that is, the correct parsing of these sentences required the reader to close the phrases as soon as possible — in the position indicated by the double slash "//"—, followed by a second possible — and later — closure. Conditions (2)b followed Late Closure: that is, the correct parsing of these sentences required the reader to close the phrases as late as possible — in the position indicated by the double slash "//"—, although it was preceded by another possible — and earlier — closure. Conditions (2)c were the control condition, in which the ambiguity clearly vanished in the fourth to last word for semantic reasons, making it impossible to be ambiguous towards Late or Early Closure.

(2)

A. a (Early Closure)	Though George kept on reading // the story / still bothered him.
A. b (Late Closure)	Though George kept on reading / the story // Sue bothered him.
A. c (control)	Though George kept on reading // the kids // still bothered him.
B. a (Early Closure)	Without her // contributions / would be very inadequate.
B. b (Late Closure)	Without her / contributions // the funds are inadequate.
B. c (control)	Without her // Antarctica / would be very lonely.

C. a (Early Closure)	In this race // to touch the wire / is to die.
C. b (Late Closure)	In this race / to touch the wire // she will win.
C. c (control)	In this race // to make a mistake / is to die.
D. a (Early Closure)	Mary kissed John // and his brother/ started to laugh.
D. b (Late Closure)	Mary kissed John / and his brother // when she left.
D. c (control)	Mary kissed John // and the car / hit a tree.
E. a (Early Closure)	Anne was watching // you / were laughing and nobody knew why.
E. b (Late Closure)	Anne was watching / you // she laughed and nobody knew why.
E. c (control)	Anne was watching // sirens / were blaring and nobody knew why.

In Experiment 1, 45 native speakers of English read each item in a Latin Square design. The sentences were presented word-by-word (Rapid Serial Visual Presentation RSVP paradigm) at the centre of the screen for 110 ms. The task was to recall the sentences as accurately as possible. Late Closure predicts conditions (2)b (late-closure conditions) to be easier to recall than (2)a (early-closure conditions), since they comply with the principle and would not require reanalysis from the participant. The answers were analysed in three different ways: (i) the number of words accurately recalled in the correct sentence positions; (ii) the Transitional Error Probability Method (TEPM), in which the author measured the probability of accurately recalling the first disambiguating word in the sentence (the third last word for conditions a and b, and the fourth last word for condition c), if the preceding material was accurately recalled; and (iii) the Error Type Method (ETM), which scored whether the participants recalled the sentences wrongly by substituting the actual sentence with a late or early closure version (that is, if the participants wrongly recalled the sentence to be formulated as pertaining to a different condition). Results from (i) the first type of analysis (number of words accurately recalled in the correct sentence positions) showed that there were no differences between conditions. Results from (ii) the second type of analysis showed that the probability for participants to accurately recall sentences from the late-closure condition (2)b was higher than for the early-closure condition (2)a, but only in the A and B versions of the sentences. This could be because versions A and B had more items than the other conditions and, therefore, more data points. Results from (iii) the third type of analysis showed that participants tended to recall the

sentences incorrectly as if they followed Late Closure significantly more than to recall them through any other kind of strategy (109 late-closure errors, 15 early-closure errors, 44 error of another kind). In sum, participants showed a facilitation in recalling sentences from the late-closure condition; and, when making mistakes, they preferred to (wrongly) substitute sentences with a late-closure version than with an early-closure version. Frazier interpreted these results as supporting Late Closure.

In experiment 2 and 3, Frazier used the same methods and materials as in Experiment 1, but changed the task. Participants had to decide whether the sentence they were reading was grammatical or not (grammaticality-judgement task). The words were presented for 180 ms each in Experiment 2, and for 300 ms each in Experiment 3. 16 ungrammatical sentences were added to the materials. 30 participants took part in Experiment 2 and 15 participants in Experiment 3. Late Closure predicts that subjects would perform better and faster in the late-closure condition (2)b than in the early-closure condition (2)a. The results were the following: response times for correct responses were not significantly different between conditions in Experiment 2, but they were in Experiment 3, showing that late-closure sentences (2)a were easier to process than early-closure sentences (2)b when participants were given enough time to process the items. The error rate in Experiment 2 was 29% for the late-closure sentences (2)b and 50% for the early-closure sentences (2)a; and, in Experiment 3, 17% of errors in the late-closure sentences (2)b and 39% in the early-closure sentences (2)a, showing support for Late Closure. The author claimed that, taken all together, the results of these experiments found clear confirmation for the predictions of Late Closure.

Therefore, the two principles of Late Closure and Minimal Attachment, supported by the results shown in the previous paragraphs, seemed to explain how our minds parse all kinds of sentences, including ambiguous relative clauses with a double antecedent.

However, in 1988, Cuetos and Mitchell carried out a series of experiments investigating the attachment preferences of relative clauses in Spanish, and testing Late Closure. The first two experiments tested native Spanish (Experiment 1A, N = 20) and English (Experiment 1B, N = 26) participants on 24 sentences as in (3):

(3) A *El periodista entrevistó a la hija del coronel que tuvo el accidente*

B The journalist interviewed the daughter of the colonel who had had the accident

Participants were asked about their attachment preference — that is, whether the daughter or the colonel had had the accident —. This is how high and low attachment preferences were measured. Late Closure predicts low attachment preferences in both languages. However, results showed a preference for high attachment in Spanish (72% of HA) and a preference for low attachment in English (39% of HA).

In Experiment 2, Cuetos and Mitchell (1988) tested the online development of Early vs. Late Closure strategies in Spanish using a clause-by-clause version of the self-paced reading task. The experimental materials were sentences with a [NP1-inanimate of the NP2-animate] complex antecedent (4)a whereas the control sentences had a simple animate antecedent (4)b. The sentences were not globally ambiguous: instead, they disambiguated towards low attachment in the last clause (critical region):

(4) a: experimental *Pedro miraba el libro de la chica / que estaba en el salón /viendo la tele*
Peter was looking at the book of the girl / who-that was in the living-room / watching TV

b: control *Pedro miraba la chica*[3] */ que estaba en el salón / viendo la tele*
Peter was looking at the girl / who was in the living-room / watching TV

Participants (N = 24) saw 24 items and 36 fillers. The authors measured the reading times at the critical region, to determine which of the conditions was easier to process for the participants. If the participants were to prefer low attachment while reading the experimental condition (and, therefore, attach "that was in the living room" to the girl), there would not be any delay in reading the last, disambiguating region, because the disambiguation would concur with the preferred interpretation.

[3] Due to the formatting used in the appendix of the original paper, it is impossible to find out whether the experimental items used the correct phrasing of *Pedro miraba **a** la chica […]* or the incorrect phrasing of *Pedro miraba Ø la chica.*

If, however, the participants were to prefer high attachment, the critical region would invalidate their preference and, therefore, they would incur in a delay in the reading times at the critical region. The results for the reading times at the critical region showed that experimental sentences (4)a were more difficult (slower) to read than control sentences (4)b. The authors concluded that this was because high attachment was preferred and facilitated immediately, during the earliest stages of processing, and before the end of the sentence. That is, Spanish participants parsed the sentence online using early closure (i.e., preferring high attachment), and needed time to reanalyse the sentence when the disambiguating region pointed towards low attachment. However, as of today, we know that this kind of segmentation of the sentence (line break or screen break right after NP2) consistently triggers high attachment (see de la Cruz-Pavía & Elordieta, 2015; Fernández & Sekerina, 2015; Hemforth et al., 2015; Mahmoodi et al., 2022); and that animacy as well tends to attract attachment (see Hsiao & MacDonald, 2016; Kwon et al., 2019). Therefore, the results from this experiment must be taken with caution.

Furthermore, control items in Experiment 2 were shorter than the experimental ones, leading to potential confound. Experiment 3 was designed in order to avoid this, and used the same items and controls as in Experiment 2. The authors also added longer control sentences, up to the number of words of the experimental sentences, to ensure comparability in length between experimental and control items. The "long control" items, derived from (4)a, substituted the "NP1 of NP2" antecedent with "NP1 and NP2": *Pedro miraba el libro y la chica / que estaba en el salón / viendo la tele* ('Peter was looking at the book and the girl / COMP was in the living-room / watching TV'). This condition was then compared with the sentences in (4)a and (4)b. 30 participants saw 10 experimental sentences, 10 short control sentences (like the control ones in Experiment 2), 10 long control sentences and 40 filler sentences. The experimental methods were the same as in Experiment 2, but this time the authors measured reading times for the three regions. If the reading times for the long controls differed from the experimental items, then the difference found in Experiment 2 could not be attributed to the length of the control items but, instead, to a preference for high attachment. Results from reading times showed that the first display of the short control was read faster than in the other two conditions because it was composed of fewer words. However, results also showed that experimental items were faster to process than long controls, but the authors attributed this fact to a lower acceptability rate of the control sentences as compared to the experimental ones, because of the coordinated nouns "the book and the girl".

Therefore, they concluded that the reading times for the successive displays in the long control condition were inflated. However, since they found that reading times at the third (and disambiguating) region for experimental conditions were longer than the reading times for the "inflated" long controls, they argued that the purpose of the experiment was not undermined by the infelicitous long control items.

Experiment 4 used the same procedure as Experiment 3, but the authors replaced the control conditions with a structure more similar to the experimental condition:

(5) a: experimental *Alguien disparó contra el criado de la actriz / que estaba en el balcón / con su marido.*
Someone shot the male-servant of the actress / who was on the balcony / with her husband.

b: control *Alguien disparó contra la criada de la actriz / que estaba en el balcón / con su marido.*
Someone shot the female-servant of the actress / who was on the balcony / with her husband.

Experimental sentences (5)a were disambiguated towards low attachment by means of word (socio-cultural) knowledge, whereas control sentences were ambiguous in their attachment (e.g. (5)a: in 1988, at the time of the experiment, the male servant could not be married to a man; however, in (5)b both the female servant or the actress could be married to a man, and, therefore, stand on the balcony). That is, in the control sentences, the authors replaced the NP1 with a noun that was a plausible candidate for the attachment of the embedded verb. Late Closure would predict similar reading times in the experimental and in the control conditions, because low attachment is possible in both cases. 30 participants read 24 experimental sentences and 24 controls. Results showed that the third (crucial) display was read slower in the experimental (low-attaching) condition than in the control condition (in which the participants were left free to attach the EV to either antecedent noun).

Cuetos and Mitchell concluded that the four experiments clearly showed that Spanish-speaking participants consistently preferred High Attachment (i.e., attaching the embedded verb to the first NP – the son in example (1)).

In the following decades, many other works revealed that the case of Spanish (later supported by Carreiras & Clifton, 1993, 1999; Cuetos et al., 1996; Gibson et al., 1999; Gilboy et al., 1995a; Igoa et al., 1998; Mitchell et al., 1990b) is not an outlier: a number of languages were reported to prefer High Attachment to Low Attachment. Among them, Italian (De Vincenzi & Job, 1993, 1995), Portuguese (Maia & Maia, 2001; Miyamoto, 2005; Ribeiro, 1998, 2005) and French (Frenck-Mestre & Pynte, 2000; Mitchell et al., 1990; Zagar et al., 1997). These results contradict Frazier (1979), because speakers of these languages are disambiguating sentences in the supposedly most cognitively costlier way. Studies in other languages, in turn, reported a Low Attachment preference, as predicted by Late Closure and Minimal Attachment. Among them, English (Cuetos & Mitchell, 1988; Fernández, 2003; Frazier & Clifton, 1996; Gilboy et al., 1995a; Mitchell & Cuetos, 1991), Basque (Gutierrez-Ziardegi et al., 2004) and Chinese (Shen, 2006). For a detailed report of the attachment preferences for each language see table 4 in Grillo and Costa (2014) — reported below as Table 1 in Section 1.3.

However, it has to be noted that the attaching preferences recorded in some languages also differ across studies and methodologies. That is, different studies and different methodologies applied to the same language sometimes lead to diverging results, which, consequently, cannot be interpreted. Grillo and Costa (2014) report conflicting results in Bulgarian, German, and Portuguese (Augursky, 2005; Hemforth et al., 1998; Maia & Maia, 2001; Miyamoto, 2005; Ribeiro, 1998, 2005; Sekerina, 2003). In particular, this is the case for online vs. offline experiments: in languages regarded as high-attaching, offline questionnaires show a high attachment preference, while the online data show an initial facilitation for low attachment, even when the measures are taken in the same experiment. It has been proposed that the initial preference or facilitation for low attachment could be overridden by a later reanalysis, resulting in offline high attachment preferences (Fernández & Sekerina, 2015).

The pattern of results reported by the works cited so far is not clear: that is, we do not know why speakers of some languages prefer low attachment, whereas speakers of other languages prefer high attachment. This, in turn, leads to question the universality of processing mechanisms. On the one hand, we have cross-linguistic variability, which challenges the hypothesis of a universal parser. As we have already seen, the absence of a universal parser is regarded to be implausible (see, among others, Fodor, 1998; Mitchell et al., 1990b). On the other hand, speakers

of some languages systematically select what is alleged to be the most cognitively costly parsing option (i.e., high attachment: Cuetos & Mitchell, 1988; Frazier, 1979; Grillo & Costa, 2014). All of this has led researchers towards one crucial question: Are language processing mechanisms universal at all? Do we develop different processing strategies based on the specific properties of our own language?

Given that parsing is a process by which a speaker establishes core, structural, and hierarchical relationships between words and phrases, admitting that this process is not universal would lead us to conclude that language processing must be learned and subject to cross- and intra-linguistic differences. However, researchers suggest that this is implausible (Fodor, 1998). Language processing, being a core mechanism of linguistic thinking and a process by which we structure linguistic information, is unlikely to vary from language to language. In fact, many works highlight that there are consistencies in the handling of language processing and its core principles, even across very different languages. However, it is also true that there are aspects of processing that speakers develop based on the tools available in their own language-specific characteristics — or even depending on the demands posed by the experimental task. See Egurtzegi et al., 2022; Isasi-Isasmendi et al., 2023). Consequently, we circle back to the same discrepancy between theoretical stances and empirical results: "Crosslinguistic variation in parsing preferences that does not stem from a grammatical distinction poses challenges to theories of parsing." (Grillo et al., 2015). If we cannot find a systematic grammar-based bias by which the existence of high RC attachment preferences is explained, neither can we claim that the core principles of language processing — such as Minimal Attachment and Late Closure — are universal. The attachment of relative clauses is a pivotal issue that could call into question the existence of a universal parser itself, which is why researchers have been addressing this problem for years in an effort to find a hypothesis that can account for the recorded variation in RC attachment preferences.

Indeed, attachment preferences have been found to be modulated by many factors. For instance, animate nouns attract attachment more than inanimate nouns (Hsiao & MacDonald, 2016; Kwon et al., 2019). Similarly, referentiality also determine attachment preferences, that is, nouns introduced by a determiner attract attachment (Bezerra, 2019; Bezerra et al., 2017). The emotionality of the NPs as well modulate attachment preferences, in such a way that emotional nouns tend to attract attachment because they tend to capture attention and working memory resources

(García-Orza et al., 2017). Furthermore, individual differences play a role in attachment preferences — use of pragmatic cues (see Harding et al., 2019), level of autistic traits (see Jun & Bishop, 2015, 2014), working memory capacity and linguistic proficiency (see Marefat et al., 2015 and Marefat & Farzizadeh, 2018). Similarly, the linguistic profile of the participants also modulates attachment; there are differences reported in attachment preferences and RC processing based on whether the participants were monolinguals, bilinguals or heritage bilinguals, and their proficiency in each of their languages (de la Cruz-Pavía & Elordieta, 2015; Jegerski, Keating, et al., 2016; Jegerski, VanPatten, et al., 2016; Mahmoodi et al., 2022; Marefat et al., 2015; Marefat & Farzizadeh, 2018), and based on their exposure to a second language (L2, see Jegerski, Keating, et al., 2016). Finally, the implicit or explicit prosody carried by the experimental materials, based on the manipulation of the visual segmentation of the sentences, or of the prosodic breaks in auditive stimuli, also plays a role in attachment preferences (de la Cruz-Pavía & Elordieta, 2015; Fernández & Sekerina, 2015; Hemforth et al., 2015; Mahmoodi et al., 2022).

In addition, a number of accounts and hypotheses have been proposed to explain such intricate variation in attachment preferences, and the debate is still ongoing. For instance, the *Tuning Hypothesis*, in Mitchell et al. (1995), emphasised the role of the language-specific statistical learning of the parser: its decisions would be based on how the kind of structure under analysis had been most frequently resolved in the past (see also Brysbaert & Mitchell, 1996a; Cuetos et al., 1996; Mitchell & Cuetos, 1991; Papadopoulou, 2006, pp. 33–36)

The *Construal Hypothesis*, in Frazier & Clifton (1997), focused on the difference in processing main vs. non-main clauses — as per the authors, primary vs. non-primary phrases —, claiming that the latter — among them, RCs — are processed in an underspecified fashion and, therefore, do not follow Late Closure or Minimal Attachment (see also Gilboy et al., 1995b and Papadopoulou, 2006, pp. 17–23).

Anaphoric-binding, in Hemforth et al. (1998), and *Recency Preference and Predicate Proximity*, in Gibson et al. (1996; see also Gibson & Pearlmutter, 1998; Papadopoulou, 2006, pp. 28–32), focussed on the competition between the heightened saliency of the NP1 and the recency of the NP2 in resolving attachment preferences. In other words, anaphoric elements tend to attach to the most salient and focussed discourse entities, whereas syntactic processes tend to bind the RC to the most recent host. Given that in most languages the most salient antecedent is

the NP1, and the most recent antecedent is NP2, these two processes are in competition. The authors proposed that whichever process resolves the ambiguity first will determine the attachment preference. However, they argue that, in some languages, anaphoric processes are weighted less than in others. This is why some languages follow recency (attaching low), and others follow saliency (attaching high).

Other hypotheses that aimed to explain the crosslinguistic variability in attachment preferences are *Balanced Sisters*, in Fodor (1998), and *Implicit Prosody Hypothesis*, in Fodor (2002). These proposals focussed on the role of prosody and RC length in the decision of attaching a RC high or low. The first hypothesis, *Balanced Sisters*, derives from the idea that prosodic information is computed by the parser at the earliest stages of processing, along with syntactic information (Frazier & Fodor, 1978). Therefore, under this assumption, prosody would immediately guide the parser in the interpretation of the input, and influence it in higher level decisions. Specifically, the *Balanced Sisters Hypothesis* predicts that constituents prefer to attach to other "sister constituents" with similar prosodic weight. Therefore, sentences with a longer RC would more likely attach to the complex NP, in an attempt to counterbalance the "weight" of the embedded clause, whereas sentences with a shorter RC would trigger low attachment. As an example, 'the son of the baker that was sick' would trigger low attachment, because the embedded clause is fairly short: that is, people would connect 'the baker' with 'that was sick'. In turn, a sentence like 'the son of the baker that was sick and tired of his job' has a fairly long embedded clause: hence, people would prefer to attach high, so to balance 'the son of the baker' with 'that was sick and tired of his job'.

The second hypothesis, *Implicit Prosody*, claims that readers of a certain language would impose their default prosody in silent reading, which in turn could vary from language to language. Therefore, following this proposal, the differences recorded in attachment preferences would be due to language-specific prosodic structures, keeping intact the concept of a universal parser (see also Hemforth et al., 2015, and Lourenço-Gomes, 2016).

However, none of these proposals has managed to satisfactorily explain the pattern of variation in attachment preferences (see Grillo & Costa, 2014; Lourenço-Gomes, 2016; Papadopoulou, 2006). The latest of these Hypotheses is the PR-First Hypothesis, proposed by Grillo and Costa (2014). This hypothesis makes categorical

and clear-cut predictions for a number of languages, and, according to the authors, it could satisfactorily account for the crosslinguistic differences described above.

1.3 The Pseudorelative-First (PR-First) Hypothesis

The Pseudorelative-First (PR-First) Hypothesis is the latest hypothesis (Grillo & Costa, 2014) that takes into account and, as claimed by its authors, aims to explain the crosslinguistic variation in attachment preferences described in the previous Section. The hypothesis states the following:

> When PRs are available, everything else being equal, they will be preferred over RCs. Grillo and Costa (2014).

The authors put forth that, in all the research carried out until that moment, a grammatical factor had been overlooked: the availability of a Pseudorelative (PR) reading in the ambiguous sentences. Pseudorelatives are structures that are string-identical to RCs, but have a very different meaning and syntactic structure. Relative clauses modify a noun phrase (NP) and denote a specific entity in a pool of many possible referents. Pseudorelative clauses, instead, are a complement of a verb phrase (VP), denote events or situations, and, therefore, offer an eventive reading (Barros de Brito, 1995; Cinque, 1992; Fernandes, 2012; Grillo & Costa, 2014; Labelle, 1988; Rafel, 1999). Consider the following examples in Spanish:

(6) *Conozco al hijo del panadero que corría en el parque*
I know the son of the baker that was running in the park

(7) *Vi al hijo del panadero que corría en el parque*
I saw the son of the baker (that was) running in the park

Example (6) (which is a translation of example (1)) is ambiguous in terms of its attachment. Similarly to (1), one could either attach the embedded verb (EV) high, and interpret it as: "I know the son of the baker. This baker has many sons: I am referring to the one that used to run in the park". Likewise, one could attach the embedded verb low, and interpret it: "I know the son of the baker. Of all the bakers running a shop in our neighbourhood, I am referring to the one that used to run in the park" (refer to Figure 1 Figure 1and Figure 2 for their structures).

Example (7) derives from example (6) by changing its matrix (main) verb (MV) to a perceptual one: 'to see'. Given this change, the string in example (7) is now three-way ambiguous. Not only could one parse the embedded phrase as a high- or low-attaching relative clause (RC), but also as an eventive phrase, that is: "I saw the son of the baker *running*" (or, roughly: "I saw the son of the baker while he was running"; in Spanish, it equals to *Vi al hijo del panadero corriendo*). This third structure is what Grillo and Costa (2014) refer to as "Pseudorelative". In English, this structure translates to a small clause ("…the son of the baker *running*"), whereas in Spanish (as in Italian and other languages) it is identical on its surface to a relative clause — hence the name 'pseudorelative' (see Figure 3).

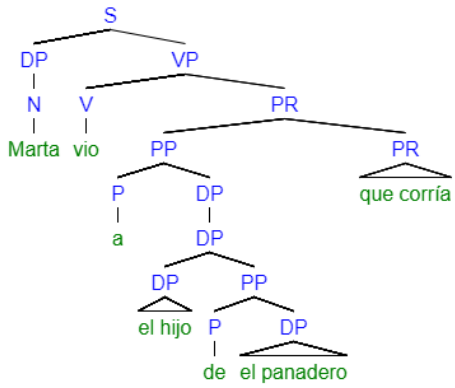

Figure 3. Syntactic tree for the pseudorelative structure Marta vio al hijo del Panadero que corría *('Marta saw the son of the baker running'). PR stands for "Pseudorelative".*

Crucially, PRs attach high — that is, in the example from Figure 3, *Marta* cannot see *el panadero* running; instead, she is seeing *el hijo* running. Grillo and Costa (2014) suggested that this might be the reason why, over the decades, many languages displayed a HA preference. They observed that most of the languages showing a HA preference, also allow PRs: see Table 1, taken from Grillo and Costa (2014). The languages on the lower part of the table have pseudorelatives (see the third column), and only two of them display low attachment preferences, that is, Norwegian and Swedish. Furthermore, out of all the languages in the list, only one — Russian — displays a clear high attachment preference and does not admit pseudorelatives. The authors claim that the results from Norwegian and Swedish come from only one study, presented at a CUNY conference (Erlich et al., 1999) and were never published in a peer-reviewed journal. The materials were not made public and, it follows, there was no way of verifying whether the experimental items

included PRs. As for the case of Russian, the authors point out that this language system forces the use of a comma between the NP and the relative pronoun. As discussed in the previous Section, commas have been shown to modify the implicit prosody of a sentence, and their presence between the NP and the relative pronoun can trigger a high attachment preference, in line with the Implicit Prosody Hypothesis (Fodor, 2002). Therefore, in this case, language-specific properties guide the high attachment preference and override the universal preference for locality.

Table 4
Attachment preferences and PR availability.

Language	Attachment	PRs
English	Low	*
Romanian	Low	*
Basque	Low	*
Chinese	Low	*
German (?)	High/Low	*
Russian (?)	High	*
Bulgarian (?)	High/Low	*
Norwegian (?)	Low	✓
Swedish (?)	Low	✓
Spanish	High	✓
Galician	High	✓
Dutch	High	✓
Italian	High	✓
French	High	✓
Serbo-Croatian	High	✓
Japanese	High	✓
Korean	High	✓
Greek	High	✓
Portuguese	High	✓

Table 1. Review of attachment preferences, as gathered by Grillo and Costa (2014). The second column shows whether each language showed a preference for high or low attachment, and the third column shows whether each language admit PRs.

Pseudorelatives are not available for all RC-like structures. One restriction is given by the matrix verb, which has to be a perceptual verb (e.g., 'to see', 'to hear', 'to watch' etc.) in order to allow a PR reading. Another important feature of PRs is that the embedded verb and the matrix verb must have the same tense, and the embedded verb must be at imperfective aspect. The reason for this is that the action described in the PR and the matrix event have to take place at the same time (for further information, see Grillo & Costa, 2014, p. 162, who provide extensive reference on the issue).

As mentioned earlier, Grillo and Costa (2014) attributed the contradictory results in the literature on attachment preference to the materials used in the experiments,

given the lack of control for the availability of PRs in the languages under study. Consequently, they claim, PRs had been a confounding factor in the literature thus far, and the cross-linguistic asymmetry and, more importantly, the inexplicable preference for high attachment in some languages was the result of an availability of pseudorelatives.

In light of these facts, the authors proposed the PR-First Hypothesis. This hypothesis claims that, if a string *can* be read as a PR (that is, when it is ambiguous between a PR and an RC reading), it *will*. This is because, the authors claim, Pseudorelatives are simpler than RCs on structural, semantic and pragmatic levels. The authors also state that, conversely, in the presence of a true RC (that is, a string that *cannot* be read as a PR), the speaker will follow the principles of Late Closure and Minimal Attachment.

To clarify, the predictions of the PR-First Hypothesis are the following (see also Alonso-Pascua, 2020):

i. Whenever a PR is possible, it will be preferred. Therefore, whenever a PR is possible, the parser will attach high (i.e., 100% or overwhelmingly high preference for high attachment in PR-compatible environments).

ii. Whenever PRs are not possible, the parser will follow Late Closure and Minimal Attachment and attach low (i.e., 100% or overwhelmingly high preference for low attachment in PR-incompatible environments).

Below is a summary scheme of the sentence processing involved in the PR-First Hypothesis, as reported in Cairncross et al. (2024, p. 5).

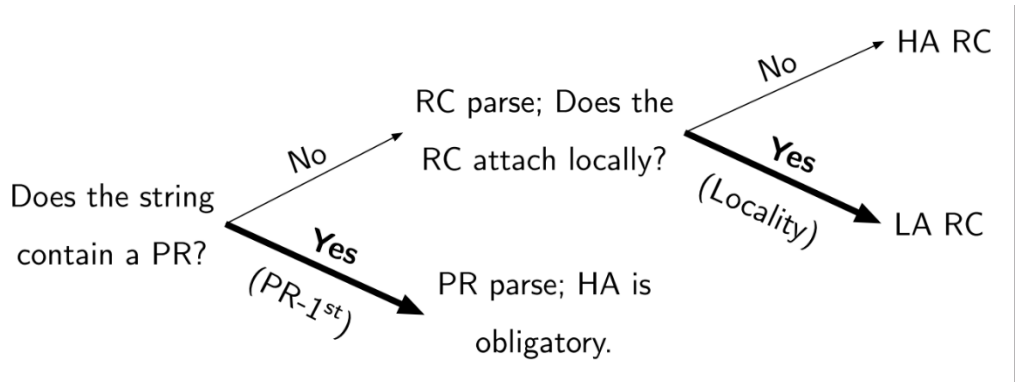

Figure 4. Processing of an ambiguous "NP1 of NP2 that EV" sentence, according to the PR-First Hypothesis. Figure taken from Cairncross et al. (2024, p. 5).

Therefore, the PR-First Hypothesis aims at (a) accounting for the cross-linguistic variability in attachment preferences, hence restoring the universality of parsing. That is, if the PR-First Hypothesis proves true, then the preference for high attachment does *not* stem from a preference for a high-attaching RC, but rather from a preference for PRs. Therefore, all languages keep consistently preferring low attachment in RC-only environments.

This would also (b) explain the existence of a preference for high attachment: given that RCs should never attach high because it is the most complex structure, we should have never encountered any. The fact that we do would be explained if the PR-First Hypothesis is proven true, since the high attachment that has been recorded so far would be due to the availability of PRs.

Furthermore, if proven true, the PR-First Hypothesis would also (c) restore the validity of the principles of Minimal Attachment and Late Closure.

Note that these predictions are consistent with the formulation of the PR-First Hypothesis that is found in Grillo and Costa (2014) "When PRs are available, everything else being equal, they will be preferred over RCs". However, in Pozniak et al. (2019) the hypothesis is reformulated as follows: "PRs are easier to parse than RCs for structural, semantic and pragmatic reasons". The two formulations are not equal, given that the original one by Grillo and Costa (2014) encapsulates the later one: PRs are categorically preferred *because* they are easier to parse. The hypothesis presented in Pozniak et al. (2019) tests whether PRs are easier, but is not concerned with whether they are categorically preferred over RCs. It deals with the cognitive burden imposed by relative and pseudorelative clauses. The hypothesis by Grillo and Costa (2014), on the contrary, takes a step further and makes categorical predictions about behavioural preferences, and not only about processing. This is why predictions (i) and (ii) above, and their consequences (a), (b) and (c), are directly derived from the 2014 formulation, and not as much from the 2019 formulation. I will henceforth refer to the PR-First Hypothesis as in the first, earliest formulation, given that it encapsulates the more recent formulation, and that it implies what has been reported in the paragraphs above.

In support of their hypothesis, Grillo and Costa (2014) provided the results of two experiments carried out in Italian, a language that permits PRs, and is consistently regarded as high-attaching (De Vincenzi & Job, 1993, 1995). In Experiment 1, the authors used globally ambiguous sentences in an offline questionnaire, and manipulated two variables: position of the RC (right-branching (RB) or centre-embedded (CE)) and extraction site (subject- or object-extracted relative clauses):

(8) a. RB-Subject: *Il barista ha guardato l'amico del cliente che veniva sorpreso dai colleghi.*
The barman watched the friend of the client (that was) being surprised by his colleagues.

b. RB-Object: *Il barista ha guardato l'amico del cliente che i colleghi avevano sorpreso.*
The barman watched the friend of the client that his colleagues had surprised.

c. CE-Subject: *L'amico del cliente che veniva sorpreso dai colleghi è molto buono.*
The friend of the client that was surprised by his colleagues is very nice.

d. CE-Object: *L'amico del cliente che i colleghi avevano sorpreso è molto buono.*
The friend of the client that his colleagues had surprised is very nice.

Based on the description of PRs, out of the four conditions, only the right-branching and subject-extracted one admitted a PR (condition (8)a), whereas the other three conditions only admitted RCs. Therefore, the PR-First Hypothesis predicts a preference for high attachment in condition (8)a, and a preference for low attachment in all other conditions. 31 participants read 20 sentences in 4 different lists, and 80 fillers, and they were asked who was performing the action in the embedded clause ("who was very nice?" in the previous example). Their attachment preferences were recorded and analysed. The authors found a statistically significant preference for HA in the PR-available condition, as opposed to its centre-embedding (RC-only) counterpart (i.e., condition (8)a with 56.6% of high attachment preferences, vs. (8)b with 44% of high attachment preferences). The authors claim that these results support the PR-First Hypothesis.

To further investigate the validity of the hypothesis, in Experiment 2 (another offline questionnaire) the authors manipulated the matrix verbs of their stimuli in two conditions:

(9) a. PR-taking MVs: *Gianni ha visto il figlio del medico che correva*
Gianni saw the son of the doctor (that was) running

b. Stative MVs: *Gianni vive con il figlio del medico che correva*
Gianni lives with the son of the doctor that was running

In (9)a, the authors used PR-taking MVs — that is, a perceptual verb —, hence permitting a PR, whereas in (9)b stative verbs were used, which disallowed a PR reading and only admitted RCs. 30 participants saw 24 items in two lists, and 80 fillers. Participants had to answer who they thought was performing the embedded action ("who was running?" in the previous example) and their attachment preferences were recorded and analysed. Results showed a significant preference for high attachment in the PR-admitting condition ((9)a, with 78.6% of HA), rather than in the second, RC-only condition ((9)b, with 24.2% of HA). In light of these data, the authors conclude that: "PR availability plays a major role in shaping attachment preference and we hypothesize that the observed residual differences across languages are determined by this factor" (Grillo & Costa, 2014, p. 177).

1.4 Overview of the literature testing the PR-First Hypothesis

The PR-First Hypothesis has not been extensively investigated and the literature consists mainly of offline questionnaires, carried out in Italian (Grillo & Costa, 2014; Grillo & Turco, 2016), Spanish (Aguilar et al., 2021, 2022; Aguilar & Grillo, 2021; Aldama García & Sandoval, 2017; Alonso-Pascua, 2020), French (Pozniak et al., 2019), and Portuguese (Costa et al., 2016; Tomaz et al., 2014). Most of these studies claim that there is a support for PR-first, but I argue that the landscape is much more complicated than that.

After the proposal of the PR-First Hypothesis in Grillo and Costa (2014, discussed in Section 1.3), the first work on the topic was by Tomaz et al. (2014), who tested the Hypothesis in Portuguese, a language in which, they claim, PRs exist

in the form *que estava a INF* ('who was pre INF'). The authors designed two experiments to test the PR-First Hypothesis.

The first experiment aimed to measure attachment preferences and whether the availability of PRs determines them. It was a questionnaire on globally ambiguous sentences, in which the authors — similarly to Experiment 2 in Grillo and Costa, 2014 — manipulated the matrix verb, which could either be perceptual — triggering the availability of PRs — or non-perceptual:

(10) a. PR-available condition: *O Eduardo ouviu o irmão do jovem que estava a cantar no largo.*
Eduardo heard the brother of the young.person (who was) singing in the square.

b. RC-only condition: *A Bárbara vive com o irmão do jovem que estaba a cantar no largo.*
Barbara lives with the brother of the young.person who was singing in the square.

The matrix verb could either admit a PR reading (condition (10)a), or ban it (condition (10)b). The PR-First Hypothesis predicts high attachment preference in (10)a and low attachment preference in (10)b. 24 participants saw 24 items in two lists, and 48 fillers, and they were asked who was performing the action in the embedded clause ("Who was singing in the square?"). Results showed a larger preference for high attachment in the PR-available condition (70.1% in (10)a vs. 50.3% in (10)b). Furthermore, participants were faster in answering to condition (10)a (3509 ms) than to condition (10)b (4041 ms). However, it has to be noted that, even though the statistical analysis revealed a difference between conditions, the attachment preferences in the RC-only condition (10)b are at chance level: that is, the same number of preferences were given to high attachment and low attachment. This invalidates the PR-First Hypothesis because, in RC-only conditions, locality should be followed, and there is yet no explanation to such a percentage of high attachment preferences. In fact, the PR-First Hypothesis was specifically intended to resolve this issue. Instead, these results suggest that PR availability somehow modulates preferences towards high attachment.

Furthermore, the authors ran a second study (self-paced reading) in which the sentences were not ambiguous. That is, attachment was forced (and disambiguated)

either towards high or low attachment by means of number agreement. They used all the logical possibilities provided by the materials, in which the attachment was either high or low, determined by singular (S) of plural (P) agreement on verbs. Furthermore, they manipulated the matrix verb (either perceptual, hence allowing PRs, or non-perceptual), ending up with 8 conditions:

(11) a'. High (SPS), perceptual: *O Eduardo oviou o irmão dos jovens que estava a cantar no largo.*
Eduardo heard the brother of the young_people (who was) singing in the square.

a". High (SPS), non-perceptual: *O Eduardo vive com o irmão dos jovens que estava a cantar no largo.*
Eduardo lives with the brother of the young_people who was singing in the square.

b'. High (PSP), perceptual: *O Eduardo oviou os irmãos do jovem que estavam a cantar no largo.*
Eduardo heard the brothers of the young_person (who were) singing in the square.

b". High (PSP), non-perceptual: *O Eduardo vive com os irmãos do jovem que estavam a cantar no largo.*
Eduardo lives with the brothers of the young_person who were singing in the square.

c'. Low (SPP), perceptual: *O Eduardo oviou o irmão dos jovens que estavam a cantar no largo.*
Eduardo heard the brother of the young_people who were singing in the square.

c". Low (SPP), non-perceptual: *O Eduardo vive com o irmão dos jovens que estavam a cantar no largo.*

Eduardo lives with the brother of the young_people who were singing in the square.

d'. Low (PSS), perceptual: *O Eduardo oviou os irmãos do jovem que estava a cantar no largo.*
Eduardo heard the brothers of the young_person who was singing in the square.

d". Low (PSS), non-perceptual: *O Eduardo vive com os irmãos do jovem que estava a cantar no largo.*
Eduardo lives with the brothers of the young_person who was singing in the square.

Conditions (11)a' and (11)b' (underlined in the examples) admit pseudorelatives, whereas the rest do not. The PR-First Hypothesis predicts high attachment facilitation in PR-available conditions ((11)a' and (11)b'), and low attachment facilitation in the rest of the conditions. 48 participants overall took part in the experiment: half of them would only see conditions with perceptual MVs (11)abcd', and the other half would only see the RC-only conditions (11)abcd". The presentation of the assigned stimuli was distributed in a Latin-Square design based on the type of the attachment — high vs. low attachment — and verb agreement — singular vs. plural. The total number of items was 24. Participants would see the stimuli in a self-paced reading task, and, as was the case with Experiment 1, they were asked who was performing the action in the embedded clause, so as to measure their accuracy as well as reading and response times. Results showed that responses to high-attaching sentences were more accurate when they were introduced by a perceptual matrix verb (93.7% of accuracy) when compared to high-attaching sentences introduced by non-perceptual verbs (73.6% of accuracy). Results from the reading times at the post-critical region — after the embedded verb — showed an interaction between type of verb — perceptual vs. non-perceptual — and attachment — high vs. low —, but the direction of this interaction was not clearly set out in the paper. Based on the data reported by the authors, I interpret their results as follows: under perceptual MVs, high attachment (477 ms) was facilitated over low attachment (494 ms); whereas the opposite turned out to be true under

non-perceptual MVs (high attachment: 529 ms, low attachment: 489 ms), although this is a inference from my part, given that no explanation was given by the authors. Furthermore, they found a facilitation for sentences introduced by perceptual verbs at the complementiser region *que* ('who'); and a facilitation for high-attaching sentences compared to low-attaching sentences when the disambiguation was obtained by plural agreement. The authors concluded that these experiments showed a preference and facilitation for high attachment in PR-available contexts, whereas no clear pattern emerged in the RC-only contexts. As noted earlier, the PR-First Hypothesis cannot stand if we do not observe a preference for locality in RC-only contexts. This is because the hypothesis clearly state that high attachment preferences are due to the availability and facilitation of PRs. Once again, we observe a modulation of attachment preferences due to PR availability, but no explanation was given about the preference for high attachment in the other conditions. Furthermore, I see issue in the methodology. The statistical power of the study is poor, and the analyses are not clearly described, to the point that the reader has to guess the direction of the reported effects.

Another work testing the PR-First Hypothesis in European Portuguese is by Costa et al. (2016). However, in their work, the authors claim that Portuguese is a language that *lacks* pseudo-relatives (sec. 3), contrary to what is stated in Tomaz et al. (2014) and Grillo and Costa (2014)[4]. For this reason, the authors tested a different structure — prepositional infinitival constructions, PICs, which they claim is the Portuguese counterpart of a PR —, yet finding support for the PR-First Hypothesis.

Given that the hypothesis makes predictions about *pseudorelatives*, and not about alternatives to it, studying prepositional infinitival constructions opens to the fact that researchers are not testing the hypothesis as the categorical claim it was formulated to be; instead, they seem to investigate whether the availability of an eventive clause can *modulate* attachment preferences, rather than determine them. At any rate, the existence (or lack) of PRs in Portuguese remains an unresolved issue.

Furthermore, the authors wanted to shed light on the linguistic acquisition of relative clauses, and, for this reason, tested a group of adults (N = 20), a group of 5 years-old children (N = 22), and a group of 4 years-old children (N = 20). The

[4] Note that these three works (Costa et al., 2016; Grillo & Costa, 2014; Tomaz et al., 2014) were also authored by Nino Grillo.

experiment had two conditions: (12)a is the RC-only condition, whereas (12)b is the PIC condition (admitting PR):

(12) a. RC *Mostra-me o amigo do caçador que está a saltar.*[5]
Show me the friend of the hunter that is jumping.

b. PIC (PR) *Mostra-me o amigo do caçador a saltar.*
Show me the friend of the hunter jumping.

For each item (15 from condition a, 15 from condition b, and 20 fillers), participants heard the sentence and were asked to select the picture that suited the sentence the most (picture selection task). The pictures for (12) would depict an unspecified lego-person and a lego-hunter: in one picture, the hunter would be jumping — high attachment choice —, and, on the other one, the unspecified person would be jumping — low attachment choice. The authors claim that the PR-First Hypothesis predicts low attachment in (12)a and high attachment in (12)b. Results showed a numerical preference for high attachment across all conditions and groups; however, high attachment in PICs (12)b was higher than in the RC-only condition (12)a, in line with the PR-First Hypothesis — although this comparison was not statistically tested. Besides, adults and 5-years old children behaved similarly, whereas the 4-years old group showed a smaller preference towards HA as compared to other groups. The difference between the 4-years-old group and the others could be due to the fact that the intervention of the NP2 makes it more difficult for children at age 4 to attach high.

As well as the issues regarding the existence of PRs in Portuguese and the testing of a non-PR structure, which I mentioned earlier, I argue that this work has methodological issues, too. Not only does the study not have an adequate statistical power, but neither were some of the comparisons statistically tested, and the authors reported numerical effects. It follows that the results cannot be conclusive.

More recently, Pozniak et al. (2019) employed eye-tracking in the testing of the PR-First Hypothesis in French. However, and as discussed in Section 1.3, it is worth noting that they did not test the Hypothesis as stated in Grillo and Costa (2014);

[5] Note that, in Tomaz et al. (2014), a similar condition was labelled as PR-available.

instead, they tested a somewhat derived hypothesis: "PRs are easier to parse than RCs for structural, semantic and pragmatic reasons".

Their first Experiment was an offline attachment-preference questionnaire similar to Experiment 2 in Grillo and Costa (2014), in which the items were manipulated to be introduced by either a perceptual verb, thus triggering a PR reading, or a stative one, which would result in an RC-only condition. Once again, the PR-First Hypothesis predicts high attachment preferences for the PR-available condition, and low attachment in the RC-only condition. 69 participants saw all 24 items in both conditions, plus 60 fillers. Results showed that the PR-available condition had significantly larger high attachment preference (61%) than the RC-only condition (28%). The authors concluded that these results not only support the PR-First Hypothesis, but also the idea that PRs are overall preferred over RCs.

In the following Experiment 2, the authors tested the acceptability of sentences on a scale from 1 to 10, in which the PR availability was manipulated through tense match and mismatch. In the items (N = 6, plus 26 fillers), they manipulated both the matrix verb — either perceptual or stative, as in experiment 1 — and the matching in terms of tense of the matrix verb with the embedded verb — either an MV-EV matching condition, that is, both verbs in the past tense, which is the case with conditions (13)a and (13)c; or an MV-EV mismatching condition, that is to say that the matrix verb was in the present tense and the embedded verb was in the past tense, which is the case with conditions (13)b and (13)d. PRs are only available when the matrix verb is perceptual, and when the MV and the EV match in their tenses, as in (13)a in past tense. Note that sentences for experiments 2 and 3 did not have a complex antecedent of the type 'NP1 of NP2', and, therefore, were not ambiguous in their attachment. Despite the change in the experimental paradigm, their results are indeed useful to determine the cognitive cost for each parsing option in their easiest possible configuration.

(13) a. Perceptual – match (PR) *Jean a vu la fille qui poussait la femme.*
John saw the girl that pushed the lady.

b. Perceptual – mismatch *Jean voit la fille qui poussait la femme.*
John sees the girl that pushed the lady.

c. Stative – match *Jean était marié à la fille qui poussait la femme.*
John was married to the girl that pushed the lady.

d. Stative – mismatch *Jean est marié à la fille qui poussait la femme.*
John is married to the girl that pushed the lady.

The same sentences were tested with French (N = 58) and English (N = 103) participants. In the latter language, PRs do not exist, and, therefore, all four conditions of the experiment consisted in non-ambiguous RCs. Participants were tested online, and had to read each sentence and rate their acceptability on a scale from 1 to 10. Since (13)a could potentially trigger a PR, the PR-First Hypothesis — as worded in Pozniak et al. (2019) — predicts higher acceptability for (13)a than for (13)b in French, whereas no such difference shall be found in English. No difference between conditions should be found for stative matrix verbs, either. These predictions were supported by their data.

Experiment 3 tested the same set of sentences, in French (N = 52) and English (N = 37), and eye-tracking data were recorded to explore the cognitive cost of relative vs. pseudorelative clauses, and the unfolding over time of the preference for PRs over RCs. Participants had to read the sentences — presented altogether on the screen — at their own pace, and then answer a comprehension question. The authors analysed eye-tracking data at the critical region (EV, where it is possible to determine whether the sentence admitted a PR or not), as well as the pre-critical (NP2 + complementiser) and post-critical regions (the last two words). The PR-First Hypothesis predicts longer reading times at this region for tense mismatch in PR-available environments only in French — i.e., in condition (13)b, because the PR preference would cause reanalysis. This is what results for the regression path durations and regressions-out at the critical region showed. In English, only a main effect of tense was found, suggesting that a mismatching tense is more difficult to process overall. The authors concluded that the preference for PR in French is present even at the earliest stages of processing.

In another study, Alonso-Pascua (2020) replicated both experiments from Grillo and Costa (2014) in Spanish. See Section 1.3 above for the materials and methods. In addition, self-paced reading times were gathered but not statistically analysed. Results from Experiment 1 (32 Spanish native participants) showed no difference between conditions, and, therefore, no preference for PRs over RCs. In the attachment preferences for the second experiment (30 Spanish native participants), the type of verb — either perceptual or non-perceptual — was not found to have a significant effect, showing no preference for either high or low attachment. Instead,

the author reported an overall numerical preference for low attachment (67.14%), regardless of the nature of the main verb. The author concluded that he did not find support for the PR-First Hypothesis in his data. Furthermore, he also pointed out that even the results from Grillo and Costa (2014) did not verify their own hypothesis. This is because, in both studies, the PR-available conditions did not show an *overwhelming* HA preference, as would be predicted by the categorical formulation of the PR-First Hypothesis — see prediction (7)i. above, in Section 1.3. Rather, Alonso-Pascua (2020) argued that what the authors find is a *modulation* towards high attachment caused by PR availability, and recommended a reformulation of the hypothesis, one that would state that PRs are "a contributing but not determining factor in attachment preferences". This work is the only one that is critical with the PR-First Hypothesis, but I have reached the same conclusion as I studied the literature, and moreover so when I considered the results of my experiments.

Subsequently, Aguilar et al. (2021) tested the effect of PR availability in offline (Experiment 1) and online (Experiment 2) tasks in Spanish. The first Experiment was an offline attachment preference questionnaire, similar to the one of Experiment 2 from Grillo and Costa (2014), using globally ambiguous sentences as in (14):

(14) a. Perceptual MV (PR) *Juan vio al entrenador$_{MASC}$ del tenista$_{MASC}$ que lloraba contento$_{MASC}$ por la victoria.*
Juan saw the coach$_{MASC}$ of the tennis-player$_{MASC}$ that cried happily$_{MASC}$ for the victory.

b. Non-perceptual MV *Juan conoció al entrenador$_{MASC}$ del tenista$_{MASC}$ que lloraba contento$_{MASC}$ por la victoria.*
Juan met the coach$_{MASC}$ of the tennis-player$_{MASC}$ that cried happily$_{MASC}$ for the victory.

90 native Spanish speakers were recruited and read 32 items in a Latin-Square design, plus 64 filler sentences. Participants were asked to report who was shedding tears for the victory, i.e., their preferred attachment. The PR-First Hypothesis predicts high attachment in (14)a, and low attachment in (14)b. Results showed an overall preference for high attachment, and a stronger preference for high attachment in PR-available contexts (condition (14)a: 84%) rather than in RC-only

contexts (condition (14)b: 73%). The authors conclude that the results support the PR-First Hypothesis, and that the overall high attachment preference can be explained by the use of long embedded clauses, which were made up of 5 words.

The second experiment was designed to investigate the unfolding of attachment preferences over time, by using the eye-tracking method. Participants were asked to read a version of the sentences from Experiment 1, which were further manipulated to be unambiguous in their attachment, by means of gender agreement:

(15) a. Perceptual – HA (PR) *Juan vio al entrenador$_{MASC}$ de la tenista$_{FEM}$ que lloraba amargado$_{MASC}$ por la derrota.*
Juan saw the coach$_{MASC}$ of the tennis-player$_{FEM}$ that wept bitterly$_{MASC}$ for the defeat.

b. Perceptual – LA *Juan vio al entrenador$_{MASC}$ de la tenista$_{FEM}$ que lloraba amargada$_{FEM}$ por la derrota.*
Juan saw the coach$_{MASC}$ of the tennis-player$_{FEM}$ that wept bitterly$_{FEM}$ for the defeat.

c. Non-Perceptual – HA *Juan conoció al entrenador$_{MASC}$ de la tenista$_{FEM}$ que lloraba amargado$_{MASC}$ por la derrota.*
Juan has met the coach$_{MASC}$ of the tennis-player$_{FEM}$ that wept bitterly$_{MASC}$ for the defeat.

d. Non-perceptual – LA *Juan conoció al entrenador$_{MASC}$ de la tenista$_{FEM}$ que lloraba amargada$_{FEM}$ por la victoria.*
Juan has met the coach$_{MASC}$ of the tennis-player$_{MASC}$ that wept bitterly$_{FEM}$ for the defeat.

The only condition permitting PRs is the one presenting a perceptual MV and high attachment (15)a. The PR-First Hypothesis predicts a facilitation for (15)a over (15)b, and a facilitation for (15)d over (15)c. 42 native speakers of Spanish saw 32 items in a Latin square design and 75 fillers. The critical region was the disambiguating word *amargado/a* ('bitterly$_{MASC/FEM}$'), and the following three words formed the spillover region. Results at the critical region showed a facilitation for low-attaching sentences when compared to high-attaching sentences, under non-perceptual matrix verbs, i.e., (15)c is slower than (15)d, in early measures (first fixation duration and gaze duration until first exit). Additionally, a facilitation for

perceptual matrix verbs over non-perceptual matrix verbs was found, albeit only in the first half of the experiment. At the spillover region (*por la victoria*), a three-way interaction between verb type, attachment and item order in a later measure (regression path duration) showed an advantage of high attachment over low attachment in sentences introduced by perceptual matrix verbs, i.e., (15)a is faster than (15)b, albeit only in the first half of the experiment. This same triple interaction was also present in the total reading times, in the same direction. In other words, PR availability speeded up processing in the first half of the experiment: reading times were shorter for high-attaching sentences in PR-available contexts than in RC-only contexts in regression path duration and in total reading times.

The authors concluded that participants preferred local attachment in online measures, and later reanalysed the sentences to show a high attachment preference in offline measures. The late facilitation for high attachment in the eye-tracking data and the overall preference for high attachment in the first experiment are consistent with previous research: the online processing showed a low attachment facilitation, and the offline processing showed high attachment facilitation (see Fernández & Sekerina, 2015). Furthermore, the authors claimed that PR availability can at least partly explain cross-linguistic variation in attachment preferences. However, as we have seen earlier, the PR-First Hypothesis makes categorical predictions in such that PRs will *determine* attachment preferences (see also Alonso-Pascua, 2020).

A further study by Aguilar and Grillo (2021) investigated the offline attachment preferences in Spanish, focusing on whether the aspect of the embedded verb modulates attachment. The authors contend that, thus far, experiments had been conducted using the past imperfective in the embedded clause, which is ambiguous between a punctual and a habitual reading. PRs are only available under punctual interpretations. Therefore, they claimed that the use of the past progressive in the embedded clause — which only allows a punctual interpretation — is more easily compatible with a PR. Conversely, an embedded verb in the past imperfective would more easily trigger a habitual reading and, therefore, an RC interpretation. It follows that the two attachment questionnaires described in the paper compared not only PR-available and RC-only sentences, as was the case in Experiment 2 in Grillo and Costa (2014), but also whether the aspect of the embedded verb could modulate attachment preferences. The experimental conditions for Experiment 1, therefore, used either perceptual — as in (16)a and (16)b, allowing PRs — or non-perceptual matrix verbs — as in (16)c and (16)d —; and either the embedded verb in the past

imperfective — as in (16)a and (16)c — or in the past progressive tense — as in (16)b and (16)d —:

(16) a. Perceptual – IMPF (PR) *Juan vio al hijo del médico que pintaba.*
John saw the son of the doctor painting / that painted.

b. Perceptual – PROG (PR) *Juan vio al hijo del médico que estaba pintando.*
John saw the son of the doctor painting / that was painting.

c. Non-Perceptual – IMPF *Juan trabaja con el hijo del médico que pintaba.*
John works with the son of the doctor painting / that was painting.

d. Non-perceptual – PROG *Juan trabaja con el hijo del médico que estaba pintando.*
John works with the son of the doctor that was painting.

The PR-First Hypothesis predicts larger preference for high attachment in conditions (16)a and (16)b as compared to (16)c and (16)d, and larger preference for low attachment in conditions (16)c and (16)d in comparison to (16)a and (16)b. However, the authors pointed out that it is reasonable to expect that the progressive verbs in (16)b could trigger PRs (and, therefore, high attachment) more than the imperfectives in (16)a, because the imperfective in (16)a could convey a habitual reading, which is incompatible with PRs. Such a difference was not expected in the conditions introduced by non-perceptual matrix verbs. 40 Spanish native participants saw 24 experimental items in a Latin square design, and 71 fillers. Results showed larger preference for HA than for LA in PR-compatible conditions ((16)a, with mean HA = 44%, and (16)b, with mean HA = 51%) rather than with RC-only conditions ((16)c, with mean HA = 29%, and (16)d, with mean HA = 35%). Furthermore, high attachment preference was greater in progressive conditions ((16)b and (16)d) than in imperfective conditions ((16)a and (16)c). The authors concluded that the results are compatible with the PR-First Hypothesis. However, they argued that the preference for high attachment with the progressive verbs could be due to the fact that, in these conditions, the RCs are one word longer than in the conditions with the imperfective verbs (see the Balanced Sisters Hypothesis in

Fodor, 1998, 2002). This is why, for Experiment 2, the authors used the same procedure and materials but they added a word at the end of the imperfective conditions — e.g., for (16)b and (16)d, the embedded phrase would be …*que pintaba caballos* '…that painted horses'. 80 native speakers of Spanish took part in this second experiment. Results showed that the preference for HA was stronger in PR-compatible conditions ((16)a, with mean HA = 58.2%, and (16)b, with mean HA = 55.2%) than in RC-only conditions ((16)c, with mean HA = 39.4%, and (16)d, with mean HA = 37%). Since the effect of verbal aspect was not significant, the authors concluded that such an effect in Experiment 1 was due to the length of the embedded clause, as predicted by Fodor (1998, 2002). Besides, they found that low attachment preference increased towards the end of the experiment. The authors deduced that their data support the PR-First Hypothesis, and that the manipulation of the aspect did not modulate attachment preferences, possibly because the preference for PRs is so strong that it arises even before processing the aspectual information of the embedded verb.

However, the results in attachment preferences in these experiments are nearly at chance level: Aguilar and Grillo (2021) reported a 51% preference for high attachment in a PR-available environment in Experiment 1, and a 55.2% preference for high attachment in one condition of Experiment 2. The authors argued that any percentage of NP1 attachment above 50% can already be considered a preference for high attachment. Conversely, I argue that, if a result of attachment preferences is not different from the product of a random choice between two alternatives, then no preference is shown, and results might be random. Researchers should test attachment preference results against chance level. However, to my knowledge, this analysis has never been carried out in any work. See Appendix E for further information of the issue.

Finally, a recent study by Cairncross et al. (2024) studied the PR-First Hypothesis in Italian by means of a self-paced reading experiment with locally ambiguous sentences. The items were ambiguous between a high or low attachment up to the critical region — a secondary predicate within the embedded CP and following the embedded verb, in which the attachment was disambiguated by means of gender agreement. In (17), the vertical bar (|) signals the breaks between each display in the self-paced reading method.

(17) a. Perceptual HA (PR) *Gianni* | *ha visto* | *il collega*$_M$ | *della biologa*$_F$ | *che correva* | *sporco*$_M$ | *di fango.*
Gianni | saw | the colleague$_M$ | of the biologist$_F$ | (that was) running | covered$_M$ | in mud.

b. Perceptual LA *Gianni* | *ha visto* | *il collega*$_M$ | *della biologa*$_F$ | *che correva* | *sporca*$_F$ | *di fango.*
Gianni | saw | the colleague$_M$ | of the biologist$_F$ | that was running | covered$_F$ | in mud.

c. Non-perceptual HA *Gianni* | *vive* | *con il collega*$_M$ | *della biologa*$_F$ | *che correva* | *sporco*$_M$ | *di fango.*
Gianni | lives | with the colleague$_M$ | of the biologist$_F$ that was running | covered$_M$ | in mud.

d. Non-perceptual LA *Gianni* | *vive* | *con il collega*$_M$ | *della biologa*$_F$ | *che correva* | *sporca*$_F$ | *di fango.*
Gianni | lives | with the colleague$_M$ | of the biologist$_F$ that was running | covered$_F$ | in mud.

66 native Italian participants were asked to read 32 experimental sentences in a self-paced reading task, and then to answer to a polar question enquiring about the attachment ("Was the biologist running?" – "Yes" or "No"). The PR-First Hypothesis predicts the highest accuracy and fastest reading times at the critical and/or post-critical region in conditions (a) because this condition allows a PR, and (d) because it follows locality. As predicted, results showed that the critical and post-critical regions in condition (a) were faster to read than in condition (b), and the same facilitation for condition (d) over condition (c). Furthermore, results showed higher accuracy in condition (a) when compared to condition (b), whereas no difference was found between conditions (c) and (d). An additional experiment was carried out with the same items: 27 native Italian speakers read 32 experimental sentences, presented altogether on the screen. Results for the accuracy showed the same pattern as in experiment 1. The authors concluded that their data support the PR-First Hypothesis, although the absence of the preference for locality under non-perceptual verbs — that is, accuracy for conditions (d) was not higher than the accuracy for condition (c) — calls for further investigation.

Almost all the works discussed so far suggest that the PR-First Hypothesis can account for the cross-linguistic variability reported in the literature: the preference

towards the HA is determined by the availability of PRs. However, as discussed earlier, these works have serious limitations.

As Alonso-Pascua (2020) already noted, the PR-First Hypothesis is a categorical hypothesis (see (7)i. and (7)ii. above in Section 1.3). It states that, whenever a pseudorelative clause is available, it *will* be chosen. This strong claim calls for categorical predictions: nearly 100% of high- attachment preferences in PR-available contexts, and nearly 0% of high-attachment preferences in RC-only contexts, allowing for human error. Similarly, online results should reflect such a remarkable preference by means of a sharp facilitation for high attachment in PR-available contexts, and a marked slow-down in RC-only contexts.

However, if we look at the data reported by Grillo and Costa (2014), we cannot see such categorical results. Even if the difference between conditions was significant, suggesting a stronger preference for HA in PR-available contexts than in RC-only contexts, the attachment preferences were far from complying with the categorical predictions of the PR-first Hypothesis. For example, in Experiment 1, the high attachment proportions were only 56.6% in the PR-available condition, and between 32.8% and 44% in the remaining RC-only conditions. In other cases, attachment preferences are random (Aguilar & Grillo, 2021; Tomaz et al., 2014).

Furthermore, as described in Section 1.2, there are several known factors that can modulate attachment preferences (e.g., animacy, multilingualism, referentiality, emotionality…). A categorical hypothesis such as PR-First does not account for any of these aspects.

Given all the concerns mentioned in this Section, I argue that the evidence in support of the PR-First Hypothesis is not as conclusive as argued in some studies. So far, no evidence was presented for the absence of high attachment preferences in RC-only environments, and for the absence of low attachment in PR-available contexts. In this dissertation, I intend to provide further evidence regarding the lack of validity of the PR-First Hypothesis with a series of experiments. To this purpose, I have taken into account the caveats of the studies described in this Section, I carefully designed and tested the materials, I made sure to have enough statistical power, I controlled for the lexical frequency of each element of the sentence, for the length of the materials, as well as for the availability of the PR interpretation in the matrix verbs selected, among other things.

2. The processing cost of high vs. low attachment in Spanish

In this chapter, I will present two self-paced reading experiments run in Spanish (preregistered at https://osf.io/4gyt7), designed to investigate the cognitive cost of high vs. low attachment, as well as whether PR availability plays a role in the processing of either strategy.

The novelty of this work mainly relies in the fact that the experimental materials were non-ambiguous, which has allowed me to measure the online processing of each structure and to determine which is the least costly option. Frazier (1979) claimed that a low-attaching RC is the easiest structure to parse. The PR-First Hypothesis predicts that PRs are the easiest structure to parse, followed by a low-attaching RC. At the time I was designing this experiment, no one had set out to determine such a baseline, that is to say, nobody had properly gathered online measures of non-ambiguous sentences to verify Frazier's or Grillo's and Costa's claims[6].

Another important concern was the statistical power of the experiment(s), which led to me test a high number of participants — 160 for Experiments 1a and 1b — so to have highly reliable results.

The materials were carefully designed to avoid effects of lexical frequency: all nouns and verbs used had Zipf values > 4, indicating high frequency. Moreover, I compared and made sure that the lexical frequencies of NP1s and NP2s did not differ. The length in words of the experimental materials was uniform across conditions. Furthermore, I carried out 2 norming studies (see Sections 2.2 and 2.3) in order to control for possible grammatical and semantic biases, and for the availability of the PR interpretation in the matrix verbs.

I analysed the data for accuracy, reading and response times. Results showed that high attachment was facilitated in all measures, regardless of the availability of PRs. Therefore, Experiments 1a and 1b do not support Late Closure, Minimal Attachment or the PR-First Hypothesis.

[6] Only recently, Cairncross et al., 2024 carried out a self-paced reading experiment with unambiguous sentences, see Section 1.4

2.1 Overview of the experiments

The goal of Experiments 1a (in-lab) and 1b (internet-based) was to shed light on whether, according to the PR-First Hypothesis, high-attaching relative clauses are cognitively costlier to process than low-attaching ones (Frazier, 1979), whether pseudorelatives are cognitively easier to process than relative clauses, and whether high attachment preference in Spanish can be due to PR availability (Grillo & Costa, 2014). With these goals in mind, I designed a self-paced reading experiment in Spanish containing an embedded clause of the type [NP1 of NP2 that EV]. These items were then manipulated to obtain four conditions. On the one hand, the matrix verb (MV) was either perceptual or quasi-perceptual (see Grillo & Costa, 2014), and thus compatible with a PR reading; or non-perceptual, hence blocking any PR interpretation. On the other hand, the attachment was either forced on the NP1 — high attachment — or on the NP2 — low attachment — by means of subject-verb number agreement. Therefore, the four conditions were the following:

(18) a. Perceptual matrix verb, low attachment:
Paco contempló al primo de los camareros que estudiaban en la biblioteca.
Paco gazed at the cousin of the waiters that were studying in the library.

b. Perceptual matrix verb, high attachment (PR-available):
Paco contempló a los primos del camarero que estudiaban en la biblioteca.
Paco gazed at the cousins of the waiter (that were) studying in the library.

c. Non-perceptual matrix verb, low attachment:
Paco ayudó al primo de los camareros que estudiaban en la biblioteca.
Paco helped the cousin of the waiters that were studying in the library.

d. Non-perceptual matrix verb, high attachment:
Paco ayudó a los primos del camarero que estudiaban en la biblioteca.
Paco helped the cousins of the waiter that were studying in the library.

I ran two norming studies to control for a possible semantic bias towards either high or low attachment (Norming Study 1), and to ensure the availability of PRs with the perceptual matrix verbs previously selected (Norming Study 2).

2.2 Norming Study 1

In order to control for possible semantic biases towards either high or low attachment, and to ensure that both the NP1s and the NP2s of each item are equally plausible to carry on the activity in the embedded verb (i.e., in (18), that both 'a waiter' and 'a cousin' are equally likely to be studying in the library), I conducted a web-based norming questionnaire on the Ibex Farm platform (Drummond, 2013) on the 42 sentences created for Experiments 1 and 2. The two conditions were simple clauses depicting either the NP1 or the NP2 performing the action in the original embedded clause. A linear model showed that the normalized frequency — as gathered in the CREA corpus by Real Academia Española (2008) — of the nouns selected as NP1s (mean = 71.25, SD = 70.66) and NP2s (mean = 77.23, SD = 83.87) did not differ ($F(1,82) = 1.39$, $p = 0.24$). Moreover, Zipf values for all NPs were above 4, so as to avoid low-frequency words.

I compared the naturalness of the two conditions and excluded those items in which there was a difference between the two conditions, in order to ensure that the items used in Experiments 1 and 2 have no semantic bias. As an example, the norming items for (18) were the following:

(19) a. NP1-attaching *El primo estudiaba en la biblioteca.*
The cousin was studying in the library.

b. NP2-attaching *El camarero estudiaba en la biblioteca.*
The waiter was studying in the library.

I then created 21 highly acceptable and natural filler sentences, and 42 highly unacceptable or ungrammatical filler sentences. Four lists were created, and each participant saw 21 experimental sentences and all the fillers. Therefore, each participant saw 42 highly unacceptable and 42 highly acceptable sentences. Participants in lists 1 and 2 saw the items in condition (19)a, whereas participants in lists 3 and 4 saw the items in condition (19)b.

Participants undertook the questionnaire on Ibex Farm, remotely and at their own pace. They were asked to read each sentence carefully, and evaluate their naturalness and acceptability on a 7-point Likert-scale, being 1 = *totally unacceptable*

and 7 = *totally acceptable*. No feedback was offered. The experiment started with 6 warm-up sentences (half of which were totally acceptable), to avoid experimental sentences at the very beginning and to ensure familiarization with the task. The presentation of the stimuli was pseudorandomised in order to have exactly 3 filler sentences between each two experimental items. The whole experiment lasted around 7 minutes.

I collected data from 120 native Spanish participants, with each list containing 30 participants. After a preliminary analysis, I discarded participants from Latin America, because the items were created using words from peninsular Spanish, and Latin American participants were plausibly rating some items based on the unfamiliarity with some words. For instance, the word *camarero* in item (19)b is widely accepted in Europe but very infrequently used in Latin America. Such selection resulted in a final pool of 120 participants (80 females, 1 did not want to disclose their gender, mean age = 35.758; SD = 12.933). Furthermore, all the trials in which a participant answered faster than 1000 ms were discarded (<0.001% of the data).

The data were analysed by using R Studio software (R Core Team, 2020). First, I checked the median for the experimental sentences. The median was 7 for the overall sentences, meaning that the experimental sentences were highly acceptable. Furthermore, the median was also 7 for each condition — NP1-attaching and NP2-attaching. Then, I tested the overall ratings against chance level. A one-tailed one-sample Wilcoxon test against $\mu = 4$ revealed a significant difference ($V = 5459664$, $p < 0.001$), suggesting that the data did differ from chance level. Finally, I tested the ratings of one condition against the other. A Mann-Whitney-Wilcoxon test for independent samples did not reveal any difference ($W = 804137$, $p = 0.316$).

Results showed overall high scores, above chance level, indicating that the items were well-formed and highly acceptable. Furthermore, the scores from the two conditions did not differ. I concluded that the NPs of the items created for Experiment 1 were equally plausible to carry on the action of the embedded verb, given that there was no difference between the two conditions. Finally, these preliminary results showed that the geographical component has to be taken into account when selecting the participants for this kind of studies. Therefore, in the following experiments, I decided to test only native participants of European (Peninsular) Spanish.

2.3 Norming Study 2

A second norming study, a web-based questionnaire on the Ibex Farm platform (Drummond, 2013), was conducted in order to assess the availability of PR structures in Spanish under the 28 perceptual matrix verbs that I selected:

Atisbar	'to discern, make out'	*Observar*	'to watch, to observe'
Contemplar	'to gaze at'	*Mirar*	'to look at'
Cotillear	'to snoop'	*Notar*	'to notice'
Delinear	'to draw up, to outline'	*Sorprender*	'to surprise, to catch someone in the act'
Descubrir	'to find'	*Percibir*	'to perceive'
Dibujar	'to draw'	*Oír*	'to hear'
Entreoír	'to half-hear'	*Reconocer*	'to recognise'
Entrever	'to catch a glimpse of'	*Retratar*	'to portray'
Escuchar	'to listen to'	*Sentir*	'to feel'
Espiar	'to spy on'	*Soñar*	'to dream'
Estudiar	'to look into'	*Pillar*	'to catch someone in the act'
Fotografiar	'to take a picture of'	*Ver*	'to see'
Grabar	'to record'	*Vigilar*	'to guard'
Imaaginar	'to imagine'	*Vislumbrar*	'to catch a glimpse'

Each item started with a perceptual or quasiperceptual verb (see Barros de Brito, 1995; Cinque, 1992; Grillo & Costa, 2014). The matrix verb was then followed by a proper noun and an eventive small clause introduced by the complementiser *que*. The attachment of the embedded clause to the proper noun forced the participants to a non-optional, unambiguous pseudorelative construction (see Grillo & Costa, 2014). The embedded clause always ended with a circumstantial clause of two or

three words in order to create as natural sentences as possible. Furthermore, the embedded verbs only consisted of atelic activities:

Correr en el parque	'to run in the park'	*Jugar con el cachorro*	'to play with the puppy'
Patinar con sus amigas	'to skate with their friends'	*Fregar los platos*	'to wash the dishes'
Jugar a futbol	'to play football'	*Entrenar para la competición*	'to train for the competition'
Esquiar por la pista	'to ski in the track'	*Tocar el saxofón*	'to play the saxophone'
Caminar por el río	'to walk by the river'	*Tocar la guitarra*	'to play the guitar'
Llorar por el duelo	'to keel'	*Cantar mi canción favorita*	'to sing my favourite song'
Fumar un puro cubano	'to smoke a Cuban cigar'	*Tocar el piano*	'to play the piano'

Follows an example of the items used:

(20) *Vi a Marta que patinaba con sus amigas*
I saw Marta skating with her friends

The normalised frequencies of the (quasi-)perceptual matrix verbs (MVs) ranged greatly, from less than 1 occurrence per million to over a thousand occurrences per million. This allowed testing for the broadest possible number of predicates. Consequently, I expected high variability in the ratings.

I then created 21 highly unacceptable or ungrammatical filler sentences, and 21 highly acceptable and natural filler sentences. Each participant saw half of the experimental sentences (N = 14, thus resulting in the creation of two lists) and all the fillers. The whole experiment lasted around 5 minutes. The procedure was the same as in Norming Study 1.

I first proceeded to discard data from non-peninsular speakers of Spanish. Then, I discarded data from those participants whose answers on the ungrammatical fillers differed the most from the expected outcome (i.e., 1 = "totally unacceptable"). As a final result of this trimming process, data from 60 participants (29 females, mean

age = 39.05; SD = 10.682) were analysed. Furthermore, all the trials in which a participant answered faster than 1000 ms were discarded (<0.001% of the data).

The data were analysed by using R Studio software (R Core Team, 2020). First, I checked the overall median and mode for the experimental sentences, to ensure the availability of PRs. The median was 5, the mode was 7. Furthermore, I tested the ratings of the experimental ratings against chance ($\mu = 4$). A one-tailed one-sample Wilcoxon test against $\mu = 4$ revealed a significant difference ($V = 169076$, $p < 0.001$). Of the experimental items, 16 had median value higher than 4.

Given the high values of mode and median, I concluded that PRs are available and acceptable in Spanish. I also concluded that at least 16 of the perceptual verbs could introduce PRs, i.e., those which received median score > 4, and, consequently, I used those verbs to craft the materials for Experiment 1.

Subsequently, I selected 10 of the highest-rated MVs to use in Experiment 1. The final perceptual verbs selected for Experiment 1 were:

Atisbar	'to discern, make out'	*Mirar*	'to look at
Contemplar	'to gaze at'	*Observar*	'to watch, to observe'
Escuchar	'to listen to'	*Reconocer*	'to recognise'
Fotografiar	'to take a picture' of	*Ver*	'to see'
Grabar	'to record'	*Vigilar*	'to guard'

All of these verbs had Zipf values > 4. Finally, I selected 10 non-perceptual verbs to create the conditions introduced by non-perceptual verbs (conditions (18)c and (18)d). The non-perceptual verbs eventually selected for Experiment 1 were:

Abrazar	'to hug'	*Esperar*	'to wait for someone'
Ayudar	'to help'	*Llamar*	'to call'
Dejar	'to leave'	*Regañar*	'to scold
Entrenar	'to train'	*Señalar*	'to point at'

Envidiar 'to envy' *Visitar* 'to visit'

A Wilcoxon test showed that the normalized frequency — as gathered in the CREA corpus by Real Academia Española (2008) — of perceptual verbs (mean = 261.7, SD = 457.51) and of non-perceptual verbs (mean = 217.31, SD = 263.82) did not differ (W = 51, p = 0.97) Again, Zipf values for all non-perceptual verbs were above 4, to avoid words of low frequency.

These two Norming studies ensured that the materials crafted for the following experiments were correct and free of confounds known to modulate attachment preferences (such as animacy, lexical and frequency factors etc.). By doing so, I ensured that the results obtained in Experiments 1 and 2 are unlikely to be due to flaws in the materials and/or to an imbalance in features between conditions, such as differences in word frequency and/or plausibility between the two attachments, since I checked for these specific factors.

2.4 Methods

2.1.1. Participants

81 participants took part in Experiment 1a (in-lab, 54 females, mean age = 24.25, SD = 7.58). Due to an error in the distribution of the lists, I had to remove the data of one participant from the analysis and test an additional participant in order to preserve the balance in the number of observations per list. As for Experiment 1b, 80 participants took part in the experiment (internet-based, 67 females, 1 did not want to disclose this information, mean age = 24.52, SD = 6.69). All participants were offered compensation for their time and gave their informed consent under experimental protocols approved by the Ethics Committee of the UPV/EHU (*Comité de Ética para las Investigaciones relacionadas con Seres Humanos*, CEISH: M10_2020_182). All participants were native speakers of peninsular Spanish. Their dominant language was Spanish, that is, they mainly spoke Spanish with their families and acquaintances, and carried out their daily activities and jobs almost exclusively in Spanish, as assessed via a questionnaire. I selected the participants over 18 and under 50 years old.

2.1.2. Materials

Materials were normed as detailed in Sections 2.2 and 2.3. From those materials, I chose 10 perceptual matrix verbs, and 10 non-perceptual matrix verbs. 20 NPs served as NP1s, and another set of 20 NPs served as NP2s. I matched NP1s and NP2s appropriately and generated 40 combinations of complex NPs of the [NP1 of NP2] type. I assigned each of the NPs to a pair of perceptual and non-perceptual matrix verbs, resulting in 40 non-ambiguous sentences like the one presented in (18) and repeated below in (21):

(21) a. Perceptual matrix verb, low attachment:
Paco contempló al primo de los camareros que estudiaban en la biblioteca.
Paco gazed at the cousin of the waiters that were studying in the library.

b. Perceptual matrix verb, high attachment (PR-available):
Paco contempló a los primos del camarero que estudiaban en la biblioteca.
Paco gazed at the cousins of the waiter (that were) studying in the library.

c. Non-perceptual matrix verb, low attachment:
Paco ayudó al primo de los camareros que estudiaban en la biblioteca.
Paco helped the cousin of the waiters that were studying in the library.

d. Non-perceptual matrix verb, high attachment:
Paco ayudó a los primos del camarero que estudiaban en la biblioteca.
Paco helped the cousins of the waiter that were studying in the library.

For each item, I created four conditions manipulating (i) the Attachment, making it high or low, and (ii) the Matrix Verb, making it perceptual or non-perceptual. In the high-attaching condition, the embedded verb agreed with the NP1, while in the low-attaching condition the verb agreed with the NP2. The embedded verb was always in plural in order to prevent possible agreement attraction effects. Although agreement attraction effects are usually found in ungrammatical contexts, studies in Spanish show mixed results (Acuña-Fariña et al., 2014; Martin et al., 2012, 2014; Wagers et al., 2009). Given that high-attaching sentences agreeing in singular form would result in the insertion of a *plural* NP2 between the NP1 and the EV, and, consequently, could possibly lead to attraction effects, I decided to use only a plural agreement when manipulating the attachment.

2.1.3. Procedure

The experiment was prepared and initially run on the Ibex Farm platform (Drummond, 2013), and, after its demise, on the updated version PCibex (Zehr & Schwarz, 2018). Participants undertook the experiment at their own pace in the Experimental Linguistics Laboratory at the Micaela Portilla Research Centre of the University of the Basque Country in Vitoria-Gasteiz (Experiment 1a). Other participants performed the task online — on the internet, that is, each from a location of their own choosing (Experiment 1b). They were asked to use a laptop or a personal computer — not a phone nor a tablet —, to be in a quiet environment, away from distractions, with their phones muted. They were also asked to run the whole experiment in one session and never step away from their computers. For both experiments, the following procedure was the same. Participants filled a survey form, provided demographic and linguistic information, and were instructed as to how to carry on the experiment. They were presented at first with a blank screen with underscores placed where the words of the stimuli would appear. They were required to press the space bar in order to read the sentences word-by-word at their own pace (self-paced reading method). Whenever a new word appeared on the screen, the previous one would disappear. All of the stimuli were presented on the same line, avoiding breaks in their implicit prosody, and as well as triggering high or low attachment (Fodor, 2002; Hemforth et al., 2015). At the end of each sentence, a comprehension question appeared; in the case of experimental items, the question inquired about who was carrying out the activity on the embedded verb. Participants had to select their answer on the keyboard by using the key "A" for the left-hand answer, and "L" for the right-hand answer. The position of the answers was random, so to have a 50% of correct answers on the left side, and vice versa. No feedback was offered. The first six sentences were practice trials to ensure familiarization with the task. Participants were not informed about the practice trials, and no feedback was offered. Practice trials were excluded from the analyses. The presentation of the stimuli was pseudo-randomised: 3 filler sentences were randomly placed between each two experimental items (which were also randomized). In Experiment 1a, the experimenter stayed in a separate area of the laboratory and tracked the participants' progress in order to intervene in case of technical difficulties.

2.1.4. Data preparation

The data were analysed using R Studio software (R Core Team, 2020) and the lme4 (Bates et al., 2015), afex (Singmann et al., 2021) and emmeans (Lenth, 2022) packages.

First, I discarded those participants that became aware of experimental manipulations used in the study (N = 3 in Experiment 1a). One participant in experiment 1a was excluded because she reported having read the sentences out loud. The final pool for Experiment 1a consisted of 76 participants (51 females, mean age = 22.75; SD = 7).

I subsequently calculated the logarithmic reading times for each word. Then, following the steps described in Jaeger's blog (Jaeger, 2007, 2008), I calculated the residual reading times for the critical and post-critical regions, separately for each experiment modality — laboratory: Experiment 1a; or internet: Experiment 1b. In other words, I ran a linear mixed model on the logarithmic reading times, with item ID, the word length, the logarithmic position of the stimulus in the list, the position of the word in the sentence as fixed effects; and subject ID as random effect.

To clean the data, I first excluded from the analysis the data from participants who had scored less than 70% in accuracy (no such data in Experiment 1a; data from 3 participants in Experiment 1b). The final sample for Experiment 1b had 77 participants (64 females, 1 did not want to disclose this information, mean age = 24.67, SD = 6.76). I subsequently trimmed all those items in which a participant had read any of the words in fewer than 50 ms or in more than 3000 ms, which resulted in the deletion of 5.4% of the data in Experiment 1a, and 4.63% in Experiment 1b. Next, I deleted all reading times that exceeded a threshold of 2.5 standard deviations from the mean by participant, region and condition. I also removed all response times and corresponding answers that exceeded the same threshold, which resulted in an overall deletion of the 8.23% of the data in the laboratory sample, and of 7.35% in the internet sample. Finally, all response times and corresponding answers lower than 500 ms or higher than 7000 ms were discarded, as well. Over all, I removed the 8.54% of the data in Experiment 1a and 7.57% in Experiment 1b.

2.1.5. Data analysis

Accuracy was analysed using a generalised linear mixed model on binomial data. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment (high vs. low) and their interaction as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model was a model with Attachment as predictor.

Response times were analysed using a linear mixed model on the logarithmic times. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment (high vs. low) and their interaction as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model was a model with Matrix Verb as predictor. Only correctly answered trials were analysed.

Reading times at all regions of interest (Embedded Verb and the following two regions: EV, EV+1, EV+2) were analysed using a linear mixed model on the residual reading times. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment (high vs. low), their interaction as predictors, as well as the logarithmic reading times from the two previous regions — which were never excluded in any of the models and were not taken into account when significant —; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model at the embedded verb was a model with Attachment as predictor; and a model with no predictor in the following two regions. Only correctly answered trials were analysed.

2.1.6. Predictions

Taking into account the example item in (21) and repeated below in (22), the PR-First Hypothesis (Grillo & Costa, 2014) predicts condition (b) — that is, a high-attaching structure, introduced by a perceptual verb, hence allowing a PR — to be the easiest, and condition (d) — a high-attaching structure, introduced by a non-

perceptual verb, and only allowing an RC — to be the most costly to parse. Participants were consequently expected to perform the task more accurately on condition (b) than on the other conditions. Also, according to the PR-First Hypothesis, participants should be the least accurate on condition (d) — that is, (b) > (c), (a) > (d). As for the response times, and following the PR-First Hypothesis, I expected the time taken to answer the questions to be faster in condition (b) than in the other ones; and to be slower in condition (d) than in the other ones — that is, (b) < (c), (a) < (d). Finally, as for the reading times at the critical and/or post-critical regions, according to the PR-First Hypothesis, I expected them to be faster in condition (b) than in the other ones; and to be slower in condition (d) than in the other ones — that is, (b) < (c), (a) < (d).

(22) a. Perceptual matrix verb, low attachment:
Paco contempló al primo de los camareros que estudiaban en la biblioteca.
Paco gazed at the cousin of the waiters that were studying in the library.

b. Perceptual matrix verb, high attachment (PR-available):
Paco contempló a los primos del camarero que estudiaban en la biblioteca.
Paco gazed at the cousins of the waiter (that were) studying in the library.

c. Non-perceptual matrix verb, low attachment:
Paco ayudó al primo de los camareros que estudiaban en la biblioteca.
Paco helped the cousin of the waiters that were studying in the library.

d. Non-perceptual matrix verb, high attachment:
Paco ayudó a los primos del camarero que estudiaban en la biblioteca.
Paco helped the cousins of the waiter that were studying in the library.

2.5 Results

Results for accuracy showed a main effect of Attachment ($p < 0.001$), indicating that responses to high-attaching sentences (mean = 0.86, SD = 0.35) were more accurate than to low-attaching sentences (mean = 0.61, SD = 0.49). See Table 2 and Figure 5.

	High attachment	Low attachment
Correct answers	1123	725
Incorrect answers	175	531

Table 2. Number of correct and incorrect answers per each level of Attachment (high vs. low). Accuracy was higher in the high-attaching conditions.

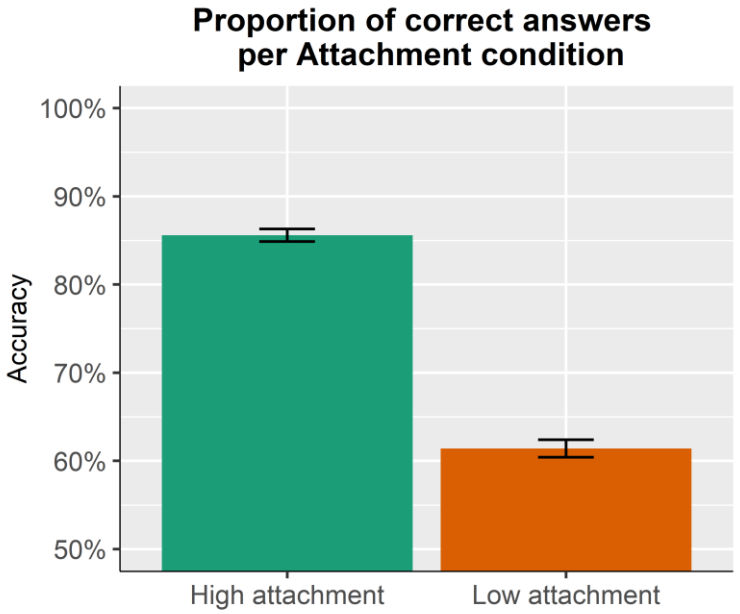

Figure 5. Proportion of correct answers per each attachment condition. High-attaching sentences were more accurate than low-attaching sentences.

Results for the response times showed a main effect of Matrix Verb ($p = 0.01$), that is, the questions to sentences introduced by a perceptual matrix verb (mean = 2915 ms, SD = 1376 ms) were answered faster than the questions introduced by a non-perceptual matrix verb (mean = 3080 ms, SD = 1424 ms). See Figure 6.

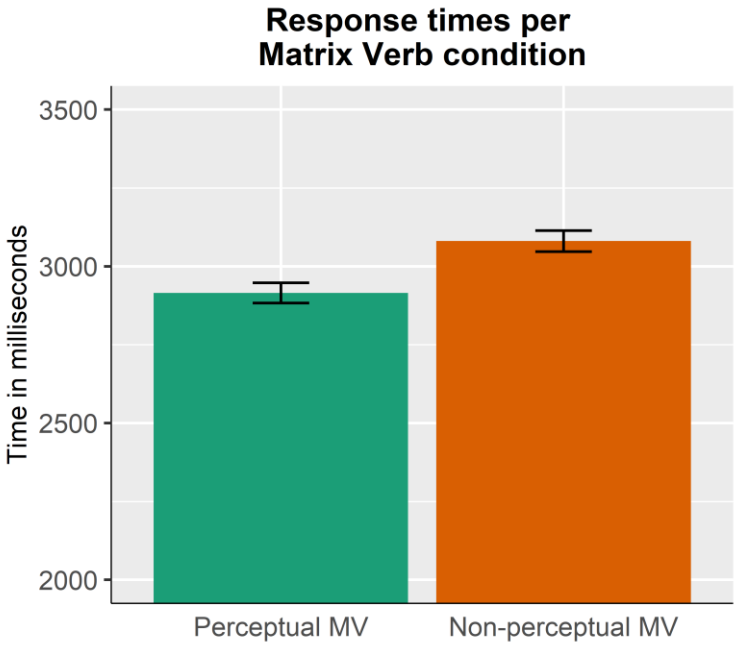

Figure 6. Response times per each matrix verb condition (perceptual vs. non-perceptual MV). Answers to the sentences introduced by perceptual matrix verbs were faster than those introduced by non-perceptual matrix verbs, regardless of the manipulation of Attachment.

Results for the reading times at the embedded verb revealed a main effect of Attachment ($p = 0.04$): verbs in high-attaching sentences (mean = 474.89 ms, SD = 245.72 ms) were faster to read than those in low-attaching sentences (mean = 481.11 ms, SD = 265.93 ms. See Figure 7). Results for the reading times at the post-critical regions showed no effect or interaction for any of the predictors into consideration (see Figure 8).

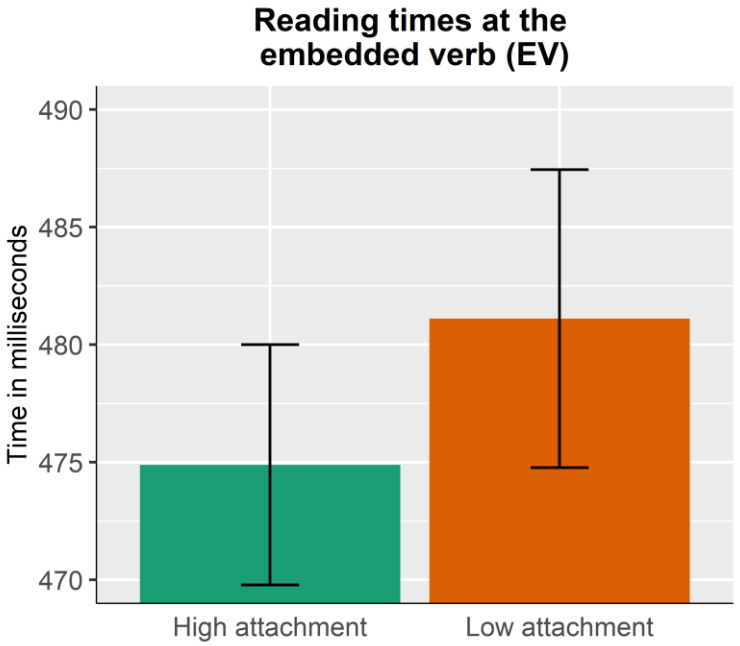

Figure 7. Reading times at the embedded verb per each level of attachment. High-attaching sentences were read faster than low-attaching sentences.

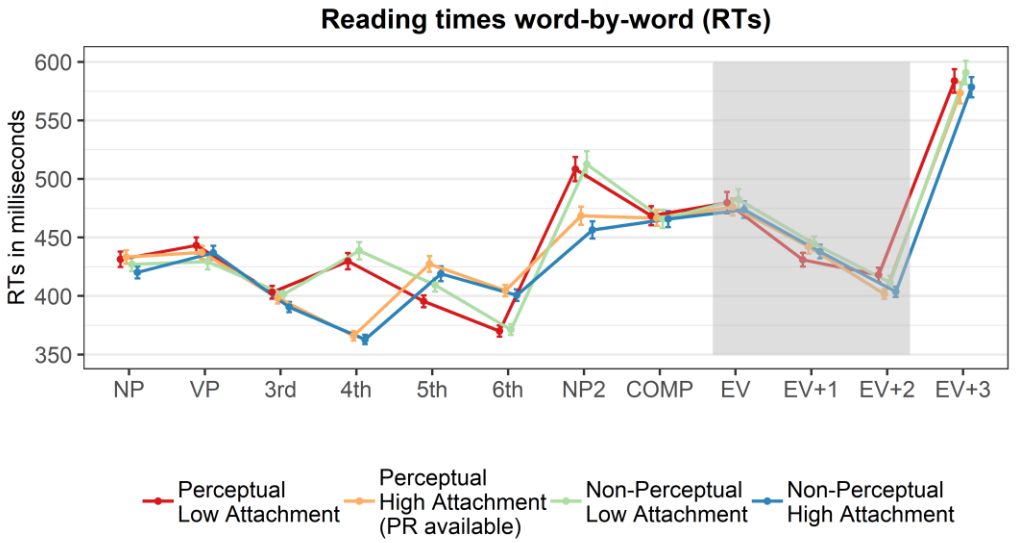

Figure 8. Reading times per each word of the experimental items, in milliseconds. Regions of interest are the embedded verb and following two regions (EV, EV+1, EV+2, in gray). An effect was only found at the first region of interest (EV).

2.6 Discussion

Experiments 1a and 1b were intended to measure the processing cost of pseudorelatives, high-attaching relative clauses and low-attaching relative clauses, and to determine whether high attachment preferences in Spanish were due to the availability of PRs (Grillo & Costa, 2014). The experimental items were non-ambiguous sentences, either disambiguated towards high or low attachment. Results from Experiments 1a and 1b showed higher accuracy and faster reading times for high attachment than for low attachment, regardless of the PR availability.

The results showed a clear advantage for high attachment, regardless of the matrix verb, in both off- and online measures. According to Frazier's Minimal Attachment and Late Closure, high attachment should be the cognitively costliest construction, whereas here we see that it is, cognitively speaking, the easiest construction. To my knowledge, no empirical evidence had ever been gathered to directly test Frazier's claim about the cognitive cost of high attachment with non-ambiguous materials. The use of unambiguous items, whose attachment was either forced high or low, allowed me to test which option was cognitively easier to process.

Furthermore, results from Experiments 1a and 1b did not support the PR-First Hypothesis. This Hypothesis predicts that high attachment preference is due to the availability of PRs, which are easier to parse than RCs. I found a consistent advantage of high attachment in all contexts, and not only whenever a pseudorelative clause is available.

Finally, I found an advantage for perceptual matrix verbs in the response times. This result cannot be due to a higher frequency of the perceptual matrix verbs over the non-perceptual ones, because this factor had been controlled in the creation of the materials. It is also not due to the fact that a perceptual matrix verb prototypically introduces a pseudorelative and, therefore, could make sentences introduced by perceptual verbs easier to parse, because only 50% of the items introduced by a perceptual verb allow a pseudorelative. See Chapter 7 for a tentative explanation of this phenomenon.

Over all, my findings regarding the high attachment advantage are consistent with most of the literature since Cuetos' and Mitchell's pioneer work from 1988 and previous to Grillo and Costa's from 2014. My results show that Spanish participants

experience an advantage for high-attaching sentences, not only when pseudorelatives are available, but across-the-board.

3. Revisiting Attachment preferences in Spanish

After determining that high attachment is the easiest strategy in Spanish, I ran two additional self-paced reading experiments, designed to test the PR-First Hypothesis directly (preregistered at https://osf.io/ph72t). These experiments allowed me to gather information about the preferred attachment strategy by asking the participants whether they interpreted each experimental sentences as high- or low-attaching. Furthermore, I measured the online cognitive cost of each attachment preference by means of reading and response times. In other words, I cross-analysed the online results with the attachment preferences given by the participants.

The PR-First Hypothesis not only predicts that in PR-available environments there will be overwhelmingly more high-attachment preferences, and in RC-only environments there will be overwhelmingly more low-attachment preferences. It also predicts that participants would find an advantage whenever they chose high attachment in PR-available contexts, since that would be the easiest structure available. In other words, the PR-First Hypothesis predicts faster reading and response times whenever PRs are available, but only if high attachment is selected — which would also be the most selected choice. Conversely, in the RC-only condition, the Hypothesis predicts faster reading and response times only when low attachment is selected (which, incidentally, should also be the most frequently selected choice according to this hypothesis).

As I had already done in Experiments 1a and 1b, here too I controlled for the statistical power of the experiment (80 participants for Experiments 2a and 2b). Furthermore, the materials were the same as in Experiments 1a and 1b, and so,once again, grammatical and/or lexical biases were prevented by means of 2 norming studies (see Sections 2.2 and 2.3).

I analysed the data for attachment preferences, reading and response times. Results showed that high attachment was preferred and facilitated in all measures, regardless of the availability of PRs. Therefore, results from Experiments 2a and 2b do not support Late Closure, Minimal Attachment or the PR-First Hypothesis.

3.1 Overview of the experiments

Experiments 1a and 1b were designed to test the processing cost of relative and pseudorelative clauses, and whether PRs are easier to parse (Grillo & Costa, 2014). Experiments 2a (in-lab) and 2b (internet-based), in turn, were designed to ascertain whether or not attachment preferences are compatible with the predictions made by the PR-First Hypothesis. The hypothesis predicts high-attachment preferences in PR-available contexts and low-attachment preferences in RC-only contexts, which is why I deployed deliberately ambiguous sentences in these experiments. The method was, again, the self-paced reading; nonetheless, in addition to recording online measures, I also measured participants' attachment preferences:

(23) a. Perceptual matrix verb (PR-available):
Paco contempló al primo del camarero que estudiaba en la biblioteca.
Paco gazed at the cousin of the waiter (that was) studying in the library.

b. Non-perceptual matrix verb (RC-only):
Paco ayudó al primo del camarero que estudiaba en la biblioteca.
Paco helped the cousin of the waiter that was studying in the library.

The experimental conditions were obtained by manipulating the matrix verb, as in Experiment 1: either perceptual or quasi-perceptual (23)a, hence allowing a PR, or non-perceptual (23)b, therefore blocking any PR and forcing a RC reading.

3.2 Methods

3.2.1. Participants

40 participants took part in Experiment 2a (27 females, mean age = 22.97, SD = 6.35) and 40 participants in Experiment 2b (31 females, mean age = 26.25, SD = 4.04). Although some of the participants preferred not to be paid, all participants were offered compensation for their time and gave their informed consent under experimental protocols approved by the Ethics Committee of the UPV/EHU (*Comité de Ética para las Investigaciones relacionadas con Seres Humanos, CEISH:* M10_2020_182). All participants were native speakers of peninsular Spanish. Their dominant language was Spanish, that is, they mainly spoke Spanish with their families and acquaintances, and carried out their daily activities and jobs almost

exclusively in Spanish, as assessed via a questionnaire. I selected the participants over 18 and under 50 years old.

3.2.2. Materials

Materials for this experiment were obtained from the materials described in Experiment 1, and were turned ambiguous by changing the number of the NP1s, NP2s and EVs to singular. Therefore, materials were normed as detailed in Sections 2.2 and 2.3. An example can be found in (23), repeated below in (24). Only two conditions were at play: the items were either introduced by a perceptual MV —allowing a PR: (24)a —, or by a non-perpceptual MV —blocking the PR and forcing a RC reading: (24)b.

(24) a. Perceptual matrix verb (PR-available):
Paco contempló al primo del camarero que estudiaba en la biblioteca.
Paco gazed at the cousin of the waiter (that was) studying in the library.

b. Non-perceptual matrix verb (RC-only):
Paco ayudó al primo del camarero que estudiaba en la biblioteca.
Paco helped the cousin of the waiter that was studying in the library.

3.2.3. Procedure

The procedure was the same as in Experiments 1a and 1b.

3.2.4. Data preparation

The data were analysed by using R Studio software (R Core Team, 2020) and the lme4 (Bates et al., 2015), afex (Singmann et al., 2021) and emmeans (Lenth, 2022) packages.

I first calculated the residual reading times separately per each modality, as detailed for Experiment 1.

I then excluded data from one participant in Experiment 2a due to diagnosed dyslexia. The final pool for Experiment 2a consisted of 39 participants (27 females, mean age = 22.92, SD = 6.42).

To clean the data, in the same fashion as in Experiment 1, I discarded those participants who scored less than 70% of accuracy in the filler items. One participant from Experiment 2b was discarded in this step. The final pool for experiment 2b consisted of 39 participants (27 females, mean age = 27.82, SD = 8.3). Then, I trimmed all items in which a participant had read any of the words in less than 50 ms or more than 3000 ms (resulting in the deletion of 9.613% of the data in Experiment 2a, 4.69% in Experiment 2b). I deleted all reading times that exceeded a threshold of 2.5 standard deviations from the mean by participant, region and condition. I also deleted all response times (and their corresponding answers) that exceeded the same threshold (overall deletion of the 7.49% of the data in Experiment 2a and 6.31 % in Experiment 2b). Finally, I discarded all response times (and corresponding answers) lower than 500 ms or higher than 7000 ms. Overall, I discarded the 10.17% of the data in Experiment 2a and the 7.79% in Experiment 2b.

3.2.5. Data analysis

Attachment preferences were analysed using a generalized linear mixed model on binomial data. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual) as predictor, and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting was one with no predictors.

Response times were analysed using a linear mixed model on the logarithmic times. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment preference (high vs. low), and their interaction as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model included Attachment preference as predictor. Only correctly answered trials were analysed.

Reading times at all regions of interest (the Embedded Verb and the following two regions: EV, EV+1, EV+2) were analysed using a linear mixed model on the residual reading times. The best-fitting model was selected by means of an ANOVA

(analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment preferences (high vs. low) and their interaction as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model for the reading times at the first two critical regions (embedded verb and following region: EV and EV+1) was a model with no predictors. The best-fitting model at the last critical region was a model with Attachment preference as predictor. Only correctly answered trials were analysed.

3.2.6. Predictions

Taking into account the example item in (23), repeated below in (25), the PR-First Hypothesis (Grillo & Costa, 2014) predicts PR-available condition (a) to be preferred for high attachment exclusively; whereas condition (b), which stands ambiguous between a PR and a RC reading, would receive a preference for low attachment exclusively — in line with Minimal Attachment and Late Closure (Frazier, 1979). This is so because (a) admits PRs, and, therefore, according to the PR-First Hypothesis, such interpretation will be preferred, whereas (b) only admits RCs. The PR-First Hypothesis also predicts that, whenever high attachment is preferred in (a), reading and response times will be faster when compared to a low attachment preference in the same condition. Conversely, in (b), reading and response times associated to a low attachment preference would be faster than those associated to a high attachment preference in the same condition.

(25) a. Perceptual matrix verb (PR-available):
Paco contempló al primo del camarero que estudiaba en la biblioteca.
Paco gazed at the cousin of the waiter (that was) studying in the library.

b. Non-perceptual matrix verb (RC-only):
Paco ayudó al primo del camarero que estudiaba en la biblioteca.
Paco helped the cousin of the waiter that was studying in the library.

3.3 Results

The intercept of the model was significant ($p < 0.001$). This indicated that high-attachment preferences were higher than chance (50%). No main effect of Matrix verb was found. See Table 3 and Figure 9.

High Attachment	Low Attachment
1633 (0.68 ± 0.47)	766 (0.32 ± 0.47)

Table 3. Raw number of high and low attachment preferences. In brackets, the means and standard deviations.

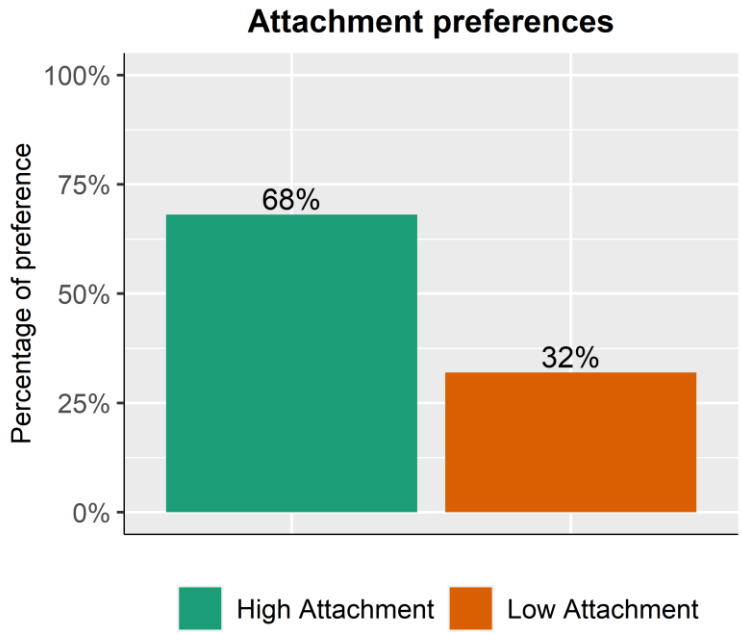

Figure 9. Proportion of overall preferences. High attachment was preferred to a greater extent than low attachment.

Results for the response times showed a main effect of Attachment preference ($p = 0.03$), indicating that participants were faster when making high-attachment choices (mean = 3092 ms, SD = 1283 ms), as compared to low-attachment ones (mean = 3286 ms, SD = 1553 ms). See Figure 10.

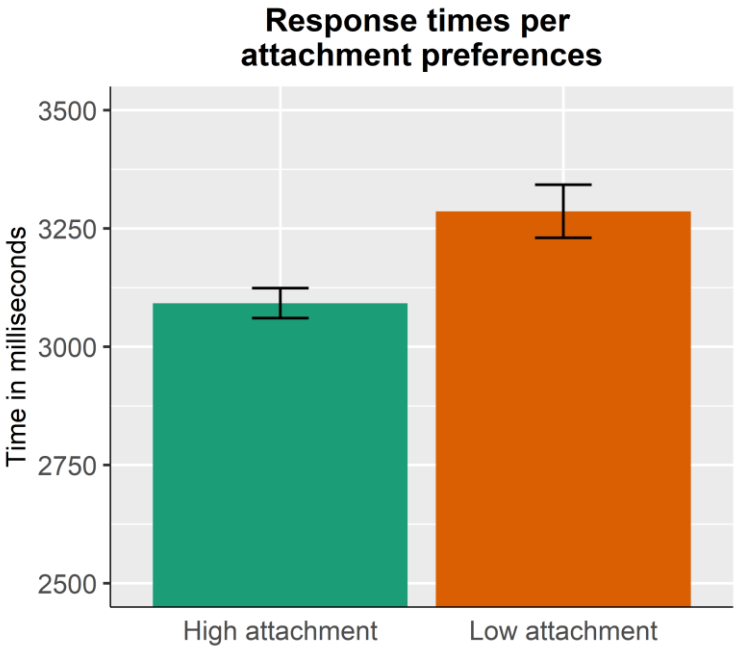

Figure 10. Response times per each attachment preference (high or low attachment). Sentences that were regarded as high-attaching were also answered faster than those that were attached low.

Results for the reading times at the critical (EV) and immediate post-critical region (EV+1) showed no effect or interaction whatsoever. As for the last critical region (EV+2), there was a main effect of Attachment preference ($p = 0.02$) showing that, at this last critical region, high-attaching sentences (mean = 397.62 ms, SD = 161.96 ms) were read faster than low-attaching sentences (mean = 400.25 ms, SD = 176.58 ms). See Figure 11 and Figure 12.

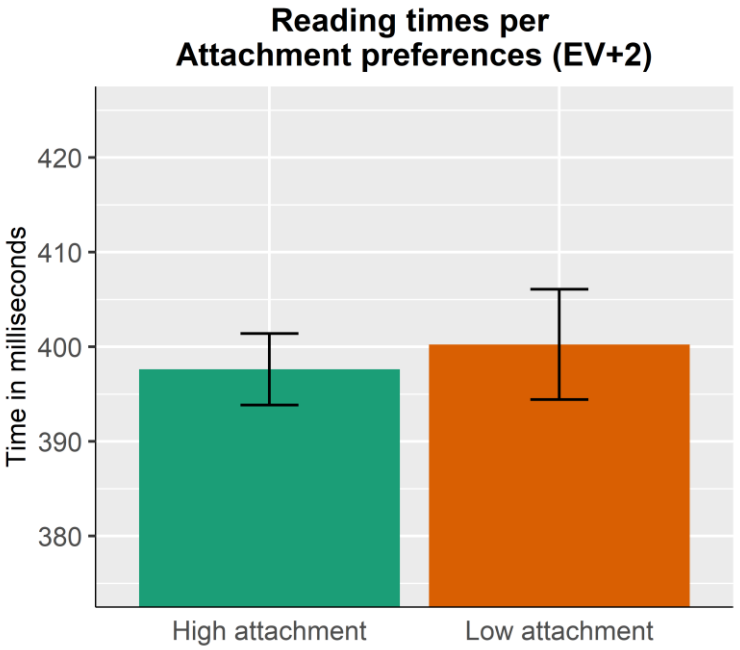

Figure 11. Reading times at the last critical region (EV+2). At this region, sentences that were regarded as high-attaching were faster to read than those that were attached low.

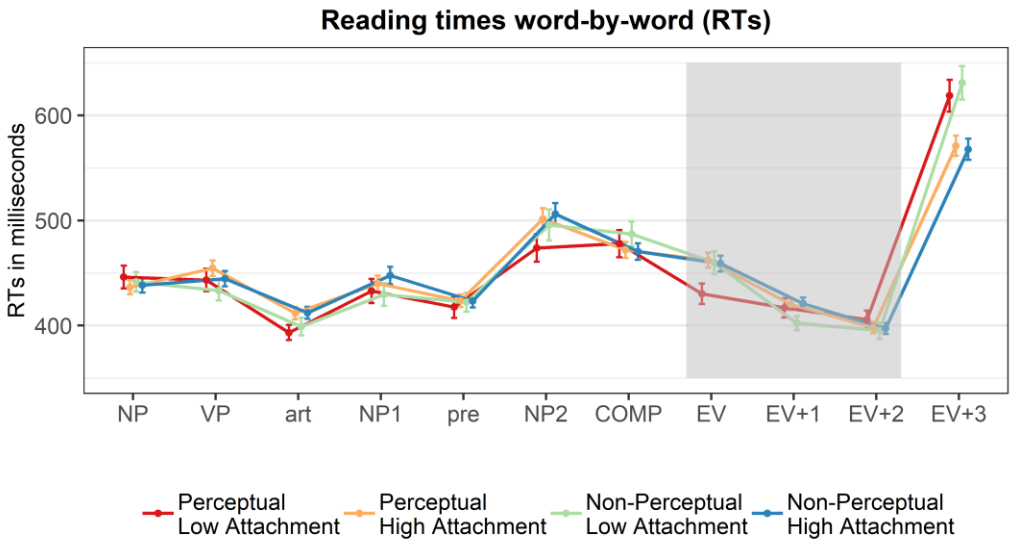

Figure 12. Reading times per each word of the experimental items, in milliseconds. Regions of interest are the embedded verb and following two regions (EV, EV+1, EV+2, in gray). An effect was only found at the last critical region (EV+2).

3.4 Discussion

Experiments 2a and 2b were designed to measure the attachment preferences of native Spanish participants, and whether or not the high-attachment preferences in Spanish were due to the availability of PRs (Grillo & Costa, 2014). The experimental items were ambiguous sentences for which the participants had to select which NP was carrying out the activity in the EV. Results from Experiments 2a and 2b showed higher preferences and faster reading times for high attachment than for low attachment, regardless of PR availability.

The data from Experiments 2a and 2b showed that there were far more high attachment readings of the ambiguous sentences than low attachment readings overall, regardless of the condition, thus revealing a strong high-attachment preference. Results also showed reduced reading and response times for high attachment readings as compared to low attachment ones. Similarly to Experiments 1a and 1b, these results revealed a clear preference and facilitation for high attachment over low attachment, with no modulation from the matrix verb (attachment preferences, response times and reading times at the last critical region EV+2). Such results do not support late closure, minimal attachment, or the PR-First Hypothesis; instead, they are in line with the results of Cuetos and Mitchell (1988).

Furthermore, and as Grillo and Costa (2014) and Jegerski (2018) pointed out, Baccino et al. (2000), De Vincenzi and Job (1995), and Kamide and Mitchell (1997) found differences between offline attachment preferences and online data regarding the processing cost of either RC attachment. Namely, they found an online facilitation for low-attaching sentences, and an offline preference for high-attaching sentences. I did not find such a discrepancy in the present data, given that everything points out to an on- and offline facilitation for high attachment.

4. The processing cost of high vs. low attachment in Italian

Given the lack of support for the PR-First Hypothesis found in these studies in Spanish, I decided to run two self-paced reading experiments in Italian (preregistered at https://osf.io/4gyt7), intended to investigate the cognitive cost of high vs. low attachment, as well as whether or not PR availability plays a role in the processing of either strategy.

These experiments are a close replica of Experiments 1a and 1b in Spanish: therefore, see Chapter 2 for a description of their novelty and importance in the literature.

I chose to run the same experiments in Italian because it is claimed that, in Italian, PRs are more frequent and more widely accepted than in Spanish (Grillo & Costa, 2014). Therefore, it is possible that PRs have a stronger modulating effect in Italian than in Spanish. If I were to find support for the PR-First Hypothesis in Italian, future work should focus on what makes PRs more available, frequent and acceptable in some languages than in others, and keep testing the hypothesis based on these characteristics. If, on the contrary, I were to find no support for the PR-First Hypothesis in Italian, I could safely claim that the hypothesis is unfit to explain the variation in attachment preferences.

I analysed the data for accuracy, reading and response times. Results showed that high attachment was facilitated in the response times. Results also showed a modulation in the accuracy. Sentences that were disambiguated towards high attachment were easier to process in PR-available contexts than in non-PR available contexts. However, high attachment was also facilitated in RC-only environments. Therefore, Experiments 2a and 2b show a modulation in the processing of the experimental sentences based on the availability of PRs, but the results do not support Late Closure, Minimal Attachment or the PR-First Hypothesis.

4.1 Overview of the experiments

In chapters 2 and 3, I described two different experiments in Spanish in order to test the PR-First Hypothesis. Given that in Experiments 1 and 2 I did not find

evidence in favour of the PR-First Hypothesis, and in order to gather cross-linguistic evidence from another language in which PR-First had been previously tested (Grillo & Costa, 2014; Grillo & Turco, 2016), I decided to replicate both experiments in Italian. It is widely accepted that PRs are more natural and available in Italian than in Spanish (Alonso-Pascua, 2020; Grillo & Costa, 2014). Therefore, it is possible that I do find evidence for the PR-First Hypothesis in Italian.

Below is an example of the materials used in Experiments 3a and 3b, which were mostly translations of the stimuli from Experiments 1a and 1b:

(26) a. Perceptual matrix verb, low attachment
Maria ha sentito il figlio dei funzionari che cantavano nel coro parrocchiale.
Maria heard the son of the administrators that were singing in the church choir.

b. Perceptual matrix verb, high attachment
Maria ha sentito i figli del funzionario che cantavano nel coro parrocchiale.
Maria heard the sons of the administrator (that were) singing in the church choir.

c. Non-perceptual matrix verb, low attachment
Maria ha allenato il figlio dei funzionari che cantavano nel coro parrocchiale.
Maria trained the son of the administrators that were singing in the church choir.

d. Non-perceptual matrix verb, high attachment
Maria ha allenato i figli del funzionario che cantavano nel coro parrocchiale.
Maria trained the sons of the administrator that were singing in the church choir.

As I did in Experiments 1 and 2, I ran two norming studies in order to control for a possible semantic bias towards either high or low attachment (Norming Study 3), and to ensure the availability of PRs with the perceptual matrix verbs that I selected (Norming Study 4).

4.2 Norming Study 3

Similarly to what I did for Spanish in Norming Study 1 (Section 2.2), I conducted a web-based norming questionnaire on the Ibex Farm platform (Drummond, 2013) regarding the translation and adaptation of the 42 sentences created for Experiments 1 and 2. I did so to control for semantic biases towards either high or low attachment and to ensure that both the NP1s and the NP2s of each item are equally plausible to carry out the activity in the embedded verb (i.e., in (26), that both a son and an administrator are equally likely to be singing in the church choir).

The methods for Norming study 3 were the same as the Norming study 1. Both the experimental and the filler materials were translations of Norming Study 1. Following is an example of the materials used in Norming Study 3:

(27) a. NP1-attaching *Il figlio cantava nel coro parrocchiale.*
The son was singing in the church choir.

b. NP2-attaching *Il funzionario cantava nel coro parrocchiale.*
The administrator was singing in the church choir.

A linear model showed that the normalized frequency — as gathered in the CORIS corpus by Rossini Favretti et al., 2002 — of the nouns selected as NP1s (mean = 90.43, SD = 95.21) and NP2s (mean = 73.84, SD = 91.36) did not differ ($F(1,82) = 0.6$, $p = 0.44$). Moreover, Zipf values for all NPs were above 4, so to avoid words of low frequency. Furthermore, in order to ensure compatibility with the Spanish data from Experiment 1, I ran a linear model whose results showed that the normalized frequencies of the NPs in Norming Study 1 and the NPs in Norming Study 3 did not statistically differ ($F(1,166) = 0.34$, $p = 0.56$).

Over all, 153 native Italian participants took part in Norming Study 3. I discarded those participants whose answers on the ungrammatical fillers differed the most from the expected outcome (i.e., 1 = "totally unacceptable"). Such a selection resulted in 120 participants (30 participants per list, 75 females, 1 did not want to disclose this information, mean age = 38.867; SD = 10.82). Furthermore, all the trials in which a participant answered faster than 1000 ms were discarded (<0.001% of the data).

The data were analysed in the same fashion as Norming Study 1. The median was 7 for the overall sentences, meaning that the experimental sentences were highly acceptable. The median was also 7 for each condition (NP1-attaching and NP2-attaching). At that point, I tested the overall ratings against chance level. A one-tailed one-sample Wilcoxon test against $\mu = 4$ revealed a significant difference ($V = 2746276$, $p < 0.001$), which means that the data did differ from chance level. Finally, I tested the ratings of one condition against the other. A Mann-Whitney-Wilcoxon test for independent samples revealed a significant difference between the two conditions ($W = 825178$, $p = 0.044$). This was due to the presence of typos in two items. After discarding the two items, the same statistical test did not show any difference ($W = 722919$, $p = 0.838$). The discarded items were not included in the materials in any of the experiments here presented.

Results showed overall high scores, statistically above chance level. Therefore, as in Norming Study 1, I concluded that the items were well formed and highly acceptable. Given that there was no difference between the conditions, the NPs of the items created for Experiment 3 are equally plausible to carry out the action of the embedded verb.

4.3 Norming Study 4

As I did for Spanish in Norming Study 2 (Section 2.3), an additional norming study was conducted in order to assess the availability, in Italian, of PR structures under the 28 perceptual matrix verbs that I had selected. The perceptual matrix verbs were:

Adocchiare	'to eye up, to notice'	*Osservare*	'to observe'
Ascoltare	'to listen to'	*Registrare*	'to record'
Avvistare	'to catch sight of'	*Riconoscere*	'to recognise'
Beccare	'to catch, to surprise'	*Ritrarre*	'to portray'
Contemplare	'to gaze at'	*Rivedere*	'to see again'

Squadrare	'to look somebody up and down'	*Scoprire*	'to find, to identify, to catch someone in the act'
Fissare	'to stare at'	*Scrutare*	'to scan, to peer at, to search'
Fotografare	'to take a picture of'	*Sentire*	'to feel, to hear'
Guardare	'to watch'	*Sognare*	'to dream'
Immaginare	'to imagine'	*Sorprendere*	'to surprise'
Individuare	'to locate'	*Spiare*	'to spy on'
Intravedere	'to catch a glimpse of'	*Disegnare*	'to draw'
Notare	'to notice'	*Udire*	'to hear'
Origliare	'to eavesdrop'	*Vedere*	'to see'

Norming Study 4 consisted in a web-based questionnaire on the IbexFarm platform (Drummond, 2013). The methods and procedure were the same as those used in the Norming Study 2. Below is an example of the experimental items:

(28) *Ho scrutato Michela che pattinava con le amiche*
I peered at Michela skating with her friends

A linear model showed that the normalized frequency — as gathered in the CORIS corpus by Rossini Favretti et al. (2002) — of the nouns selected as NP1s (mean = 90.43, SD = 95.21) and NP2s (mean = 73.84, SD = 91.36) did not differ ($F(1,82) = 0.6$, $p = 0.44$). Moreover, Zipf values for all NPs were above 4, so as to avoid words of low frequency. In order to ensure compatibility with the Spanish data from Experiment 1, I run a linear model, whose results showed that the normalised frequencies of the NPs in Norming Study 2 and the NPs in Norming Study 4 did not statistically differ ($F(1,166) = 0.34$, $p = 0.56$).

72 participants took part in this norming study (40 females, 1 did not want to disclose this information, mean age = 38.389; SD = 11.99). I discarded those participants whose answers on the ungrammatical fillers differed the most from the expected outcome (i.e., 1 = "totally unacceptable"). This trimming process resulted in data from 60 participants (30 per each list, 36 females, 1 did not want to disclose this information, mean age = 36.983; SD = 10.827). Furthermore, all the trials in

which a participant answered faster than 1000 ms were discarded (<0.001% of the data).

The data were analysed by using R Studio software (R Core Team, 2020). First, I checked the overall median and mode for the experimental sentences, to ensure the availability of PRs in both languages. The median was 6, the mode was 7. I also tested the ratings of both experiments against chance level. A one-tailed one-sample Wilcoxon test against $\mu = 4$ revealed a significant difference in both Spanish ($V = 169076$, $p < 0.001$) and Italian ($V = 244422$, $p < 0.001$). I then compared the ratings of Norming Study 2 and Norming Study 4. A Mann-Whitney-Wilcoxon test for independent samples revealed a significant difference between languages ($w = 257977$, $p < 0.001$). Out of all the experimental items in Norming Study 4, 25 had median > 4.

Given the high values of mode and median, I concluded that PRs are indeed available and acceptable in Italian. I also concluded that at least 25 of the perceptual verbs do introduce PRs — i.e., those which received median score > 4 — and could be used to create the materials for Experiment 3. I further concluded that the mean rating for PRs in Spanish (Norming Study 2) was lower than for Italian (Norming Study 4). This could be because pseudorelatives have greater availability and frequency of use in Italian rather than in Spanish (Alonso-Pascua, 2020; Grillo & Costa, 2014). However, since these norming studies were not specifically designed to answer this question, I cannot exclude that this difference could be due to the nature of the items and the frequency of the perceptual verbs used in each language. Further specific testing is needed to draw any sound conclusion on the issue.

I selected 10 of the highest-rated MVs to use in Experiment 3. The final perceptual verbs selected for Experiment 3 were:

Beccare	'to catch, to surprise'	*Sentire*	'to feel, to hear'
Fotografare	'to take a picture of'	*Sognare*	'to dream'
Immaginare	'to imagine'	*Sorprendere*	'to surprise'
Registrare	'to record'	*Disegnare*	'to draw'
Riconoscere	'to recognise'	*Vedere*	'to see'

All of those had Zipf values > 4. Finally, I translated the non-perceptual verbs used for Experiment 1 to use them in Experiment 3 — conditions (26)c and (26)d. A Wilcoxon test showed that the normalized frequency —as gathered in the CORIS corpus by Rossini Favretti et al. (2002) — of the perceptual verbs (mean = 216.47, SD = 357.8) and the non-perceptual verbs (mean = 149.29, SD = 163.22) did not differ (W = 51, p = 0.97) Again, Zipf values for all non-perceptual verbs were above 4, to avoid words of low frequency.

Finally, I checked that the normalized frequencies for the matrix verbs used in Experiment 1 and the ones to be used in Experiment 3 were the same, so as to ensure compatibility between the two languages. A Mann-Whitney-Wilcoxon test for independent samples revealed no significant difference between languages (w = 212, p = 0.76).

These two norming studies ensured that the materials crafted for the following experiments were correct and free of confounds known to modulate attachment preferences (such as animacy, lexical and frequency factors etc.). By doing so, the results obtained in Experiments 3 and 4 are unlikely to be due to flaws in the materials and an imbalance in features between conditions, such as differences in word frequency and/or plausibility between the two attachments, since I checked for these specific factors.

4.4 Methods

4.1.1. Participants

80 participants took part in Experiment 3a (57 females, 2 did not want to disclose that information, mean age =22.07; SD = 2.24). 86 participants took part in Experiment 3b (6 extra participants were erroneously tested due to an error in the distribution of the lists, for a total of 63 females, mean age = 25.88, SD = 6.11). Although some of the participants preferred not to be paid, all participants were offered compensation for their time and gave their informed consent under experimental protocols approved by the Ethics Committee of the UPV/EHU (*Comité de Ética para las Investigaciones relacionadas con Seres Humanos, CEISH:* M10_2020_182). All participants were native speakers of Italian. Their dominant language was Italian, that is, they mainly spoke Italian with their families and

acquaintances, and carried out their daily activities and jobs almost exclusively in Italian, as assessed via a questionnaire. I selected the participants over 18 and under 50 years old.

4.1.2. Materials

This experiment was a close translation of Experiment 1 — except for the matrix verbs selected in Norming 4. Further explanation on the materials can be found in Section 2.1.2. An example can be found in (26) and below in (29):

(29) a. Perceptual matrix verb, low attachment
Maria ha sentito il figlio dei funzionari che cantavano nel coro parrocchiale.
Maria heard the son of the administrators that were singing in the church choir.

b. Perceptual matrix verb, high attachment
Maria ha sentito i figli del funzionario che cantavano nel coro parrocchiale.
Maria heard the sons of the administrator (that were) singing in the church choir.

c. Non-perceptual matrix verb, low attachment
Maria ha allenato il figlio dei funzionari che cantavano nel coro parrocchiale.
Maria trained the son of the administrators that were singing in the church choir.

d. Non-perceptual matrix verb, high attachment
Maria ha allenato i figli del funzionario che cantavano nel coro parrocchiale.
Maria trained the sons of the administrator that were singing in the church choir.

4.1.3. Procedure

The procedure was the same as in Experiments 1a and 1b. Participants took part in the experiment in Experiment 3a in the COLAB laboratory (http://colab.psy.unipd.it/) in Padova. During the task, the experimenter could not track the participants' progress in real time, but was available throughout the whole process to solve any technical issues.

4.1.4. Data preparation

The data were analysed by using R Studio software (R Core Team, 2020) and the lme4 (Bates et al., 2015), afex (Singmann et al., 2021) and emmeans (Lenth, 2022) packages.

One item was discarded because of a typo in the embedded verb (item 9).

As for Experiment 3a, I discarded those participants that understood the goal of the experiment (N = 2). In fact, they reported that they realized during the experiment that the correct answer for the experimental trials was the one which appeared in plural in the sentence. One additional participant was discarded because she was diagnosed with dyslexia. The final pool for Experiment 3a consisted of 77 participants (55 females, 2 did not want to disclose this information, mean age = 22.05; SD = 2.23). As for Experiment 3b, I discarded one participant for reading most sentences out loud, and another one for reporting suspected dyslexia. Finally, since I tested 6 extra participants due to an error in the presentation of the experiment, I counterbalanced the number of participants for each list and discarded 12 additional participants, in order to have the same number of observations (18) per item. The final pool for Experiment 3b consisted of 72 participants (54 females, mean age = 26.29, SD = 6.48).

I subsequently calculated the spillovers and residual reading times separately per each modality — laboratory: Experiment 3a; or internet: Experiment 3b —, following the same procedure reported in Section 2.1.4.

To clean the data in the same fashion as in Experiment 1, I first excluded data from participants who had scored less than 70% in the accuracy (no data was excluded in this step). Then, I trimmed all items in which a participant had read any of the words in less than 50 ms or more than 3000 ms (resulting in the deletion of 2.87% of the data in Experiment 3a, and 6.57% in Experiment 3b). I deleted all reading times that exceeded a threshold of 2.5 standard deviations from the mean by participant, region and condition. I also deleted all response times (and their corresponding answers) that exceeded the same threshold (overall deletion of the 5.56% of the data in Experiment 3a and 9.31% in Experiment 3b). Finally, I discarded all response times lower than 500 ms or higher than 7000 ms, as well as their corresponding answers, which resulted in an overall deletion of 5.66% of the data in Experiment 3a and 9.54% in Experiment 3b.

4.1.5. Data analysis

All measures were analysed following the same procedure as that detailed for Experiment 1 in Section 2.1.5. The best-fitting model for accuracy included Matrix Verb, Attachment, and the interaction between Matrix Verb and Attachment as predictors. The best-fitting model for Response times included Matrix Verb and Attachment as predictors. The best-fitting model for the reading times in any of the critical regions (embedded verb and following 2 regions: EV, EV+1 and EV+2) was a model with no predictors.

4.1.6. Predictions

Predictions were the same as in Experiment 1. In other words, taking into account the example item in (29) and repeated below in (30), the PR-First Hypothesis (Grillo & Costa, 2014) predicts condition (b) — which is high-attaching, introduced by a perceptual verb, thus allowing a PR — to be the easiest, and condition (d) — which is high-attaching, introduced by a non-perceptual verb and only allowing a high-attaching RC — to be the most costly to parse. Therefore, participants were expected to perform the task more accurately under condition (b) than under the other conditions. According to the PR-First Hypothesis, participants should be the least accurate on condition (d) — that is, (b) > (c), (a) > (d). As for the response times, and following the PR-First Hypothesis, I expected the time taken to answer the questions to be faster under condition (b) than under the other ones; and to be slower under condition (d) than under the other ones — that is, (b) < (c), (a) < (d). As for the reading times at the critical and/or post-critical regions, in accordance with the PR-First Hypothesis, I expected them to be faster under condition (b) than under the other ones; and to be slower under condition (d) than under the other ones — that is, (b) < (c), (a) < (d).

(30) a. Perceptual matrix verb, low attachment
Maria ha sentito il figlio dei funzionari che cantavano nel coro parrocchiale.
Maria heard the son of the administrators that were singing in the church choir.

b. Perceptual matrix verb, high attachment
Maria ha sentito i figli del funzionario che cantavano nel coro parrocchiale.

Maria heard the sons of the administrator (that were) singing in the church choir.

c. Non-perceptual matrix verb, low attachment
Maria ha allenato il figlio dei funzionari che cantavano nel coro parrocchiale.
Maria trained the son of the administrators that were singing in the church choir.

d. Non-perceptual matrix verb, high attachment
Maria ha allenato i figli del funzionario che cantavano nel coro parrocchiale.
Maria trained the sons of the administrator that were singing in the church choir.

4.5 Results

Results regarding accuracy showed a main effect of Attachment ($p < 0.001$), indicating that responses to high-attachment sentences (mean = 0.92, SD = 0.27) were more accurate than to low-attaching sentences (mean = 0.66, SD = 0.47). Furthermore, the interaction between Attachment and Matrix Verb was significant ($p = 0.002$). Subsequent analyses showed that responses obtained in high-attaching sentences were more accurate than those obtained in low-attaching sentences under both perceptual and non-perceptual verbs (all p-values < 0.001), thus mirroring the main effect of Attachment. Finally, in high-attaching sentences, I observed a facilitation of perceptual matrix verbs over non-perceptual matrix verbs ($p = 0.009$); that is, high-attaching sentences introduced by perceptual matrix verbs were answered with higher accuracy than those high-attaching sentences introduced by non-perceptual matrix verbs. Conversely, under low-attaching sentences, I found a trend towards significance in the opposite direction, that is, the responses obtained for non-perceptual matrix verbs had marginally higher accuracy ($p = 0.0969$) as compared to those for the perceptual verbs. See Table 4 for the means and standard deviations of each condition, and Figure 13.

	High attachment	Low attachment
Perceptual MV	1201 / 1287 (0.93 ± 0.25)	760 / 1198 (0.63 ± 0.48)

Non-perceptual MV	1124 / 1247 (0.9 ± 0.3)	818 / 1204 (0.68 ± 0.47)

Table 4. Number of correct over incorrect answers in each of the four conditions of Matrix Verb and Attachment. In brackets, the means and standards deviation for the accuracy.

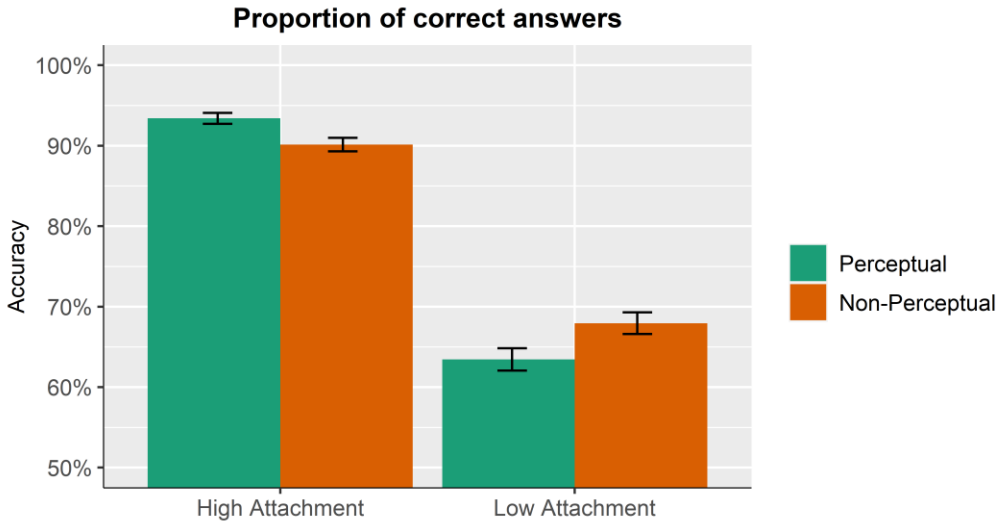

Figure 13. Accuracy in each of the four conditions. High-attaching sentences were overall facilitated over low-attaching sentences. An interaction between Matrix Verb and Attachment showed that perceptual matrix verbs were facilitated under high-attaching sentences, whereas under low-attaching sentences a trend in the opposite direction was found.

Results for the response times showed a main effect of Matrix Verb ($p = 0.003$), revealing that questions for sentences introduced by perceptual matrix verbs (mean = 2530 ms, SD = 1250 ms) were answered faster than for non-perceptual matrix verbs (mean = 2673 ms, SD = 1328 ms). See Figure 14.

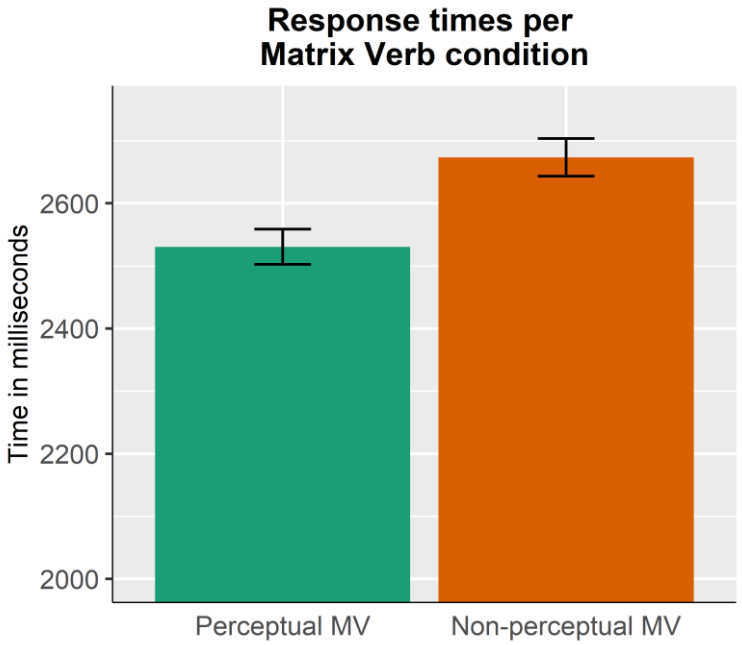

Figure 14. Response times per each condition of the Matrix Verb. Questions about the sentences introduced by perceptual matrix verbs were faster to answer than those introduced by non-perceptual matrix verbs.

Furthermore, a main effect of Attachment ($p < 0.001$) was found, showing that questions for high-attaching sentences (mean = 2499 ms, SD = 1203 ms) were answered faster than those for low-attaching sentences (mean = 2753 ms, SD = 1398 ms). See Figure 15.

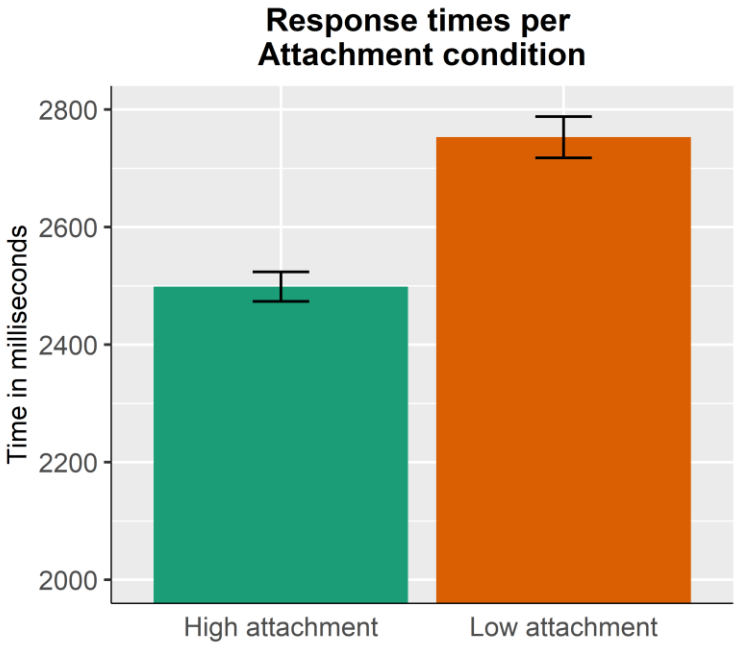

Figure 15. Response times per each condition of Attachment. Questions about high-attaching sentences were faster to answer than those about low-attaching sentences.

Results for the reading times in any of the three critical regions (embedded verb and following two words) showed no effect or interaction whatsoever (see Figure 16).

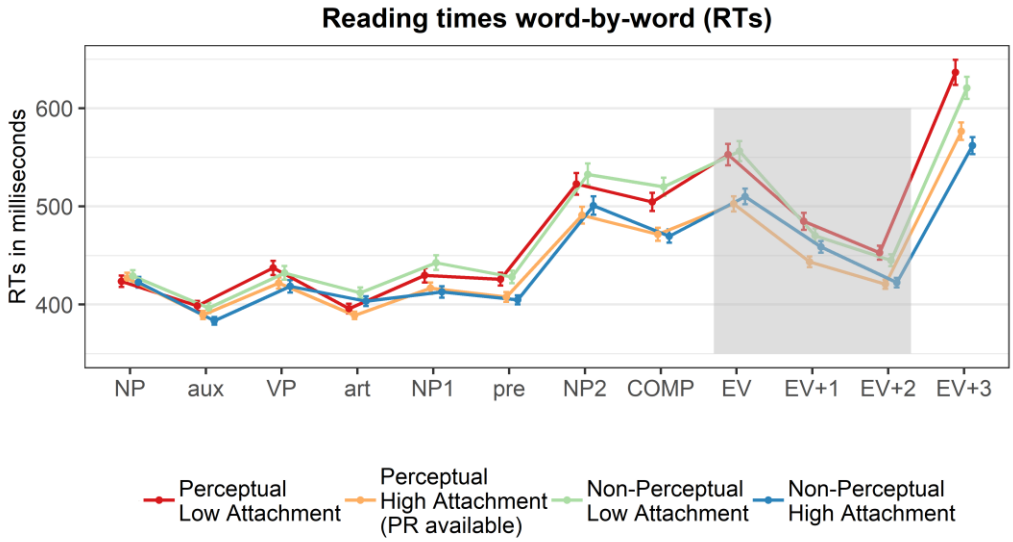

Figure 16. Reading times per each word of the experimental items, in milliseconds. Regions of interest are the embedded verb and following two regions (EV, EV+1, EV+2, in gray). No effect was found in any of the regions of interest.

4.6 Discussion

Experiments 3a and 3b were designed to measure the cognitive cost of pseudorelatives, high- and low-attaching relative clauses, and to ascertain whether the high-attachment preferences in Italian were due to the availability of PRs (Grillo & Costa, 2014). The experimental items were non-ambiguous sentences, either disambiguated towards high or low attachment.

Results revealed faster response times in high-attaching conditions than in low-attaching conditions, regardless of the matrix verb, similarly to the Spanish results in Experiment 1. Furthermore, responses to high-attaching sentences were more accurate than responses to low-attaching sentences overall. However, in the subset of high-attaching conditions, responses were more accurate when the sentences were introduced by perceptual matrix verbs, when compared to those introduced by non-perceptual matrix verbs.

Results showed a clear facilitation for high attachment in the accuracy and response times, similarly to Experiment 1 in Spanish. According to Frazier's Minimal Attachment and Late Closure, high attachment should be the cognitively costliest construction; however, these data indicate that it is the easiest construction to process.

Furthermore, as far as accuracy is concerned, I found an interaction between Attachment and Matrix Verb. This showed that the matrix verb modulated the accuracy differently under high- or low-attaching sentences, in the same direction as what the PR-First Hypothesis predicts. That is, under high-attaching sentences there was a facilitation for perceptual matrix verbs, whereas a trend towards significance in the opposite direction was found in low-attaching sentences. In Experiment 1, in Spanish, I found no such interaction, since high attachment was facilitated regardless of the matrix verb. It could be the case that the higher acceptability and accessibility of PRs in Italian modulates the cognitive cost of high attachment in a perceptual environment. That is, the fact that a perceptual matrix verb introduces a PR more prototypically in Italian than in Spanish could have led to these results, and to such

a difference between languages — see Chapter 6 for a detailed comparison between the two experiments.

Such results do not support the PR-First Hypothesis, which predicts that, under perceptual matrix verbs, high attachment should be facilitated, and that the opposite should be true for non-perceptual matrix verbs. In the data regarding the accuracy, even though an interaction was found — as predicted by the PR-First Hypothesis —, high attachment was facilitated under both perceptual and non-perceptual matrix verbs.

Finally, and as was the case in Experiment 1, there was a facilitation for perceptual matrix verbs in the response times — see also the discussion in Section 6.1.8, and Chapter 7 for a tentative explanation of this phenomenon.

5. Revisiting Attachment preferences in Italian

After determining that high attachment was the easiest strategy in Spanish, and observing that PR availability somehow modulated the offline performances of the participants, I decided to run two additional experiments in Italian, designed to test directly the PR-First Hypothesis (preregistered at https://osf.io/ph72t). These experiments allowed me to gather information about the preferred attachment strategy by asking the participants whether they interpreted each experimental sentences as high- or low-attaching. I was also able to measure the online cognitive cost of each attachment preference by means of reading and response times. In other words, I cross-analysed the online results with the attachment preferences given by the participants.

These experiments are a close replica of Experiments 1a and 1b in Spanish: therefore, see Chapter 2 for a description of their novelty and importance in the literature, and Chapter 4 for the reason why the experiments were run in Italian.

As detailed in Chapter 2, the PR-First Hypothesis not only predicts that in PR-available environments there will be an overwhelming majority of high-attachment preferences, and in RC-only environments an overwhelming majority of low-attachment preferences. It also predicts that participants would be facilitated whenever they chose high attachment in PR-available environment, since that would be the easiest structure available. That is, the PR-First Hypothesis predicts faster reading and response times whenever PRs are available, but only if high attachment is selected — which, incidentally, would also be the most selected choice. Conversely, in the RC-only condition, the hypothesis predicts faster reading and response times only when low attachment is selected — which, once again, would also be the most selected choice.

I analysed the data for attachment preferences, reading and response times. Results showed that high attachment was preferred over low attachment. However, this preference was modulated by PR availability in such a way that high attachment preferences went up in PR-available contexts. High attachment was also facilitated in response times and slowed down in reading times, regardless of the availability of PRs. In light of these results, I claim that PRs play a role in attachment preferences in Italian. However, the overall high-attachment preferences were so numerous that

the results do not support Late Closure, Minimal Attachment or the PR-First Hypothesis.

5.1 Overview of the experiments

Experiments 3a and 3b were intended to test the cognitive burden posed by relative and pseudorelative clauses, and whether PRs are easier to parse or not (Grillo & Costa, 2014). Experiments 4a (in-lab) and 4b (internet-based), in turn, aimed at detecting whether attachment preferences are compatible with the predictions made by the PR-First Hypothesis. The two experiments are a replication of Experiments 2a and 2b in Italian. The materials were matched to the Spanish ones and normed as described in Sections 4.2 and 4.3. Below is an example of the materials used in Experiment 4:

(31) a. Perceptual matrix verb, PR-available
Maria ha sentito il figlio del funzionario che cantava nel coro parrocchiale.
Maria heard the son of the administrator (that was) singing in the church choir.

b. Non-perceptual matrix verb
Maria ha allenato il figlio del funzionario che cantava nel coro parrocchiale.
Maria trained the son of the administrator that was singing in the church choir.

5.2 Methods

5.2.1. Participants

40 participants took part in Experiment 4a (28 females, 1 did not want to disclose this information, mean age = 20.87, SD = 1.72) and other 40 participants took part in Experiment 4b (31 females, mean age = 26.25, SD = 4.04). Although some of the participants preferred not to be paid, all participants were offered compensation for their time and gave their informed consent under experimental protocols approved by the Ethics Committee of the UPV/EHU (*Comité de Ética para las Investigaciones relacionadas con Seres Humanos, CEISH*: M10_2020_182). All participants were native

speakers of Italian. Their dominant language was Italian, that is, they mainly spoke Italian with their families and acquaintances, and carried out their daily activities and jobs almost exclusively in Italian, as assessed via a questionnaire. I selected the participants over 18 and under 50 years old.

5.2.2. Materials

Materials were normed as detailed in Sections 2.2 and 2.3. This experiment was a close translation of Experiment 2 — except for the matrix verbs selected with Norming Study 4. A further explanation can be found in Sections 3.2.2. An example can be found in (31) and below in (32):

(32) a. Perceptual matrix verb, PR-available
Maria ha sentito il figlio del funzionario che cantava nel coro parrocchiale.
Maria heard the son of the administrator (that was) singing in the church choir.

b. Non-perceptual matrix verb
Maria ha allenato il figlio del funzionario che cantava nel coro parrocchiale.
Maria trained the son of the administrator that was singing in the church choir.

5.2.3. Procedure

The procedure was the same as in Experiment 1 (Section 2).

5.2.4. Data preparation

The data were analysed using R Studio software (R Core Team, 2020) and the lme4 (Bates et al., 2015), afex (Singmann et al., 2021) and emmeans (Lenth, 2022) packages.

Due to an error in the presentation of the stimuli, item 9 was removed from the final analyses.

As for Experiment 4a, I discarded one participant due to stuttering speech impediment, and an additional participant in order to have the same number of observations per item. The final pool consisted of 38 participants (26 females, 1 did not want to disclose this information, mean age = 20.89; SD = 1.73).

Subsequently, I calculated the residual reading times separately per each modality, as detailed in Experiment 1.

I cleaned the data in the same fashion as I did in Experiment 1, that is, I first set out to exclude data from participants who had scored less than 70% in the accuracy (no data was excluded in this step). Then, I trimmed all items in which a participant had read any of the words in less than 50 ms or more than 3000 ms (resulting in the deletion of 1.05% of the data in Experiment 4a, 3.61% in Experiment 4b). I deleted all reading times that exceeded a threshold of 2.5 standard deviations from the mean by participant, region and condition. I also deleted all response times (and their corresponding answers) that exceeded the same threshold (overall deletion of 3.67% of the data in Experiment 4a and 6.31 % in Experiment 4b). Finally, I discarded all response times (and corresponding answers) lower than 500 ms or higher than 7000 ms. Over all, I discarded 3.74% of the data in Experiment 4a and the 6.53% in Experiment 4b.

5.2.5. Data analysis

All measures were analysed as detailed in Experiment 2. The best-fitting model for attachment preferences included Matrix Verb as predictor. The best-fitting model for Response times included Matrix Verb and Attachment preference as predictors. The best-fitting model for the reading times at the first two critical regions — the embedded verb and the following region — was a model with no predictors. The best-fitting model at the last critical region was a model with Attachment preference as predictor.

5.2.6. Predictions

Predictions were the same as in Experiment 2: taking into account the example item in (32) and repeated below in (33), the PR-First Hypothesis (Grillo & Costa, 2014) predicts condition (a) (PR-available) to be preferred for high attachment exclusively; whereas condition (b) (ambiguous between a PR and a RC reading) would receive a preference for low attachment exclusively — in line with Minimal Attachment and Late Closure (Frazier, 1979). This is so because (a) admits PRs, and, therefore, according to the PR-First Hypothesis, such interpretation will be preferred, whereas (b) only admits RCs. Furthermore, the PR-First Hypothesis predicts that, whenever high attachment is preferred in (a), reading and response times will be faster when compared to a low-attachment preference in the same

condition. Conversely, in (b), reading and response times associated to a low attachment preference would be faster than those associated to a high-attachment preference in the same condition.

(33) a. Perceptual matrix verb, PR-available
Maria ha sentito il figlio del funzionario che cantava nel coro parrocchiale.
Maria heard the son of the administrator (that was) singing in the church choir.

b. Non-perceptual matrix verb
Maria ha allenato il figlio del funzionario che cantava nel coro parrocchiale.
Maria trained the son of the administrator that was singing in the church choir.

5.3 Results

The intercept of the model was significant ($p < 0.001$). This revealed that high-attachment preferences were higher than chance (50%). See Table 5 and Figure 17.

	High Attachment	Low Attachment
Perceptual	1195 (0.87 ± 0.33)	168 (0.12 ± 0.33)
Non-perceptual	1030 (0.78 ± 0.41)	283 (0.21 ± 0.41)
Total	2225 (0.83 ± 0.37)	451 (0.17 ± 0.37)

Table 5. Raw number of high- and low- attachment preferences per each condition of Matrix Verb (perceptual vs. non-perceptual matrix verbs). In brackets, the means and standard deviations for the attachment preferences averaged over the corresponding matrix verb total. In the total row, the numbers in bracket are the overall means and standard deviations for high- and low-attachment preferences.

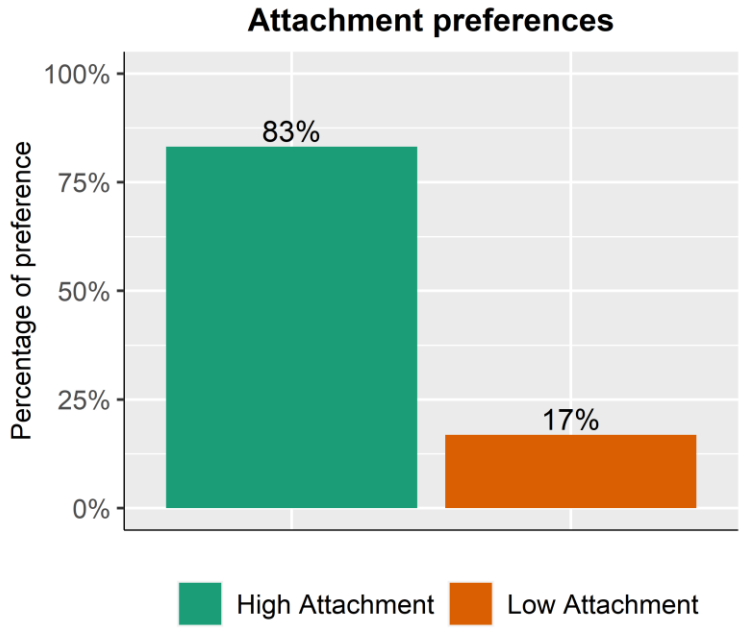

Figure 17. Proportion of overall preferences. High attachment was preferred significantly more often than low attachment.

Furthermore, a main effect of Matrix Verb ($p < 0.001$) indicated that high-attachment preferences were higher in the condition of perceptual matrix verbs, while the opposite was true in the non-perceptual condition. See Figure 18.

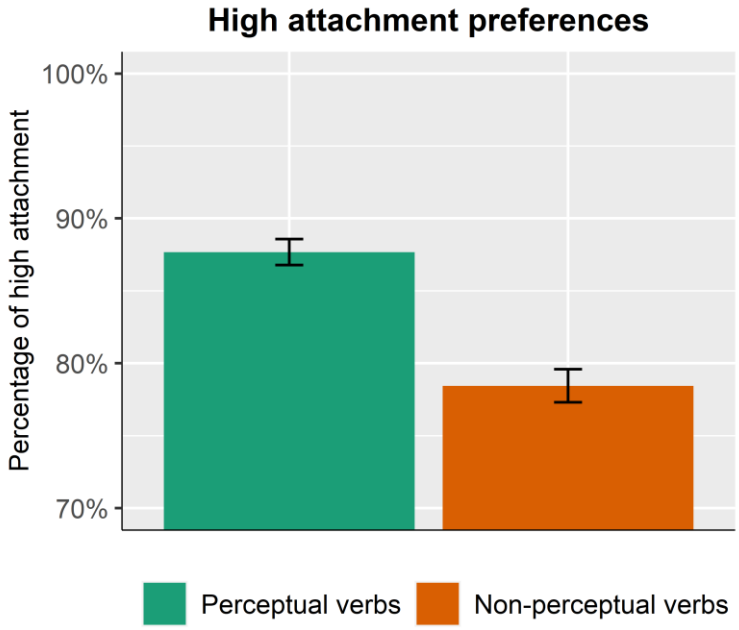

Figure 18. Proportions of high attachment preferences for each type of matrix verb. High attachment occurred significantly more often for perceptual verbs than for non-perceptual verbs.

Results for the response times showed a main effect of Matrix Verb ($p < 0.001$), indicating that questions referring to sentences introduced by perceptual matrix verbs (mean = 2513 ms, SD = 1274 ms) were faster to answer than those introduced by non-perceptual matrix verbs (mean = 2706 ms, SD = 1320 ms). See Figure 19.

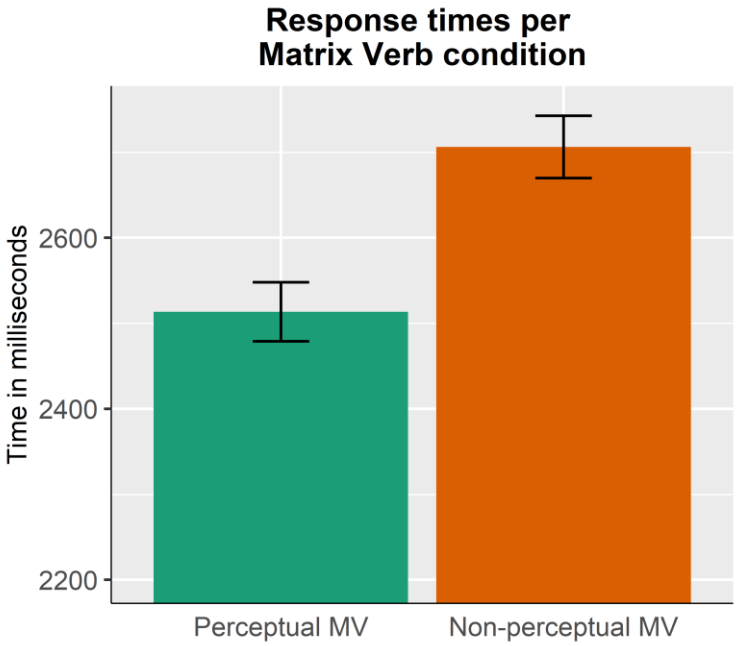

Figure 19. Response times per each of the conditions (perceptual vs. non-perceptual matrix verbs). Questions to sentences introduced by perceptual matrix verbs were faster to answer than those introduced by non-perceptual matrix verbs.

Furthermore, a main effect of Attachment preference ($p < 0.001$) showed that participants were faster in giving their high attachment preferences (mean = 2514 ms, SD = 1237 ms), as compared to low attachment preferences (mean = 3071 ms, SD = 1491 ms). See Figure 20.

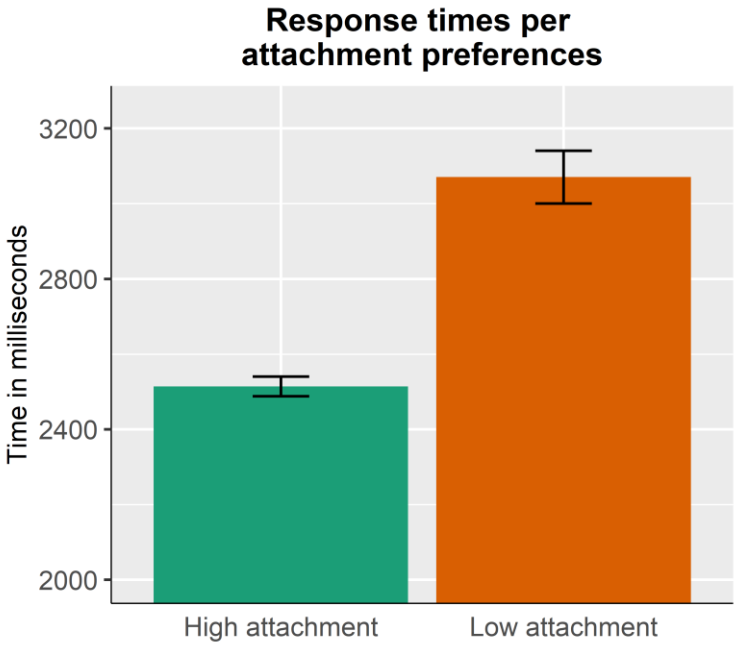

Figure 20. Response times per each attachment preference (high or low attachment). Sentences that were regarded as high-attaching were also answered faster than those that were attached low.

Results for the reading times at the critical (EV) and immediate post-critical region (EV+1) showed no effect or interaction whatsoever. As for the last critical region (EV+2), there was a main effect of Attachment preference ($p = 0.002$) showing that, at this last critical region, high-attaching sentences (mean = 404.14 ms, SD = 146.31 ms) were read slower than low-attaching sentences (mean = 393.05 ms, SD = 141.61 ms). See Figure 21 and Figure 22.

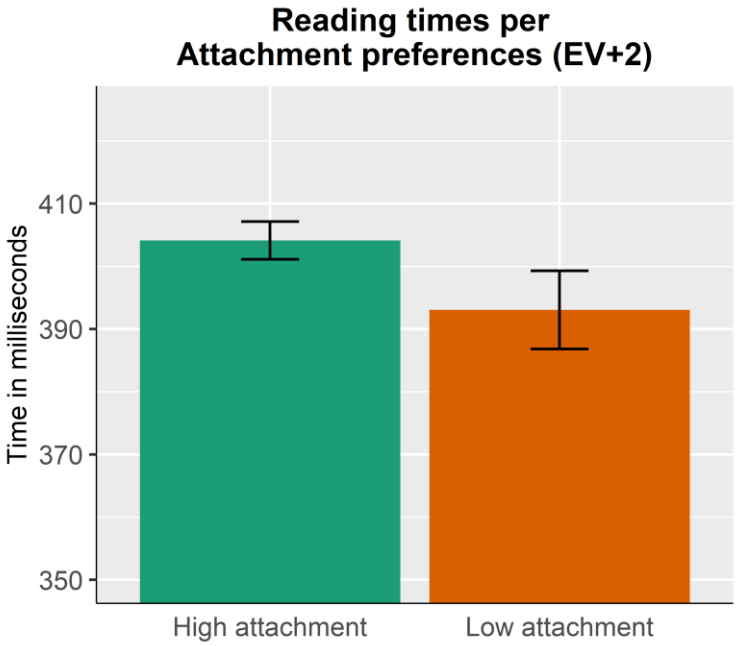

Figure 21. Reading times at the last critical region (EV+2). At this region, sentences that were regarded as high-attaching were also slower to read than those that were attached low.

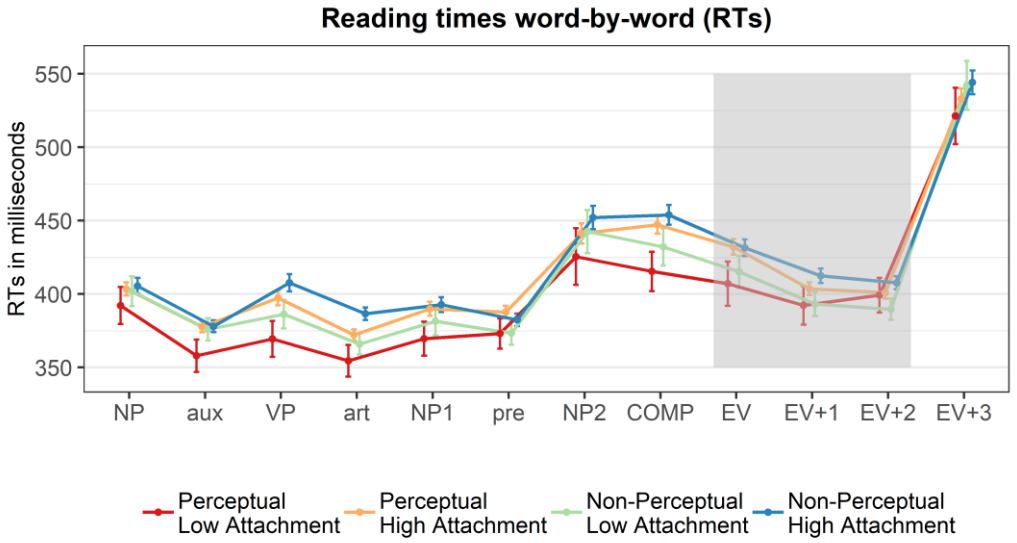

Figure 22. Reading times per each word of the experimental items, in milliseconds. Regions of interest are the embedded verb and following two regions (EV, EV+1, EV+2, in gray). An effect was only found at the last critical region (EV+2).

5.4 Discussion

Experiments 4a and 4b were intended to measure the attachment preferences of native Italian participants, and whether the high-attachment preferences in Italian were due to the availability of PRs (Grillo & Costa, 2014). The experimental items were ambiguous sentences for which the participants had to select which NP was carrying out the activity indicated in the embedded clause.

Results showed an overall preference for high attachment, albeit modulated by the condition: high attachment was preferred more frequently than low attachment in PR-available conditions with perceptual MVs, whereas low attachment was preferred more frequently in RC-only conditions with non-perceptual MVs. Furthermore, the data show that participants were faster in their response times when they selected high attachment, compared to when they selected low attachment: that is, we saw a facilitation for high-attaching sentences. Moreover, whenever participants selected high attachment, they were also slower in reading the last critical region, when compared with those instances in which low attachment was selected. In other words, in the last critical region, high-attaching sentences posed a higher processing cost to the reader, whereas we saw a facilitation for low-attaching sentences.

Results showed a clear preference for high attachment over low attachment, similarly to Experiments 1 and 3. In addition, results indicated that the matrix verb — and, therefore, the availability of PRs — modulated attachment preferences, leading to a stronger high-attachment preference in PR-available environment. This modulation, however, cannot be explained by the PR-First Hypothesis, which predicts a preference for high attachment only in PR-available structures and no preference in RC-only contexts. Instead, my results showed that 78% of sentences introduced by non-perceptual verbs (RC-only) are more often interpreted as high-attaching. This is coherent with the results from Experiment 3, in which we have seen that the accuracy is modulated by the availability of PRs (see Sections 4.6).

Therefore, I argue that PR availability *does* modulate attachment preferences, but it is not a determinant factor.

Furthermore, the data showed a slow-down for high attachment in the reading times at the last critical region (EV+2), suggesting a heavier cognitive load, which is, in principle, incompatible with the striking number of high-attachment preferences discussed above. However, there was also a facilitation for high attachment in the response times. In other words, sentences that were regarded as high-attaching were read slower at their last critical region, but were also answered faster than low-attaching ones. I interpret this as an effect of trade-off: whenever participants saw a sentence that they later interpreted as high-attaching, they read its ending slower — more carefully —, but, later, they were faster — more confident — in making their judgement towards high attachment.

Finally, I observed a facilitation for perceptual matrix verbs in the response times, as shown in Experiments 1 and 3 (see Sections 2.6 and 4.6). See Chapter 7 for a tentative explanation of this phenomenon.

6. Comparing the processing cost and preferences of high vs. low attachment in Spanish and Italian

6.1 Overview

This chapter provides a direct comparison and detailed discussion of the results obtained in Spanish (Experiment 1 and 2) and Italian (Experiment 3 and 4). These experiments were translations of one another, and, therefore, the data were perfectly compatible with a conjoined analysis of Experiment 1 against Experiment 3, and Experiment 2 against Experiment 4). The aim of this comparison was to determine whether or not there is any significant difference in the processing and in the attachment preferences between Spanish and Italian. It is widely accepted that PRs are more natural and available in Italian than in Spanish (Alonso-Pascua, 2020; Grillo & Costa, 2014); therefore, this analysis could ascertain whether and to what extent PR availability, frequency and acceptability are reflected in high vs. low attachment resolution.

6.2 Comparison of Experiments 1 and 3 (non-ambiguous experimental sentences)

6.1.1. Data analysis

Accuracy was analysed using a generalized linear mixed model on binomial data. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment (high vs. low), Language (Italian vs. Spanish) and their interactions as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model was a model with Matrix Verb, Attachment, Language, the interactions between Matrix Verb and Attachment, and between Attachment and Language as predictors.

Response times were analysed using a linear mixed model on the logarithmic times. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the

simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment (high vs. low), Language (Italian vs. Spanish) and their interactions as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model was a model with Matrix Verb, Attachment and Language, and the interaction between Attachment and Language as predictors. Only correctly answered trials were analysed.

Reading times at all regions of interest (Embedded Verb and following two regions: EV, EV+1, EV+2) were analysed using a linear mixed model on the residual reading times. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Attachment (high vs. low), Language (Italian vs. Spanish) and their interaction as predictors, as well as the logarithmic reading times from the two previous regions — which were never excluded in any of the models and were not taken into account when significant —; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model at the embedded verb (EV) was a model with Attachment, Language, and the interaction between Attachment and Language as predictors. The best-fitting model for the following region (EV+1) was the full model with all predictors and interactions. The best-fitting model for the last critical region (EV+2) was a model with no predictors. Only correctly answered trials were analysed.

6.1.2. Predictions

Predictions are the same as detailed in Section 2.1.6. In addition, given that PRs are more frequent and/or available in Italian than in Spanish, I hypothesise that the data from Spanish and Italian could differ — even though this is not a prediction that stems from the PR-First Hypothesis, which, in turn, makes categorical predictions that should apply similarly across languages. In other words, I expect that the data from Italian participants would be modulated to a larger extent by PR-availability, whereas data from Spanish participants would not be modulated.

6.1.3. Results

Results for the accuracy showed a main effect of Attachment ($p < 0.001$), indicating that participants were more accurate when performing the judgement task

in high-attaching sentences (mean = 0.89, SD = 0.32) than in low-attaching sentences (mean = 0.63, SD = 0.48). See Figure 23.

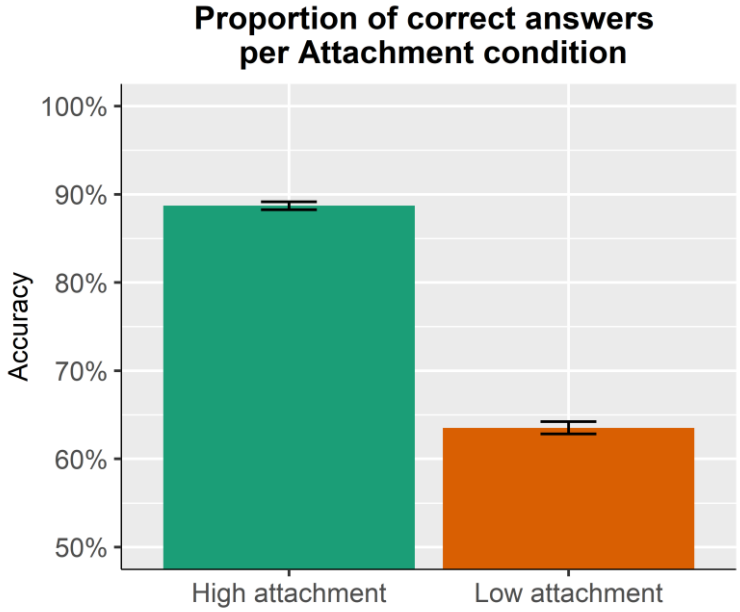

Figure 23. Proportion of correct answers per each level of Attachment (high- vs. low-attaching). High-attaching sentences showed higher accuracy rates than low-attaching sentences.

Furthermore, a main effect of Language showed that, overall, Spanish participants (mean = 0.74, SD = 0.44) were less accurate than Italian participants (mean = 0.79, SD = 0.41). See Figure 24.

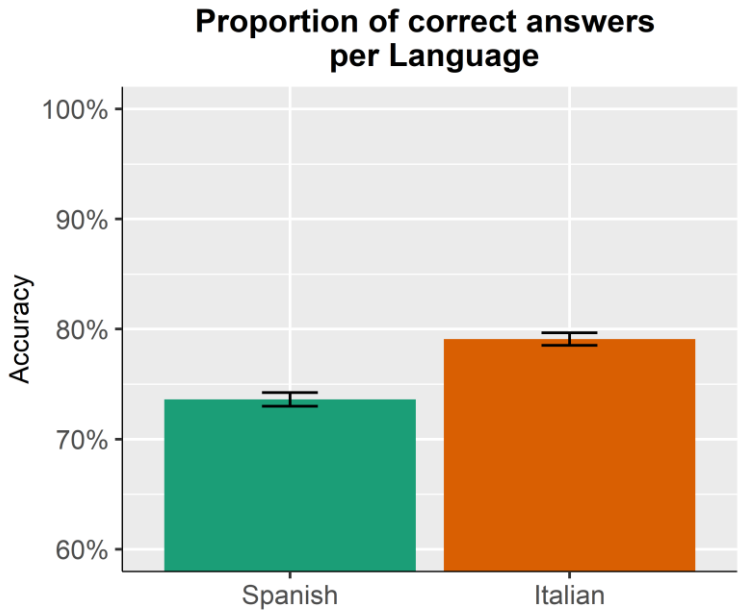

Figure 24. Proportion of correct answers per each Language (Spanish vs. Italian). Spanish participants were less accurate than Italian participants.

Moreover, an interaction between Matrix Verb and Attachment was found ($p = 0.009$). Further analyses showed a facilitation for high attachment over low attachment under both perceptual and non-perceptual verbs (all p-values < 0.001); and a facilitation for perceptual verbs under high-attaching sentences ($p = 0.01$), whereas the difference was not significant under low-attaching sentences ($p = 0.23$). See Figure 25, and Table 6 for the means and standard deviations per each condition of Matrix Verb and Attachment.

	High Attachment	Low Attachment
Perceptual	2309 / 2555 (0.9 ± 0.29)	1501 / 2419 (0.62 ± 0.48)
Non-perceptual	2160 / 2483 (0.87 ± 0.34)	1584 / 2437 (0.65 ± 0.48)

Table 6. Number of correct over incorrect answers in each of the four conditions of Matrix Verb and Attachment. In brackets, the means and standard deviations for the accuracy. High-attaching sentences were facilitated over low-attaching sentences under both perceptual and non-perceptual verbs. A difference was also found between perceptual and non-perceptual verbs under high-attaching sentences.

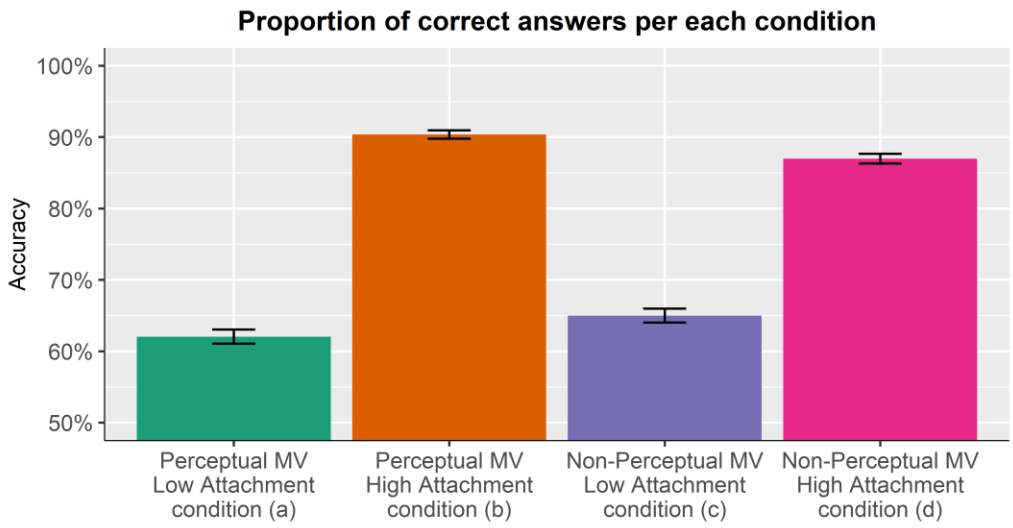

Figure 25. Proportion of correct answers per each condition. The graph shows a facilitation for perceptual verbs under high-attaching sentences (i.e., a facilitation for condition b over condition d), whereas this difference was not significant under low-attaching sentences (i.e., no difference between condition a and condition c).

Finally, an interaction between Attachment and Language was found ($p < 0.001$). Further analyses showed higher accuracy in high-attaching sentences than in low-attaching sentences, for both Spanish and Italian participants (all p-values < 0.001); and higher accuracy for Italian participants than for Spanish participants under high-attaching sentences ($p < 0.001$), whereas the difference only approached significance under low-attaching sentences ($p = 0.06$). See Figure 26, and Table 7 for the means and standard deviations per each condition of Attachment and Language.

	High Attachment	Low Attachment
Spanish	2143 / 2504 (0.86 ± 0.35)	1507 / 2454 (0.61 ± 0.49)
Italian	2326 / 2534 (0.92 ± 0.27)	1578 / 2402 (0.66 ± 0.47)

Table 7. Number of correct over incorrect answers in each of the four conditions of Language and Attachment. In brackets, the means and standard deviations for the accuracy. High-attaching sentences were facilitated over low-attaching sentences for both Spanish and Italian participants. Italian participants were more accurate than Spanish

participants in high-attaching sentences, whereas the difference only approached significance in low-attaching sentences (p = 0.06).

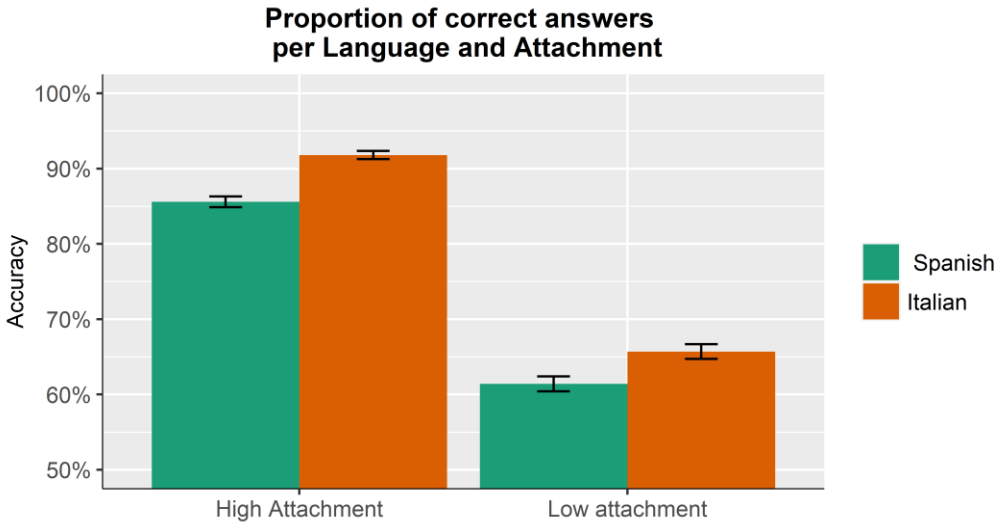

Figure 26. Proportion of correct answers per each level of Attachment (high vs. low) and per each language (Spanish vs. Italian). Italian participants were more accurate than Spanish participants in high-attaching sentences, whereas the difference only approached significance under low-attaching sentences.

Results for the response times showed a main effect of Matrix Verb (p = 0.0017), that is to say that questions to sentences introduced by perceptual matrix verbs (mean = 2717 ms, SD = 1327 ms) were answered faster than those introduced by non-perceptual matrix verbs (mean = 2869 ms, SD = 1390 ms). See Figure 27.

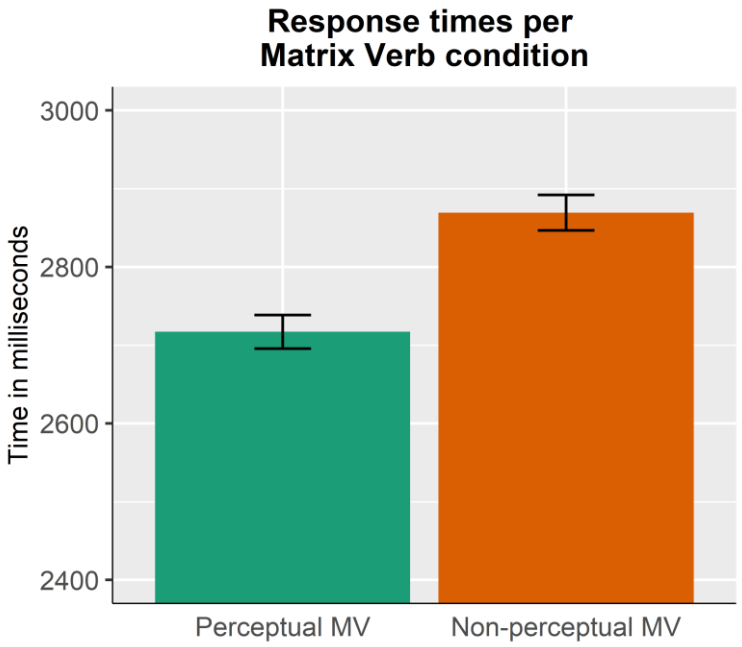

Figure 27. Response times per each level of Matrix Verb (perceptual vs. non-perceptual). Perceptual matrix verbs facilitated processing over non-perceptual matrix verbs.

Furthermore, a main effect of Attachment ($p < 0.001$) showed that questions referring to high-attaching sentences (mean = 2717 ms, SD = 1294 ms) were answered faster that those referring to low-attaching sentences (mean = 2902 ms, SD = 1444 ms). See Figure 28.

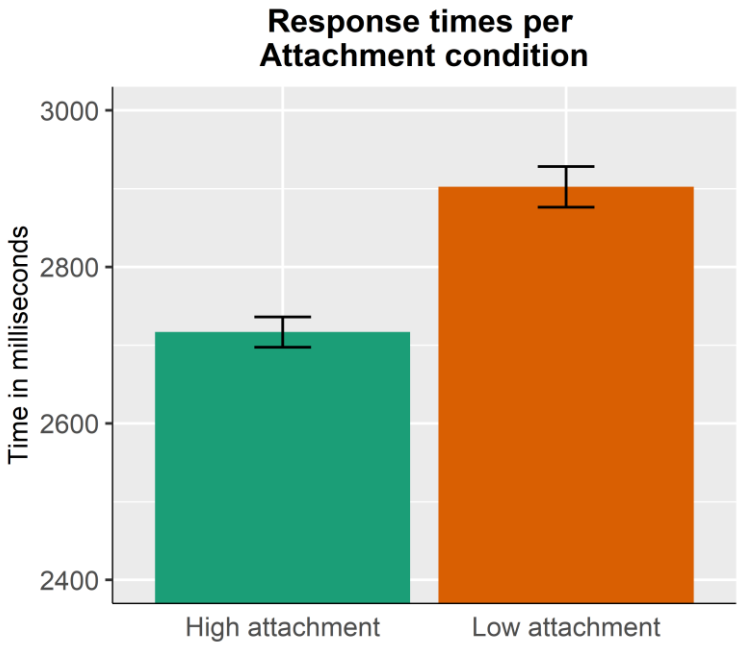

Figure 28. Response times per each level of Attachment (high vs. low). High-attaching sentences were facilitated over low-attaching sentences.

A main effect of Language ($p < 0.001$) also showed that Spanish participants (mean = 2997 ms, SD = 1402 ms) answered slower to the questions than Italian participants (mean = 2601 ms, SD = 1291 ms). See Figure 29.

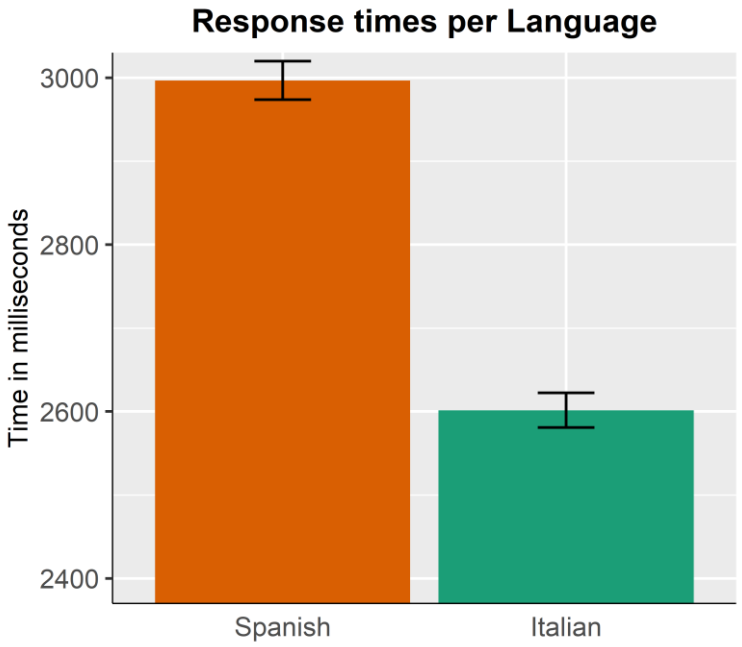

Figure 29. Response times per each language (Spanish vs. Italian). Spanish participants were slower than Italian participants in answering the questions.

Finally, I found an interaction between Attachment and Language ($p = 0.01$). Further analyses showed that high-attaching sentences were facilitated for both Spanish ($p = 0.046$) and Italian ($p < 0.001$) participants; and that Spanish participants were slower than Italian participants in both high- and low-attaching sentences (all p-values < 0.001; see Table 8 for the response times in milliseconds). Based on the significance of the interaction, and considering Figure 30, I conclude that high attachment was easier to process in Italian than in Spanish.

	Spanish	Italian
High Attachment	2953 ± 1347 ms	2499 ± 1203 ms
Low Attachment	3059 ± 1475 ms	2753 ± 1398 ms

Table 8. Response times per each language (Spanish vs. Italian) and each level of Attachment. High attachment was facilitated to a greater extent in Italian than in Spanish.

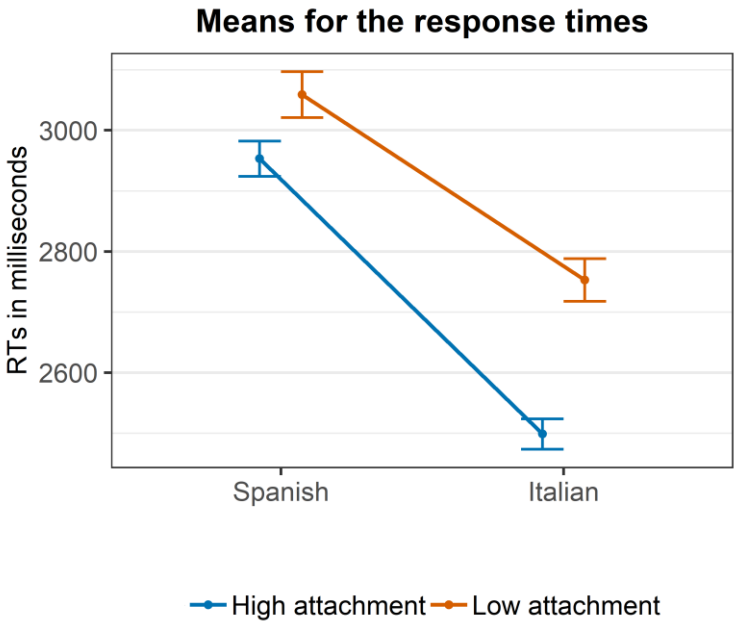

Figure 30. Means and standard errors per each Language (Spanish vs. Italian) and each level of Attachment (high vs. low). The high-attachment facilitation was stronger in Italian than in Spanish.

Results for the reading times at the embedded verb (EV) showed a main effect of Language ($p < 0.001$), indicating that Spanish participants (mean = 477.58 ms, SD = 254.64 ms) were faster than Italian participants (mean = 526.39 ms, SD = 286.87 ms). See Figure 31.

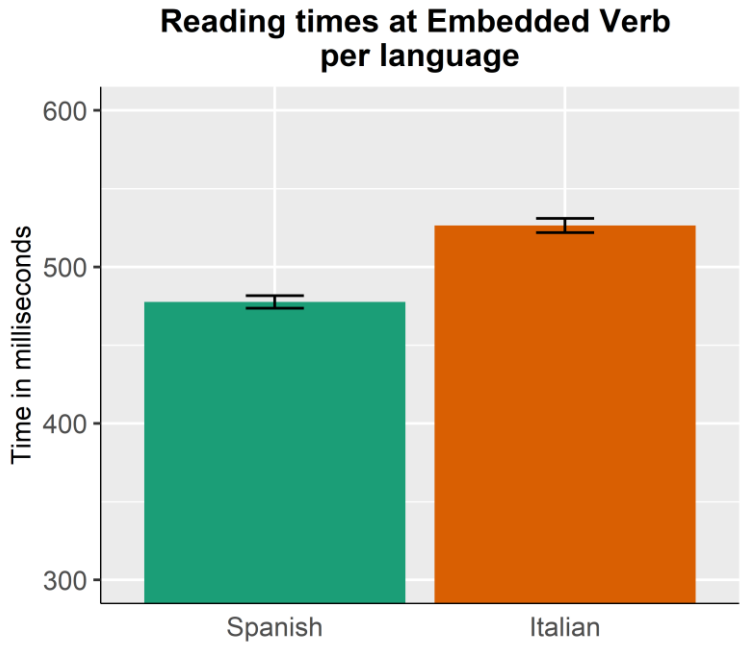

Figure 31. Reading times at the embedded verb (EV) per each language. Spanish participants were faster than Italian participants.

Furthermore, an interaction between Attachment and Language was significant ($p = 0.004$). Further analyses showed that, under both high- ($p = 0.03$) and low-attaching sentences ($p < 0.001$), Spanish participants were faster than Italian participants; and that Italian participants read high-attaching sentences faster than low-attaching sentences ($p = 0.02$), whereas this effect did not reach significance for Spanish participants ($p = 0.07$). See Table 9 and Figure 32.

	High Attachment	Low Attachment
Spanish	474.89 ± 245.72	481.11 ± 265.93
Italian	506.19 ± 268.18	554.55 ± 308.93

Table 9. Means and standard deviations per each language (Spanish vs. Italian) and level of attachment (high vs. low), in milliseconds.

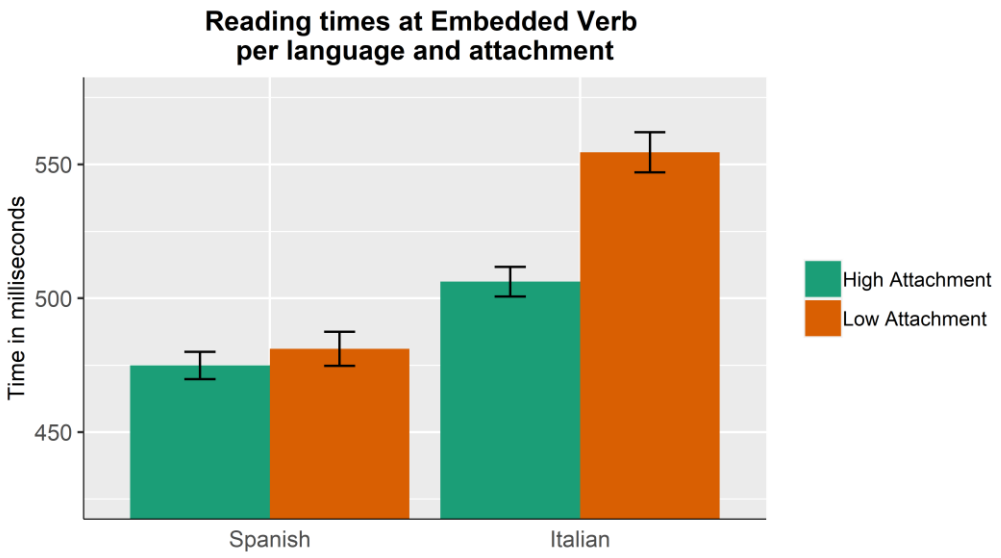

Figure 32. Reading times at the embedded verb (EV) per each language (Spanish vs. Italian) and each level of Attachment (high vs. low). Italian participants experienced high-attachment facilitation whereas Spanish participants did not.

Results for the reading times at the post-verbal critical region (EV+1) showed a significant triple interaction between Matrix Verb, Attachment and Language ($p = 0.047$). Further analyses on the perceptual vs. non-perceptual matrix verb subsets, which were carried out by selecting the best-fitting model, and on the high- vs. low-attaching subset showed no effect or interaction between the remaining factors. The analyses based on the Spanish vs. Italian subsets are reported in Sections 2.5 and 4.5: no effect or interaction was observed in either subset. However, after inspecting the full models for the Spanish and Italian subsets separately and without selecting the best-fitting model, I observed a marginal interaction between Matrix Verb and Attachment in Italian ($p = 0.055$). Comparing the data shown in Figure 33, I see that, in Italian the effect of Attachment was larger in the perceptual matrix verb subset (i.e., high attachment was facilitated to a greater extent under perceptual matrix verbs than under non-perceptual matrix verbs); whereas in Spanish (on the left), although no statistical difference was found, the direction of the effect was the opposite. The significant triple interaction in the main analyses is most likely due to this difference.

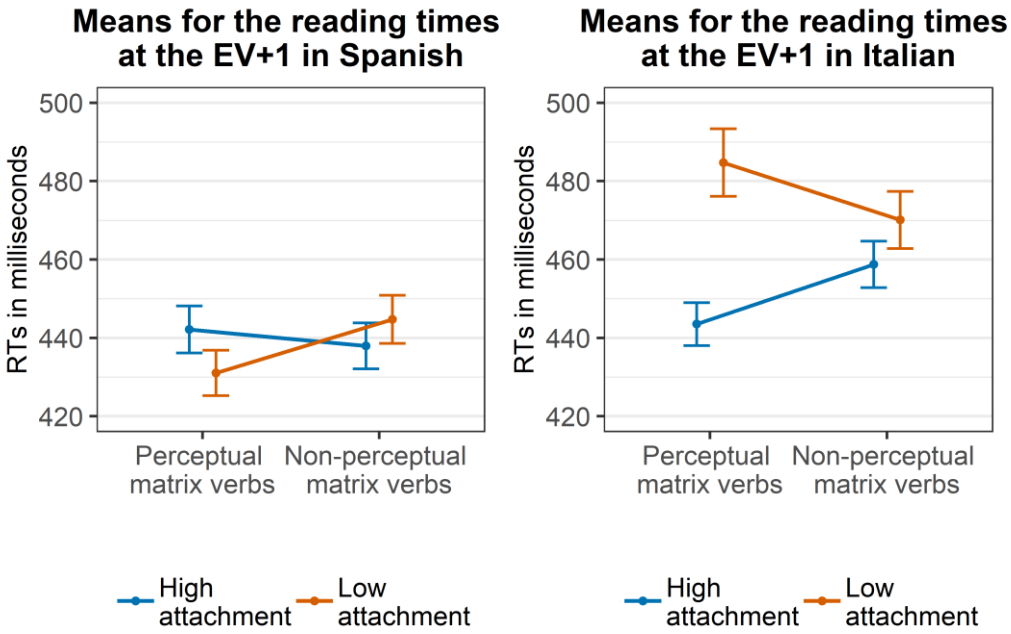

Figure 33. Means and standard errors for the reading times at post-verbal position (EV+1) per each level of Attachment (high vs. low) and Matrix Verb (perceptual vs. non-perceptual) in Spanish (on the left) and Italian (on the right) data. High attachment was facilitated to a greater extent in Italian and under perceptual matrix verbs than under non-perceptual matrix verbs.

Results for the reading times in the last critical region (EV+2) showed no effect or interaction. See Figure 8 in Section 2.5 and Figure 16 in Section 4.5 for the word-by-word reading times.

6.1.4. Discussion

The data showed that participants were overall more accurate in high-attaching conditions than in low-attaching conditions, albeit modulated by the condition: under high-attaching sentences, the items introduced by a perceptual matrix verb were more accurate than those introduced by a non-perceptual one, suggesting a modulating factor of PR availability. Furthermore, Italian participants were overall more accurate than Spanish participants, and even more so under high-attaching conditions. Furthermore, questions referring to high-attaching sentences were answered faster than those referring to low-attaching sentences, in both languages; however, this effect was more prominent in Italian than in Spanish. As for the

reading times at the embedded verb position, Spanish participants were faster than Italian participants. However, only Italian participants showed a facilitation for high attachment — that is, only Italian participants read the EV faster in high-attaching sentences than in low-attaching sentences. Likewise, the data indicated that, in the reading times at the post-critical region, only Italian participants experienced a facilitation of high attachment in sentences introduced by perceptual matrix verbs when compared to low attachment. In other words, Italian participants were faster at reading sentences introduced by a perceptual verb and with a high attachment than at reading sentences introduced by a perceptual verb and in which the attachment was low.

Overall, the results showed a clear high-attachment facilitation in the accuracy and response times in both Spanish and Italian. Therefore, and as argued in previous chapters, there is no evidence that Minimal Attachment and Late Closure hold in these languages, as it had also been found in the pioneering work by Cuetos and Mitchell (1988).

I also found a modulation of perceptual matrix verbs in the reading times (post-verbal region: EV+1); that is, in Italian only, high attachment was facilitated to a greater extent under perceptual matrix verbs than under non-perceptual matrix verbs. However, as I argued in Sections 4.6 and 5.4, such modulation does not comply with the PR-First Hypothesis, for the hypothesis predicts low attachment facilitation under non-perceptual matrix verbs, and my data show an across-the-board high-attachment facilitation.

The data further suggested that high attachment was facilitated to a larger degree in Italian than in Spanish in terms of response times and reading times at the embedded verb. This correlates with the fact that PRs are more natural and available in Italian than in Spanish (Alonso-Pascua, 2020; Grillo & Costa, 2014). On the one hand, these results suggests that not all the languages that had been regarded as high-attaching are alike, and that different languages take a different place on the spectrum of attachment preferences, possibly depending on language-specific characteristics. On the other hand, these results suggest that PR availability is a modulating factor behind the stronger high-attachment preference in Italian.

Moreover, I observed a trade-off effect in Spanish between reading times at the embedded verb, and accuracy and response times. Specifically, Spanish participants

were faster than Italian participants in reading the embedded verb. As a consequence of this, Spanish participants were also slower and less accurate in answering the comprehension questions.

Finally, as observed in Sections 2.6, 4.6 and 5.4, there was a facilitation for perceptual matrix verbs. See Chapter 7 for a tentative explanation of this phenomenon.

6.3 Comparison of Experiments 2 and 4 (ambiguous experimental sentences)

6.1.5. Data analysis

Attachment preferences were analysed using a generalized linear mixed model on binomial data. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Language (Italian vs. Spanish) and their interaction as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model was the full model.

Response times were analysed using a linear mixed model on the logarithmic times. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models, selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Answer (high vs. low attachment), Language (Italian vs. Spanish) and their interactions as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model was a model with Matrix Verb, Answer, Language, the interaction between Matrix Verb and Language, and the interaction between Answer and Language as predictors. Only correctly answered trials were analysed.

Reading times at all regions of interest (embedded verb and following two regions: EV, EV+1, EV+2) were analysed using a linear mixed model on the residual reading times. The best-fitting model was selected by means of an ANOVA (analysis of variance) between the full model and a series of simplified models,

selecting the simplest and best-fitting model. The full model included Matrix Verb (perceptual vs. non-perceptual), Answer (high vs. low attachment), Language (Italian vs. Spanish) and their interaction as predictors; and participant code, item number and modality (laboratory vs. internet) as random effects. The best-fitting model at the embedded verb (EV) was a model with Language as predictor. The best-fitting model for the following region (EV+1) was a model with Language as predictor. The best-fitting model for the last critical region (EV+2) was a model with Matrix Verb, Answer and their interaction as predictors. Only correctly answered trials were analysed.

6.1.6. Predictions

Predictions are the same as detailed in Section 2.1.6. In addition, given that PRs are more frequent and/or available in Italian than in Spanish, I hypothesise that Spanish and Italian data will differ. Specifically, I expect that the data from Italian participants would be modulated to a larger extent by PR-availability, whereas data from Spanish participants would not be modulated.

6.1.7. Results

Results from the attachment preferences showed that high-attachment preferences were higher than chance (50%, p-value < 0.001). See Table 10 and Figure 34.

High Attachment	Low Attachment
3858 (0.76 ± 0.43)	1217 (0.24 ± 0.43)

Table 10. Raw number of high- and low-attachment preferences. In brackets, the means and standard deviations.

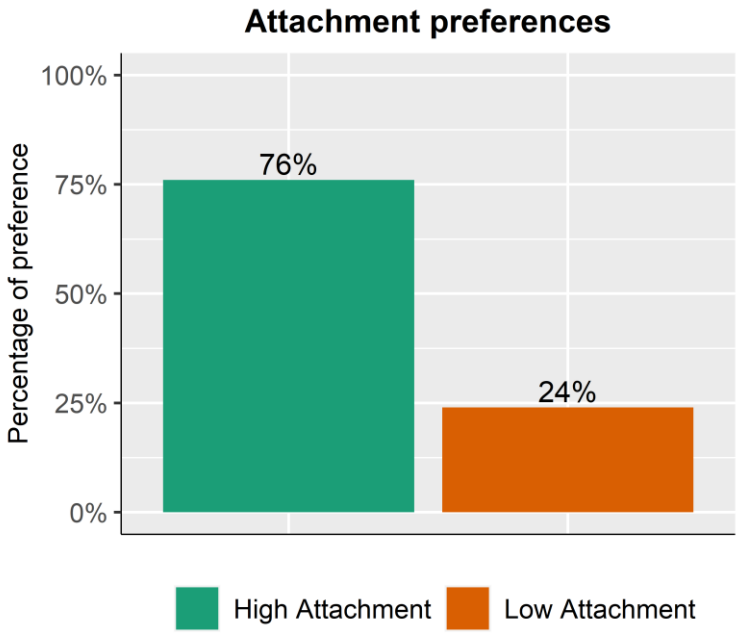

Figure 34. Proportions of high and low attachment preferences. High attachment was preferred more often than low attachment.

Furthermore, a main effect of Matrix Verb showed that high attachment was preferred more often when the matrix verb was perceptual, rather than when it was non-perceptual ($p < 0.001$). A main effect of language showed that high attachment was preferred more often in Italian than in Spanish ($p < 0.001$). Finally, the interaction between Matrix Verb and Language was significant ($p < 0.001$). Further analyses showed that the preference for high attachment was stronger in Italian participants than in Spanish participants under both perceptual ($p < 0.001$) and non-perceptual matrix verbs ($p = 0.0021$). In addition, in Italian, high attachment was preferred more often under perceptual matrix verbs than under non-perceptual verbs ($p < 0.001$), whereas no such difference was found in Spanish ($p = 0.15$). See Table 11 and Figure 35.

	Spanish	Italian	Total
Perceptual MV	842 / 1212 (0.7 ± 0.46)	1195 / 1363 (0.88 ± 0.33)	2037 / 2575 (0.79 ± 0.41)

Non-perceptual MV	791 / 1187 (0.67 ± 0.47)	1030 / 1313 (0.78 ± 0.41)	1821 / 2500 (0.73 ± 0.44)
Total	1633 / 2399 (0.68 ± 0.47)	2225 / 2676 (0.83 ± 0.37)	3858 / 5075

Table 11. Raw number of high attachment preferences and total number of observations per each condition of Matrix Verb (rows: perceptual vs. non-perceptual matrix verbs) and Language (columns: Spanish vs. Italian). In brackets, the means and standard deviations for the attachment preferences averaged over the corresponding row or column. In the total row, the numbers in bracket are the overall means and standard deviations for the condition in the corresponding row or column.

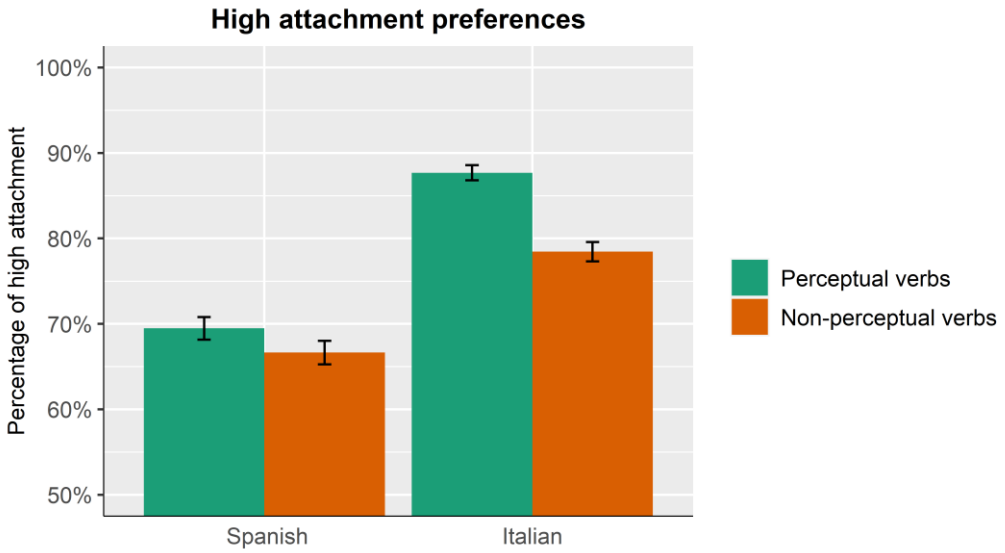

Figure 35. Proportions of high attachment per each language (Spanish vs. Italian) and condition (perceptual vs. non-perceptual matrix verb). There were more high-attachment preferences in Italian than in Spanish, and more in the condition of perceptual matrix verbs than with non-perceptual matrix verbs. The significant interaction between Matrix Verb and Language showed that, in Italian, high attachment was preferred under perceptual matrix verbs to a greater extent than under non-perceptual ones, whereas no such difference was found in Spanish.

As for the response times, a main effect of matrix verb ($p < 0.001$) showed that questions to sentences introduced by perceptual matrix verbs (mean = 2814 ms, SD = 1376 ms) were faster to answer than those introduced by non-perceptual matrix verbs (mean = 2919 ms, SD = 1351 ms). See Figure 36.

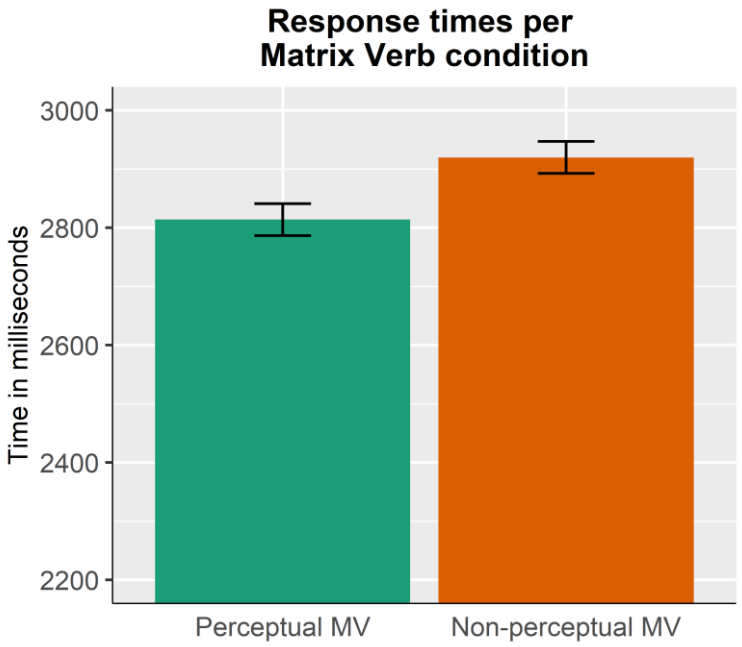

Figure 36. Time taken to answer the questions to sentences introduced by either perceptual or non-perceptual matrix verbs, in milliseconds. Questions to sentences introduced by perceptual matrix verbs were answered faster than those introduced by non-perceptual matrix verbs.

Furthermore, a main effect of Answer ($p < 0.001$) showed that questions to sentences that were attached high (mean = 2759 ms, SD = 1289 ms) were faster to answer than those that were attached low (mean = 3206 ms, SD = 1533 ms). See Figure 37.

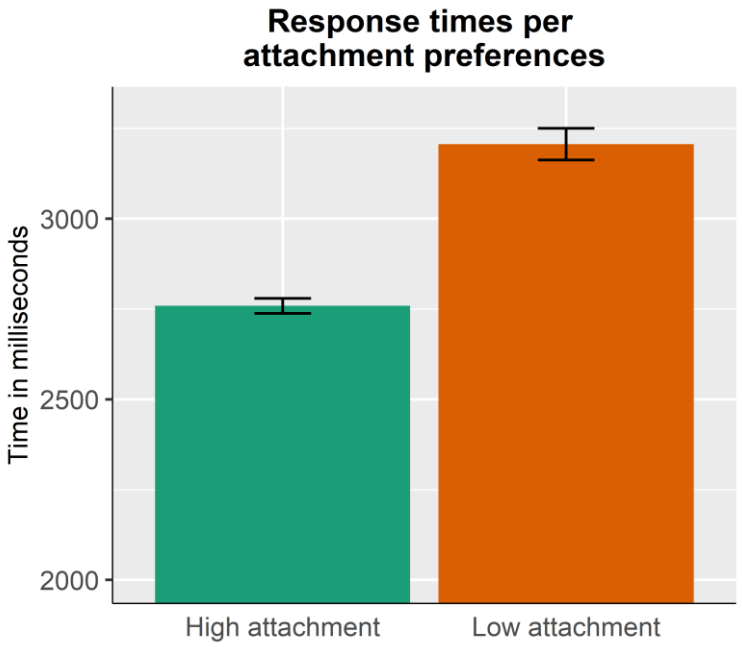

Figure 37. Response times (in milliseconds) per sentences that were attached either high or low. High-attaching sentences were facilitated over low-attaching sentences.

Moreover, a main effect of Language ($p < 0.001$) showed that Italian participants (mean = 2608 ms, SD = 1300 ms) answered the questions faster than Spanish participants (3154 ms, SD = 1377 ms). See F*igure* 38.

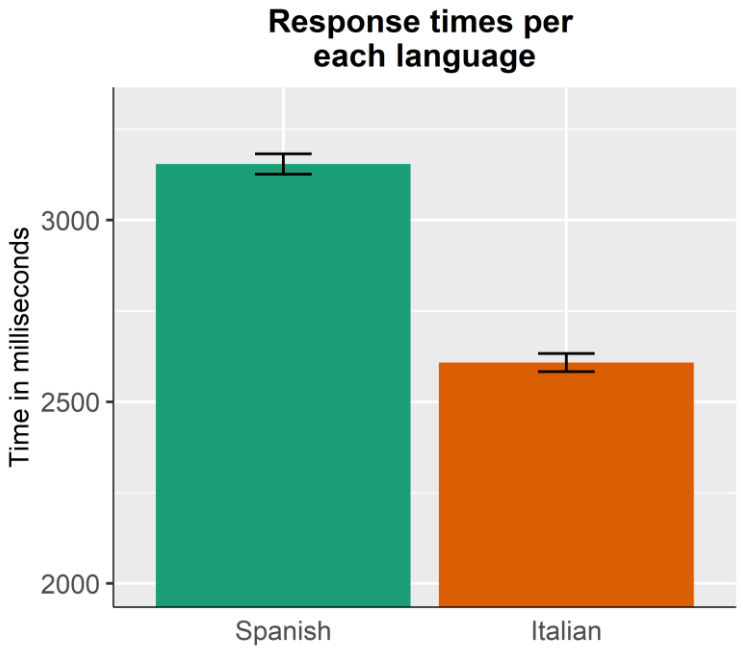

Figure 38. Response times in milliseconds for Spanish and Italian participants. Italian participants were faster than Spanish participants.

Furthermore, a significant interaction between Matrix Verb and Language ($p = 0.002$) was found. Further analyses showed that Spanish participants were slower than Italian participants under sentences introduced by perceptual matrix verbs ($p < 0.001$), as well as under those introduced by non-perceptual matrix verbs ($p = 0.002$). Italian participants were also faster to answer to sentences introduced by perceptual matrix verbs than those introduced by non-perceptual matrix verbs, whereas data from the Spanish participants did not show any difference between the two conditions ($p = 0.66$). See Table 12 and Figure 39.

	Spanish	Italian
Perceptual matrix verbs	3152 ± 1408	2513 ± 1274
Non-perceptual matrix verbs	3156 ± 1347	2706 ± 1320

Table 12. Response times and standard deviations in milliseconds per each language (Spanish vs. Italian) and condition of matrix verb (perceptual vs. non-perceptual).

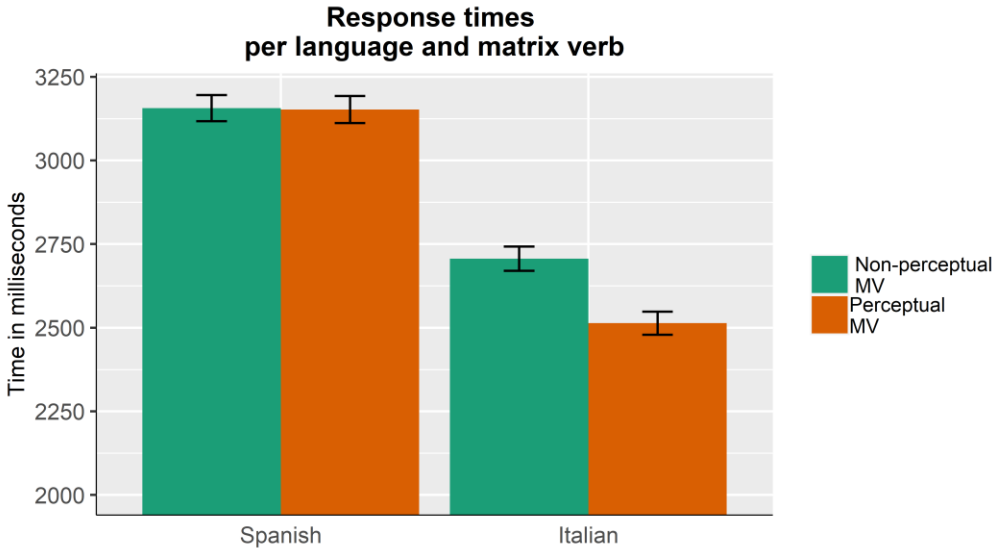

Figure 39. Response times in milliseconds per each condition of Matrix Verb (perceptual vs. non-perceptual) and per each language (Spanish vs. Italian). Spanish participants did not experience any facilitation under perceptual verbs, whereas Italians, do. Furthermore, Spanish participants were overall slower than Italian participants.

Lastly, there was an interaction between Answer and Language ($p = 0.001$). Further analyses showed that high attachment was facilitated over low attachment in both Spanish ($p = 0.047$) and Italian ($p < 0.001$); and that Spanish participants were slower than Italian participants, in both high- ($p < 0.001$) and low-attaching sentences ($p = 0.01$; see Table 13 for the response times in milliseconds). Based on the significance of the interaction, and considering Figure 40, I concluded that high attachment was facilitated to a greater extent in Italian rather than in Spanish.

	Spanish	Italian
High attachment	3092 ± 1283	2514 ± 1237
Low attachment	3286 ± 1553	3071 ± 1491

Table 13. Response times and standard deviations in milliseconds per each language (Spanish vs. Italian) and depending on whether the items were regarded as high- or low-attaching.

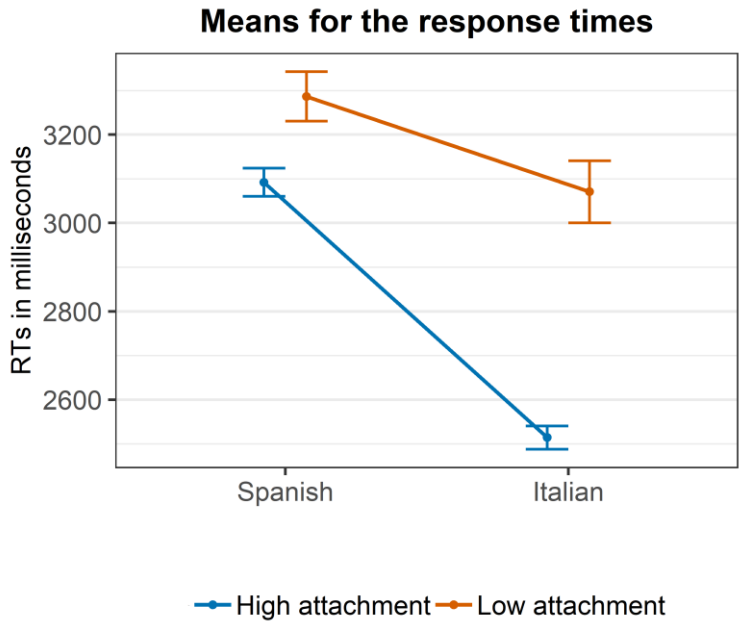

Figure 40. Means and standard errors in the response times per each Language (Spanish vs. Italian) and whether the items were regarded as high- or low-attaching. The high-attachment facilitation was stronger in Italian than in Spanish.

Results for the reading times at the embedded verb (EV) showed a main effect of Language ($p < 0.001$), indicating that Italian participants (mean = 428.32 ms, SD = 188.84 ms) were faster than Spanish participants (mean = 455.49 ms, SD = 220.44 ms). See Figure 41.

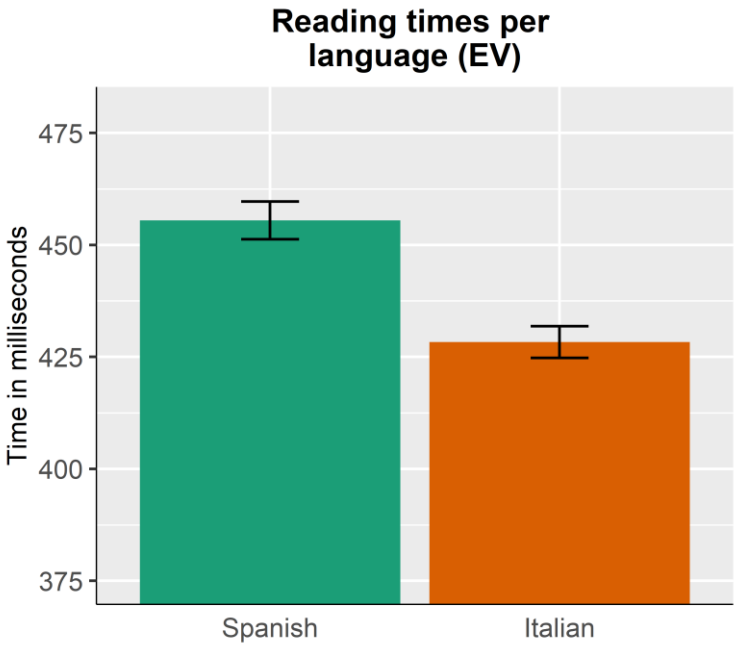

Figure 41. Reading times in milliseconds at the embedded verb (EV) per each language (Spanish vs. Italian). Spanish participants were slower than Italian participants.

At the post-verbal region (EV+1), results showed a main effect of Language ($p < 0.001$), indicating that Italian participants(mean = 405.01 ms, SD = 158.3 ms) were faster than Spanish participants (mean = 416.73 ms, SD = 174.34 ms). See Figure 42.

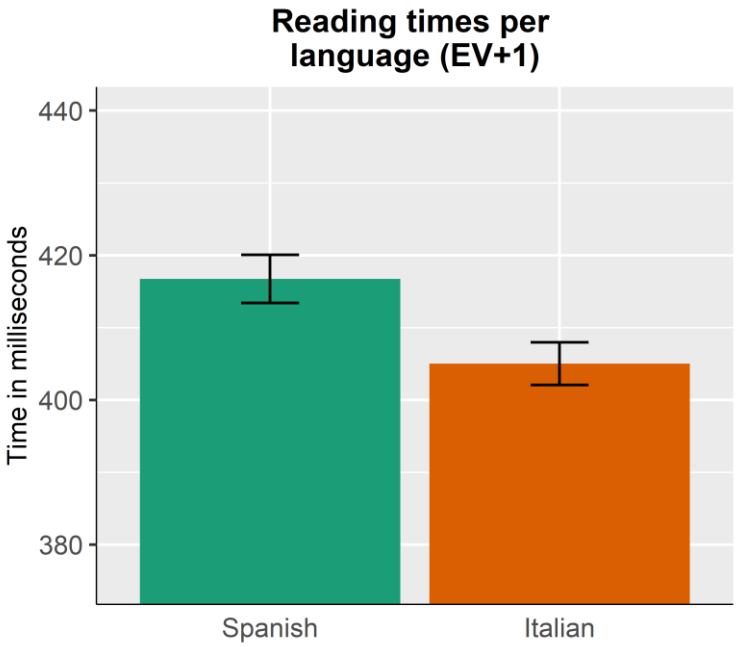

Figure 42. Reading times in milliseconds at post-verbal (EV+1) per each language (Spanish vs. Italian). Spanish participants were slower than Italian participants.

Results at the last critical region (EV+2) showed a main effect of Answer ($p < 0.001$), indicating that sentences that were regarded as high-attaching (mean = 401.29 ms, SD = 153.38 ms) were read slower than those regarded as low-attaching (mean = 397.66 ms, SD = 164.83). See Figure 43.

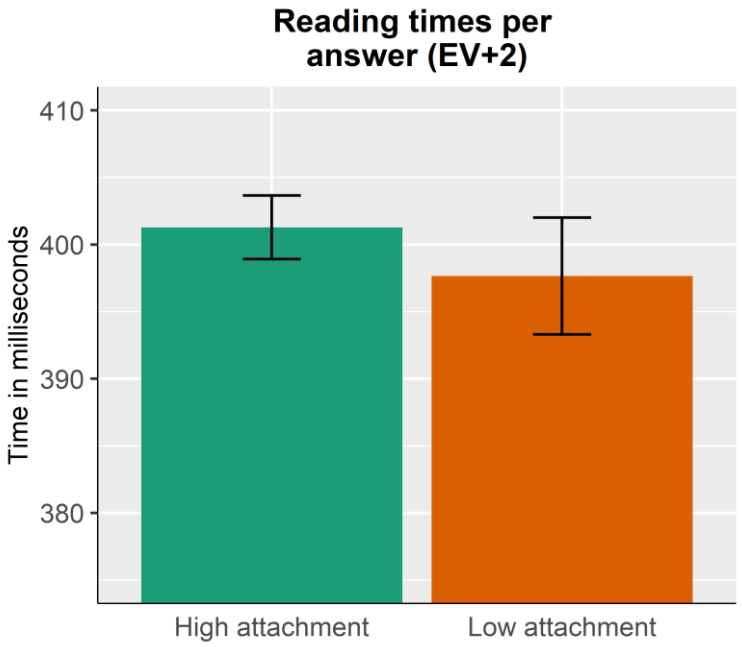

Figure 43. Reading times in milliseconds at the last critical region (EV+2) per each level of Answer (high vs. low attachment). Sentences that were regarded as high-attaching were slower to read than those regarded as low-attaching.

Furthermore, a main effect of Language ($p < 0.001$) showed that Spanish participants (mean = 398.5 ms, SD = 166.95 ms) were faster than Italian participants (mean = 402.14 ms, SD = 145.52 ms) in this region (see Figure 44).

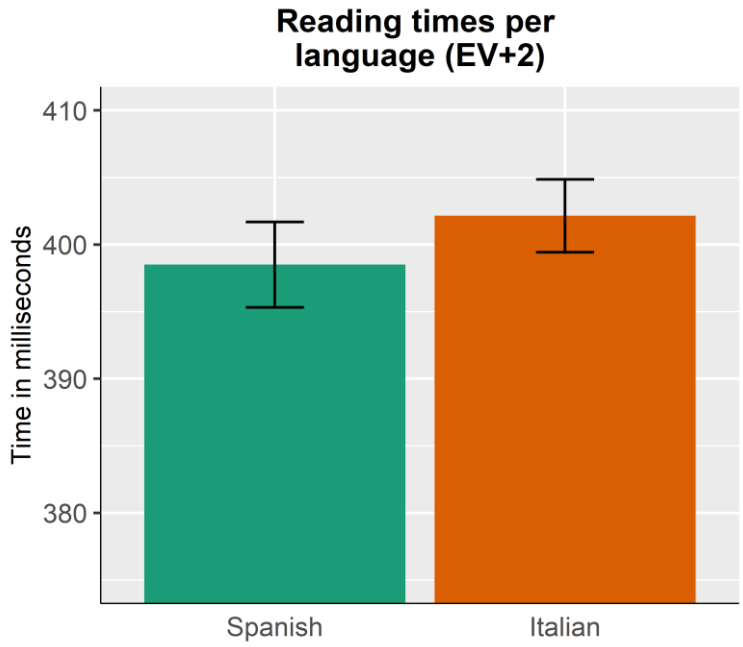

Figure 44. Reading times in milliseconds at the last critical region (EV+2) per each language (Spanish vs. Italian). Spanish participants were faster than Italian participants.

Finally, the interaction between Matrix Verb and Answer indicated that, under perceptual matrix verbs, high-attachment sentences were read faster than low attachment ($p < 0.001$), whereas the difference did not reach significance under non-perceptual matrix verbs ($p = 0.09$). Perceptual matrix verbs were also facilitated under high-attaching sentences ($p = 0.039$), but not under low-attaching ones ($p = 0.21$). See Table 14 and Figure 45.

	High attachment	Low Attachment
Perceptual MV	399.76 ± 153.93	403.77 ± 174.69
Non-perceptual MV	402.96 ± 152.79	392.88 ± 156.65

Table 14. Means and standard deviations of the reading times at the last critical region (EV+2) for each level of Matrix Verb (perceptual vs. non-perceptual) and Answer (high or low attachment), in milliseconds.

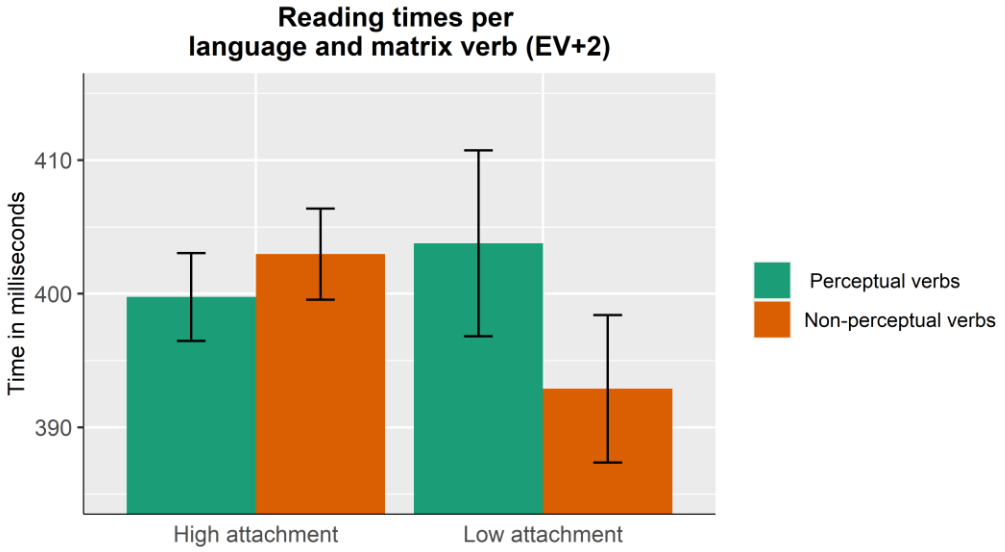

Figure 45. Reading times in milliseconds per each level of Matrix Verb (perceptual vs. non-perceptual) and Answer (high vs. low attachment). High attachment was facilitated under perceptual matrix verbs, whereas low attachment failed to be facilitated under non-perceptual matrix verbs. Perceptual matrix verbs were facilitated under high-attaching sentences.

6.1.8. Discussion

Results showed that participants overall preferred high attachment over low attachment, and even more so in the case of Italian participants. Furthermore, high attachment was preferred more often under perceptual matrix verbs than under non-perceptual matrix verbs only as far as Italian participants were concerned. Response times were faster when participants selected the high-attaching response than when they selected the low-attaching response, which was even more conspicuous in the case of Italian participants than as far as Spanish participants were concerned. When reading the embedded verb and the post-critical region, Italian participants were faster than Spanish participants, whereas the opposite was true at the last critical region. Additionally, results showed that, at the last critical region, those sentences that were regarded as high-attaching were read slower than those regarded as low-attaching. However, I also saw that high attachment was facilitated under perceptual matrix verbs, whereas low attachment was *not* facilitated under non-perceptual matrix verbs: that is to say that under perceptual matrix verbs,

participants read high attachment faster than low attachment; whereas, under non-perceptual matrix verbs, the opposite was not true.

Finally, the interaction between Matrix Verb and Answer indicated that, under perceptual matrix verbs, high attachment was faster to read than low attachment ($p < 0.001$), whereas the difference did not reach significance under non-perceptual matrix verbs ($p = 0.09$).

Results showed an overall high-attachment preference and facilitation in attachment preferences, response times and reading time measures at the last critical region. Therefore, as mentioned in the previous chapters, Minimal Attachment and Late Closure are not supported by my data.

My findings indicated that the availability of the PR modulated the results in the attachment preferences and the reading times at the last critical region (EV+2). Specifically, as for attachment preferences, a greater high-attachment facilitation was found in Italian when sentences were introduced by a perceptual matrix verb, rather than in those cases when they were introduced by a non-perceptual one. No such result was found in Spanish. This modulation is in line with the results of Italian in Experiments 3 (see Section 4.5) and 4 (see Section 5.3), and with the results of the comparison between Experiments 1 and 3 (see Section 6.1.3). Consequently, I conclude that PR availability *does* modulate attachment preferences, at least in Italian. Yet, my data do not support the PR-First Hypothesis because of the overwhelming preference for high attachment in the non-perceptual condition (73%).

As for the reading times at the last critical region (EV+2), high attachment was clearly facilitated when compared to low attachment under perceptual matrix verbs, whereas a trend in the opposite direction — that is, a non-significant facilitation of low attachment — was found under non-perceptual matrix verbs. This finding is the only one in partial support of the PR-First Hypothesis.

My results further indicate that attachment preferences differed in Spanish and Italian. Specifically, the high-attachment advantage and preference were stronger in Italian than in Spanish, as seen in the attachment preferences and response times. As noted in Section 6.1.4, this could be due to the fact that PRs are more frequent in Italian than in Spanish.

Furthermore, Italian participants were faster than Spanish participants in the reading times at the embedded verb and post-verbal region (EV and EV+1). Nevertheless, they were slower than Spanish participants in reading the last critical region. I interpret this result as a trade-off effect: Italian participants might have been rushing their readings up to the last regions, and then taken their time to reanalyse the whole sentence and make their choice. It could be for this same reason that Italian participants were also faster in aswering the comprehension questions.

Similarly to what is described in Section 5.4, participants read sentences that were later regarded as high-attaching slower than the low-attaching ones. If we consider this together with the high-attachment facilitation in the response times, this could also be a trade-off effect: whenever participants saw a sentence that they later interpreted as high-attaching, they would read slower — more carefully — its last part (EV+2), and later they would be faster — more confident — in making their judgement towards high attachment. This effect could be caused by the modality of the experiment: given that participants were asked to make a judgement about their preferences, they might have developed a specific strategy to deal with the task.

Finally, as also noted in Sections 2.6, 4.6, 5.4 and 6.1.4, questions to sentences containing perceptual matrix verbs were answered faster than those introduced by non-perceptual matrix verbs. See Chapter 7 for a tentative explanation of this phenomenon.

7. General conclusions, limitations and future outlooks

In this dissertation, I presented the results of four different experiments, carried out in two different modalities: in-lab vs. internet-based.

In Experiments 1a and 1b (see Chapter 2), I used the self-paced reading method to compare the cognitive cost of high and low attachment in Spanish. I analysed the residual reading times at the embedded verb, that is, the region where attachment — which was, by construction, either high or low — took place, and the following two regions. I also analysed the accuracy and the response times in answering the comprehension questions. The latter asked which of the two NPs attached to the embedded verb — the attachment was provided. Results showed a clear facilitation for high-attaching sentences over low-attaching ones, regardless of the availability of PRs.

In Experiments 2a and 2b (see Chapter 3), I used the same method to analyse the attachment preferences in Spanish, and their cognitive cost. The materials were ambiguous, so that participants could indicate whether they interpreted the sentence as high-attaching or low-attaching. Results showed both an online facilitation and an offline preference for high attachment, regardless of the availability of PRs.

In Experiments 3a and 3b (see Chapter 4), I used the same methods and analyses as in Experiments 1a and 1b, with the intent of determining the cost of high and low attachment in Italian. Results showed a clear facilitation for high attachment in the accuracy and response times. As far as accuracy is concerned, I found a modulation given by the availability of PRs. This shows that, under high-attaching sentences, PR availability boosted accuracy.

In Experiments 4a and 4b (see Chapter 5), I used the same methods and analyses as in Experiments 2a and 2b to analyse the attachment preferences in Italian, and their cognitive cost. Results showed a clear preference for high attachment over low attachment, although modulated by the availability of PRs. This modulation indicated that high attachment was preferred to a greater extent in PR-available environments.

In Chapter 6, I compared the data from Experiments 1 and 3. Results showed a clear high-attachment facilitation in the accuracy and response times in both Spanish and Italian. Furthermore, the reading times at the post-verbal region in Italian were

faster in high-attaching conditions introduced by perceptual verbs — one of these conditions being the PR-available one. Moreover, high attachment was facilitated to a greater extent in Italian than in Spanish, with regards to the response times and the reading times at the embedded verb, regardless of PR availability.

I then compared the data from Experiments 2 and 4. Results showed an overall high-attachment preference and facilitation, regardless of the availability of PRs. However, PR availability did modulate attachment preferences in Italian: high attachment was more prevalent in PR-available contexts; and reading times at the last critical region sped up in the condition where PRs were available.

Overall, I see a consistent preference and facilitation for high attachment, both in off- and online measures. This preference, in some cases, is modulated by the availability of pseudorelatives, but this is so only in Italian. The analysis for the conjoined data from Spanish and Italian also showed a partial modulation based on the availability of PRs.

In part, such remarkable preference for and facilitation of high attachment in RC-only environments could be due to some features of the materials used in my studies. Rohde et al. (2011) provided evidence for increased high-attachment preferences when the main verb could trigger implicit causality. Taking one of my RC-only experimental items from Experiment 3 as an example: *Alberto envidió al colega del gobernador que salía con mi prima* ('Albert envied the colleague of the governor who left with / dated my cousin'). The use of the verb *envidiar* ('to envy'), following Rohde et al. (2011) could have biased the participants' preference for high attachment, since they could have read the item as 'Albert envied the colleague of the governor *because* he left with / dated my cousin'. Other non-perceptual MVs in my experiments that could have triggered high attachment because of their implicit causality are *ayudar* ('to help') and *regañar* ('to scold'). Future studies should take into account this caveat in creating their materials.

Considering all the evidence together, and as pointed out in the Discussion Sections from Chapters 2 to 6, I argue that the modulation found in the data shows no support for the PR-First Hypothesis. High attachment is overall preferred and facilitated, although modulated by PR availability. PR-First, instead, as a categorical hypothesis, predicts that results would be *determined* by PR availability (Grillo & Costa, 2014) and no high attachment preference would be found in RC-only

contexts. My data do not support these categorical claims, even taking into account the caveats mentioned in the previous paragraphs.

In line with Alonso-Pascua (2020) and as previously discussed in Section 1.3, I argue that the PR-First Hypothesis is not even supported by the results from the previous works. The reason is that, as previously discussed in Chapter 0, the hypothesis predicts almost complete preference for high attachment in PR-available contexts in all languages admitting PRs; and almost no preference or facilitation for high-attaching relative clauses. None of the works published so far found an absence of high-attachment preference for relative clauses.

The results offered in this dissertation, as well as previous research, suggest that PR availability *does* play a role in attachment preferences and the processing of complex structures, at least in some languages such as Italian, but does not explain the general crosslinguistic variation in preference. Nevertheless, I contend that there is no need for a categorical hypothesis such as the PR-First Hypothesis, that claims to explain how speakers of all languages process relative clauses. In fact, it seems that the hypothesis only applies to a reduced type of constructions, and does not account for structures that allow, for instance, implicit causality, or other modulating factors, such as animacy and RC length. In short, it applies to a small group of instances, and, it follows, the PR-First Hypothesis cannot generalise enough to offer the key to understanding how relative clause attachment works in human minds.

Instead, I argue that PR availability is one of the *many modulating factors* for attachment preferences in some languages such as Italian, along with animacy (Hsiao & MacDonald, 2016; Kwon et al., 2019), prosody (de la Cruz-Pavía & Elordieta, 2015; Fernández & Sekerina, 2015; Hemforth et al., 2015; Mahmoodi et al., 2022), linguistic profile (de la Cruz-Pavía & Elordieta, 2015; Jegerski, Keating, et al., 2016; Jegerski, VanPatten, et al., 2016; Mahmoodi et al., 2022; Marefat et al., 2015; Marefat & Farzizadeh, 2018) among others. In other words, PR availability does not determine attachment preferences, but it *could* modulate them towards high attachment, and, therefore, future works should take this effect into account. There is consistent evidence that the variation in attachment preferences is a multifactorial issue, which cannot be accounted for by means of a single, categorical factor such as PR availability, as claimed in the PR-First Hypothesis, or locality, as claimed by Frazier (1979).

Another interesting question is why there is no modulation in the Spanish set of experiments (1ab – 2ab, in Sections 2.5 and 3.3). Previous works have found that PRs consistently modulate attachment in Spanish (Aguilar et al., 2021, 2022; Aguilar & Grillo, 2021). The materials I created were thoroughly comparable between languages: therefore, there was no reason to expect different results for different languages. Aguilar and Grillo (2021) argued that PR availability in Spanish is more restricted because of the existence of an unambiguous cognate structure with a gerundive small clause: *Juan vio a María bailando* ('John saw Mary dancing'). According to the authors, this would be the reason for PR availability to produce a lessened modulation of attachment. However, Italian as well allows a cognate structure with the embedded verb in infinitive: *Giovanni ha visto Maria ballare*. Therefore, once again, there is no a priori reason to believe that the effect of PR availability would differ between languages.

As mentioned earlier in this dissertation, another possible reason could consist in that PR availability modulates attachment in Italian more so than in Spanish because such a structure is more frequent and widely accepted in Italian than in Spanish. However, this leads to a self-feeding loop in terms of logical thinking: Italian accepts PRs more readily because it admits more PRs than Spanish; since Italian admits more PRs than Spanish, it consequently accepts PRs more readily. In other words, because A is due to B, then B is due to A, which obviously constitutes fallacious reasoning. This claim does not give any clue as to *why* PRs are more accepted, and, therefore, largely preferred in Italian, but it reads as cause-effect what could very well be a coincidental relationship. Further research should investigate PR-availability across languages and determine what, if any features of a language make a PR more available and/or accepted in certain cases rather than in others.

Concerning the use of perceptual vs. non-perceptual matrix verbs, I find a consistent facilitation for sentences introduced by the former over the latter in all experiments. Since the materials were strictly controlled (see the Norming Studies 2 and 4 in Sections 2.3 and 4.3), this facilitation cannot be due to a frequency effect, as the frequency of the perceptual and non-perceptual verbs did not differ: either within or across languages. Therefore, there is no reason to assume that it is due to the characteristics of the materials.

A possible explanation may be derived from Embodied Cognition theories (see Borghi & Cimatti, 2010). Embodied Cognition accounts state that even the higher

levels of cognition — among them, language processing — are grounded in sensorimotor processing. (Jirak et al., 2010). In fact, there are studies that describe how brain areas related to action and language cannot be seen as exclusive and independent, but must be seen as working together towards language processing (see Pulvermüller, 2005). Therefore, according to these theories, processing verbs would imply a re-enactment of the sensorimotor skills needed to perform them. Action words would reliably activate not only the areas dedicated to language processing, but also the cortical representation of the action they refer to (see Hauk et al., 2004, and Scerrati et al., 2015).

It might be the case that the perceptual matrix verbs selected in my study had more concrete body-related features than the non-perceptual ones. If so, said perceptual matrix verbs could have more easily triggered the bodily re-enactment of the verbal signifiers and, thus, facilitated processing. In fact, Aziz-Zadeh et al. (2006) do not find evidence for embodied cognition in abstract verbs. Even though the non-perceptual verbs in my studies were not abstract per se, they do not correlate that easily to certain intrinsically physical actions or body movements. While we can all imagine and re-enact what 'seeing' or 'hearing' something feels like, it could be trickier to do the same with a verb like 'envy'. Other non-perceptual verbs that are less somatic than the perceptual ones are 'to wait', 'to leave', 'to visit'; and, to some extent, 'to help' and 'to train', which were matrix verbs left with no context: 'to train' could be a highly physical action, but my sentences do not specify *for what* the subject is training, making it much less somatic. I believe that the reason why perceptual verbs were facilitated throughout all my experiments could be that perceptual matrix verbs were highly body-related and deeply grounded in sensory processes, and, therefore, facilitated by the elicited embodiment; whereas the non-perceptual ones did not incur as much in such a facilitation for being less "bodily". I cannot draw any clear conclusion on the issue because the experiments were not designed to test this hypothesis. Therefore, further work is required to determine whether or not this is the reason for the pattern of results found in my experiments.

As pointed out earlier in this chapter, I argue that the PR-First Hypothesis should be, ad minimum, revised, in order to better describe the role pseudorelative clauses have in *modulating* — not *determining* — attachment preferences and the processing of ambiguous construction of the [NP1 of NP2 COMP] type. In addition, I believe that an exhaustive compendium of the various modulating factors for attachment

preferences should be compiled, including PR availability and the rest of the causes described in Section 1.1.

Furthermore, it would be desirable for future works to pre-test experimental materials not only to obtain similar plausibility between NP1- and NP2-attaching embedded verbs, as most of the aforementioned works did (see also Norming Studies 1 and 3 in Sections 2.2 and 4.2), but also to pre-test the pool of perceptual verbs to be used in further experiments for their plausibility to introduce a PR — as I did in Norming Studies 2 and 4 in Sections 2.3 and 4.3. Such a norming study allowed me to obtain at least 10 perceptual or quasi-perceptual matrix verbs to use in my experiments, whereas most of the previous studies only relied on a handful of verbs, repeating them multiple times across the experiment.

In conclusion, in the present work, I have aimed to ascertain the existence of high attachment preferences in Italian and Spanish, and test whether this preference could be explained by the PR-First Hypothesis. I designed eight experiments, in Italian and Spanish, and used the self-paced reading technique to describe the cognitive burden posed by each attachment strategy, and to test the PR-First Hypothesis directly. My final conclusion is that the PR-First Hypothesis does not explain attachment preferences in either language. However, PR availability does play a modulating role in the preference for high attachment in Italian. Future work must take into account this factor, and more research is needed in order to explain the reason(s) why there is a crosslinguistic difference in attachment preferences.

Resumen en castellano

En esta tesis doctoral se aborda el problema de la adjunción de oraciones de relativo con doble antecedente y la variación en las preferencias de adjunción en este tipo de oraciones. Este problema aún no ha sido resuelto: la existencia de diferencias translingüísticas e intralingüísticas en las preferencias de adjunción que no derivan de las características gramaticales de cada idioma va en contra de la idea del procesamiento del lenguaje como un mecanismo universal. Por eso, examiné la Hipótesis Pseudorrelativas-Primero propuesta por Grillo y Costa (2014), que afirma haber encontrado la razón de tal variación en las preferencias de adjunción: la disponibilidad de oraciones pseudorrelativas (PR) en idiomas como el italiano y el español.

En la tesis, empiezo describiendo detalladamente el problema de la adjunción de oraciones relativas en detalle. Luego procedo a describir la propuesta de Cierre Tardío y Adjunción Mínima de Frazier (1979). Proporciono una descripción del trabajo seminal de Cuetos y Mitchell (1988), el primer estudio cuyos datos no respaldan las propuestas de Frazier en español, y al que luego siguieron muchos otros trabajos en otros idiomas — como italiano, portugués, francés, etc. Destaco cómo estas diferencias en la preferencia de adjunción no solo son translingüísticas, sino que también varían intralingüísticamente, dependiendo de la metodología utilizada por los investigadores. Además, considero los muchos factores gramaticales y léxicos que modulan las preferencias de adjunción. Finalmente, ilustro brevemente las hipótesis que se han propuesto a lo largo de los años para explicar tales variaciones.

A continuación, presento la Hipótesis Pseudorrelativas-Primero (Grillo & Costa, 2014) y sus predicciones. Esta hipótesis se basa en que las oraciones pseudorrelativas son disponibles en algunos idiomas y no en otros. La Hipótesis afirma que "Cuando hay posibilidad de interpretar una oración como pseudorrelativa, siendo todo lo demás igual, esa interpretación será preferida a la oración de relativo". Esto se basa en que, en lenguas como el castellano y el italiano, una estructura del tipo "Vi al hijo del panadero que corría" es ambigua: tiene tres distintas interpretaciones. Dos de ellos se realizan con una construcción de oración relativa, bien de adjunción alta o baja. La tercera sería una construcción eventiva, que también se puede expresar como "Vi al hijo del panadero corriendo". Esta construcción de pseudorrelativa,

entre otras, tiene dos características fundamentales. Por un lado, sólo puede darse si el verbo principal de la oración es un verbo de percepción. Por otro lado, requiere una adjunción alta.

El hecho de que exista esta tercera construcción, según Grillo y Costa, hace que las preferencias de adjunción alta sean más frecuentes que las de adjunción baja e en italiano, castellano y todas las demás lenguas donde las pseudorelativas son disponibles. Sin embargo, si la oración pseudorrelativa no fuera disponible, los principios, los principios de localidad de Frazier (1979) volverían a aplicar por razones de menor coste cognitivo (es decir, se preferirá la adjunción baja). Según Grillo y Costa (2014), el hecho de que hasta entonces no se había tomado en cuenta esta variable de confusión resulta en que los estudios previos en lenguas donde las pseudorrelativas son disponibles no puedan ser fiables. Asimismo, en su publicación describen minuciosamente cuál es la estructura y cuáles son las características de las pseudorrelativas, y presentan dos estudios en italiano, cuyos resultados, afirman, apoyan la hipótesis.

Tras la explicación de la hipótesis, analizo entonces los trabajos realizados durante los últimos diez años, que testean directamente la Hipótesis Pseudorrelativas-Primero. Describo cada trabajo en detalle y resalto sus problemas metodológicos.

Los siguientes capítulos están dedicados a la descripción de dos estudios de normalización y cuatro experimentos de lectura autoadministrada que realicé en español (Experimentos 1 y 2) y en italiano (Experimentos 3 y 4), diseñados para testear directamente la Hipótesis Pseudorrelativas-Primero. En estos experimentos tuve en cuenta los problemas metodológicos descritos en las secciones anteriores y tomé en cuenta una gran variedad de características (frecuencia léxica, plausibilidad del verbo para cada adjunción y disponibilidad de pseudorrelativas) basándome en dos estudios de normalización para cada idioma. El objetivo de los experimentos es responder a las siguientes preguntas de investigación:

i) ¿Puede la Hipótesis de la Pseudorrelativas-Primero explicar las preferencias de adjunción en español e italiano? (Experimentos 1 y 2 en español y Experimentos 3 y 4 en italiano)
ii) ¿Cuáles son las preferencias de adjunción en español e italiano? (Experimento 2 en español y Experimento 4 en italiano)

iii) ¿Es la adjunción alta más costosa que la adjunción baja en español e italiano? (Experimento 1 en español y Experimento 3 en italiano)

iv) ¿Existen diferencias en las preferencias de adjunción entre español e italiano? (Experimentos 1 y 2 en español y Experimentos 3 y 4 en italiano)

Los resultados de mis experimentos no respaldan la Hipótesis de la Pseudorrelativas-Primero en ninguno de los idiomas. Sin embargo, en italiano, encuentro una modulación hacia la adjunción alta basada en la disponibilidad de oraciones pseudorrelativas.

En el Capítulo 2 presento los Estudios Normativos 1 y 2 y los Experimentos 1a y 1b. Los estudios normativos sirvieron para controlar un posible sesgo semántico hacia la adjunción alta o baja (Estudio Normativo 1), y para garantizar la disponibilidad de PRs con los verbos perceptuales previamente seleccionados (Estudio Normativo 2). El objetivo de los Experimentos 1a (en laboratorio) y 1b (basado en internet) es arrojar luz sobre si, de acuerdo con la Hipótesis de la Pseudorrelativas-Primero, las oraciones relativas de adjunción alta son cognitivamente más costosas de procesar desde el punto de vista cognitivo que las de adjunción baja (Frazier, 1979); si las pseudorrelativas son más fáciles de procesar que las oraciones relativas; y si la preferencia por la adjunción alta en español puede deberse a la disponibilidad de PRs (Grillo & Costa, 2014).

Con estos objetivos en mente, diseñé un experimento de lectura autoadministrada en español que contenía una oración subordinada del tipo [NP1 de NP2 que EV]. Manipulé cada ítem para obtener cuatro condiciones. Por un lado, el verbo principal era perceptual o cuasi-perceptual (véase Grillo & Costa, 2014), y, por lo tanto, compatible con una lectura de PR; o no perceptual, haciendo así imposible cualquier interpretación de PR. Por otro lado, la adjunción era disponible bien hacia el primer nombre (adjunción alta) o hacia el segundo (adjunción baja) mediante el acuerdo de número entre sujeto y verbo. Por lo tanto, las cuatro condiciones son las siguientes:

(a) Verbo perceptual, adjunción baja:
Paco contempló al primo de los camareros que estudiaban en la biblioteca.

(b) Verbo perceptual, adjunción alta:
Paco contempló a los primos del camarero que estudiaban en la biblioteca.

(c) Verbo no perceptual, adjunción baja:
Paco ayudó al primo de los camareros que estudiaban en la biblioteca.
(d) Verbo no perceptual, adjunción alta:
Paco ayudó a los primos del camarero que estudiaban en la biblioteca.

Con estos experimentos, medí el coste de procesamiento de cada estructura en términos de precisión, tiempo de lectura y respuesta. Los resultados muestran una facilitación general para la adjunción alta, independientemente de la disponibilidad de PRs, en todas las medidas. Por lo tanto, no se encuentra apoyo para la Hipótesis de la Pseudorrelativas-Primero.

El Capítulo 3 describe los Experimentos 2a (en laboratorio) y 2b (basados en internet). Estos experimentos fueron diseñados para determinar si las preferencias de adjunción son compatibles con las predicciones hechas por la Hipótesis de la Pseudorrelativas-Primero. La hipótesis predice preferencias de adjunción alta en contextos donde hay disponibilidad de PRs, y preferencias de adjunción baja en contextos donde solo puede haber oraciones de relativo. Por lo tanto, utilicé ítems deliberadamente ambiguos en estos experimentos. El método fue la lectura autoadministrada; no obstante, además de registrar medidas *online*, también medí las preferencias de adjunción de los participantes.

Las condiciones experimentales se obtuvieron mediante la manipulación del verbo principal como en el Experimento 1: ya sea perceptual o cuasi-perceptual, permitiendo así una PR, o no perceptual, bloqueando cualquier PR y forzando una lectura de relativo.

(a) Verbo perceptual (disponibilidad de PR): Paco contempló al primo del camarero que estudiaba en la biblioteca.
(b) Verbo no perceptual (solo oraciones de relativo): Paco ayudó al primo del camarero que estudiaba en la biblioteca.

Los resultados muestran una preferencia y una facilitación para la adjunción alta, independientemente de la disponibilidad de PRs, en todas las medidas. Por lo tanto, no se encuentra apoyo para la Hipótesis de la Pseudorrelativas-Primero.

El Capítulo 4 describe los Estudios Normativos 3 y 4 y los Experimentos 3a y 3b, que consisten en unas réplicas en italiano de los Estudios Normativos 1 y 2 y de los Experimentos 1a y 1b. Los experimentos están diseñados para determinar los

costes cognitivos de las PRs, las oraciones relativas de adjunción alta y las oraciones relativas de adjunción baja. Los materiales consistían en oraciones relativas no ambiguas, y sirvieron para medir el coste de procesamiento base de cada estructura en términos de precisión, tiempo de lectura y respuesta.

Los resultados muestran una facilitación general de la adjunción alta en la precisión y los tiempos de respuesta. Sin embargo, en la precisión, esta facilitación está modulada por la disponibilidad de estructuras pseudorrelativas. No obstante, debido a la naturaleza de los resultados, concluyo que esta modulación no brinda apoyo a la Hipótesis de la Pseudorrelativas-Primero.

El Capítulo 5 describe los Experimentos 4a y 4b, que son unas réplicas de los Experimentos 2a y 2b en italiano, diseñados para investigar las preferencias de adjunción. Los materiales consistían en oraciones de relativo ambiguas, y sirvieron para medir las preferencias de adjunción de los participantes, así como el coste de procesamiento de cada estructura mediante tiempos de respuesta y lectura.

Los resultados muestran una preferencia general por la adjunción alta, aunque modulada por la disponibilidad de estructuras pseudorrelativas. Sin embargo, sostengo que este tipo de modulación no brinda apoyo a la Hipótesis de la Pseudorrelativas-Primero.

El Capítulo 6 compara los resultados de los Experimentos 1 y 3, con el fin de determinar si existen diferencias entre español e italiano en términos de los costes cognitivos de las PR, las oraciones relativas de adjunción alta y las oraciones relativas de adjunción baja; y los resultados de los Experimentos 2 y 4, para investigar si español e italiano difieren en sus preferencias de adjunción.

Los resultados muestran que la adjunción alta es facilitada y preferida en mayor medida en italiano que en español. Además, encuentro que la disponibilidad de oraciones pseudorrelativas solo modula la adjunción en italiano.

El Capítulo 7 contiene la discusión general y las conclusiones, teniendo en cuenta los resultados de todos los experimentos y la literatura mencionada anteriormente. En general, en mis estudios, se ve una preferencia y facilitación consistentes para la adjunción alta, tanto en medidas *offline* como *online*. Esta preferencia, en algunos casos, está modulada por la disponibilidad de pseudorrelativas, pero, como ya se ha señalado, esto solo ocurre en italiano. El análisis de los datos combinados de español

e italiano también muestra una modulación parcial basada en la disponibilidad de PRs. En base a esto, afirmo que la modulación encontrada en los datos no brinda apoyo a la Hipótesis de la Pseudorrelativas-Primero, ya que ésta afirma que la disponibilidad de PR *determina* las preferencias de adjunción tanto en italiano como en español. En cambio, sugiero que la disponibilidad de PR es uno de los muchos factores de *modulación* en las preferencias de adjunción y debe tratarse como tal.

En parte, esta considerable preferencia y facilitación para la adjunción alta en entornos solo de oraciones relativas podría deberse a algunas características de los materiales utilizados en mis estudios. Rohde et al. (2011) proporcionaron evidencia de que las preferencias por la adjunción alta aumentan cuando el verbo principal podría desencadenar una interpretación de causalidad implícita. Tomando como ejemplo uno de mis ítems experimentales del Experimento 3: "Alberto envidió al colega del gobernador que salía con mi prima". El uso del verbo "envidiar", siguiendo a Rohde et al. (2011), podría haber sesgado la preferencia de los participantes hacia la adjunción alta, ya que podrían haber leído el ítem como "Albert envidió al colega del gobernador porque salía con mi prima". Otros verbos usados en mis experimentos que podrían haber desencadenado la adjunción alta por la misma razón son "ayudar" y "regañar". Este elemento ha de tenerse en cuenta a la hora de diseñar materiales para experimentos futuros.

Considerando toda la evidencia junta, sostengo que la modulación encontrada en los datos no brinda apoyo a la Hipótesis de la Pseudorrelativas-Primero. Por un lado, la adjunción alta es preferida y facilitada en general, aunque modulada por la disponibilidad de pseudorrelativas (en italiano). Por otro lado, la Hipótesis de la Pseudorrelativas-Primero, como hipótesis categórica, predice que los resultados serían determinados por la disponibilidad de pseudorrelativas (Grillo & Costa, 2014) y, por lo tanto, no se encontraría preferencia por la adjunción alta en contextos donde haya exclusivamente oraciones relativas. Mis datos no respaldan estas afirmaciones categóricas, incluso teniendo en cuenta las advertencias ya mencionadas, ya que encuentro una cantidad ingente de preferencia y facilitación por la adjunción alta, incluso en condiciones donde las pseudorrelativas no son disponibles.

En línea con Alonso-Pascua (2020), pues, sostengo que la Hipótesis de la Pseudorrelativas-Primero ni siquiera está respaldada por los resultados de los trabajos anteriores. La razón es que la hipótesis predice una preferencia casi

completa por la adjunción alta en contextos donde hay PR y en todos los idiomas que admiten PRs; y casi ninguna preferencia o facilitación por oraciones relativas de adjunción alta. Ninguno de los trabajos publicados hasta ahora encontró una ausencia de preferencia por la adjunción alta en oraciones relativas.

Los resultados ofrecidos en esta tesis doctoral, así como la investigación previa, sugieren que la disponibilidad de pseudorrelativas sí juega un papel en las preferencias de adjunción y el procesamiento de estructuras complejas, al menos en algunos idiomas como el italiano, pero no explica la variación general en las preferencias entre idiomas. Asimismo, propongo que no hay necesidad de recurrir a una hipótesis categórica como la Hipótesis de la Pseudorrelativas-Primero, que pretende explicar cómo los hablantes de todos los idiomas procesan las oraciones relativas. De hecho, parece que la hipótesis solo se aplica a un tipo reducido de construcciones y no tiene en cuenta estructuras que permiten, por ejemplo, causalidad implícita u otros factores moduladores, como la animacidad y la longitud de la oración relativa. En resumen, la Hipótesis de la Pseudorrelativas-Primero se aplica a un pequeño grupo de casos y, por lo tanto, no puede generalizarse lo suficiente como para ofrecer la clave para comprender cómo funciona la adjunción de oraciones relativas en las mentes humanas.

En cambio, sostengo que la disponibilidad de PR es uno de los muchos factores de *modulación* de las preferencias de adjunción en algunos idiomas como el italiano, junto con la animacidad, la prosodia, el perfil lingüístico, entre otros. En otras palabras, la disponibilidad de PR *no determina* las preferencias de adjunción, pero podría modularlas hacia la adjunción alta, y, por lo tanto, los futuros trabajos deben tener en cuenta este efecto. Existe evidencia consistente de que la variación en las preferencias de adjunción es un problema multifactorial, que no puede explicarse por medio de un solo factor categórico como la disponibilidad de pseudorrelativas, como afirma la Hipótesis de la Pseudorrelativas-Primero, o la localidad, como afirma Frazier (1979).

En conclusión, en el presente trabajo, he buscado determinar si existe una preferencia de adjunción alta en italiano y español, y comprobar si esta preferencia podría explicarse mediante la Hipótesis de la Pseudorrelativas-Primero. Diseñé cuatro estudios normativos y ocho experimentos, en italiano y español, y utilicé la técnica de lectura autoadministrada para investigar el coste cognitivo de cada estrategia de adjunción, y para testear directamente la Hipótesis de la

Pseudorrelativas-Primero. Mi conclusión final es que la Hipótesis de la Pseudorrelativas-Primero no explica las preferencias de adjunción en ninguno de los dos idiomas. Sin embargo, la disponibilidad de PRs sí juega un papel modulador en la preferencia por la adjunción alta en italiano. Futuros trabajos deberán tener en cuenta este factor, y se necesita más investigación para explicar el o los motivos por los cuales existe una diferencia en las preferencias de adjunción entre idiomas.

Laburpena euskaraz

Frazier-en (1979) eta Cuetos & Mitchell-en (1988) lan aitzindarietatik abiatuta, aurrekari bikoitzak dituzten erlatibozko perpausen ebazpen-estrategien gaia ('NP1 of NP2 that EV' motakoa) sakon aztertu izan da psikolinguistikan. Hala ere, proposatutako hipotesietako batek ere ezin izan du osotasunean azaldu erlatibozko esaldi horiek atxikitzeko lehentasunean aurkitzen dugun aldakortasuna.

2014an, Grillok eta Costak *Pseudorelative-First* (PR-First) izeneko Hipotesia proposatu zuten. Hipotesi horren arabera, pseudoerlatibozko perpausak posible izateak eragiten du hizkuntza batzuetako hiztunek goi-atxikipenaren (edo adjunzioaren) estrategia gogokoagoa izatea, nahiz eta hori (ustez) kognitiboki esfortzu handiena eskatzen duen aukera izan.

Tesi honetan, PR-First Hipotesia eta bi atxikipen estrategien (goi- eta behe-atxikipena) kostu kognitiboa zein den aztertu dut gaztelaniaz eta italieraz, norberak gidatutako irakurketa (*self-paced reading*) metodoa erabiliz.

Emaitzek erakusten dute PR-First Hipotesiak huts egiten duela gaztelaniazko goi-atxikipenaren nahiagotasuna azaltzen. Gainera, italierazko datuetan, atxikipen nahiagotasunaren modulazioa aurkitzen dut eta modulazio hori pseudoerlatibozko perpausei zor zaie. Emaitza horren arrazoia italieraz (gaztelaniarekin alderatuta) egitura horiek duten maiztasun eta onargarritasun handiagoari egotz dakioke.

Laburbilduz, tesi honetan aurkeztutako emaitzek ez dute PR-First Hipotesia babesten. Aitzitik, pseudoerlatibozko perpausen eskuragarritasuna (goi- edo behe-) atxikipena azaltzeko faktore modulatzaileetako bat baino ez dela iradokitzen dute (italieraz, behintzat).

Appendix A: supplementary materials for Norming Studies 1 and 3

Experimental items: Spanish (Norming Study 1)

List	Item	Condition	Stimulus
01	01	NP1-attaching	El hijo cantaba en el coro.
01	02	NP1-attaching	El compañero silbaba como un pastor.
01	03	NP1-attaching	El jefe tosía por el asma.
01	04	NP1-attaching	El niño estudiaba en la biblioteca.
01	05	NP1-attaching	El colega salía con mi prima.
01	06	NP1-attaching	El médico jugaba a fútbol sala.
01	07	NP1-attaching	El niño corría en el parque.
01	08	NP1-attaching	El maestro cocinaba en la cafetería.
01	09	NP1-attaching	El jefe comía en el restaurante.
01	10	NP1-attaching	El secretario conducía un viejo Seiscientos.
01	11	NP1-attaching	El sastre caminaba con unas muletas.
01	12	NP1-attaching	El suegro paseaba por el río.
01	13	NP1-attaching	El hermano robaba chicles del estanco.
01	14	NP1-attaching	El compañero bailaba danzas tradicionales vascas.
01	15	NP1-attaching	El hermano trabajaba con sus colegas.
01	16	NP1-attaching	El primo escribía poemas de amor.
01	17	NP1-attaching	El secretario patinaba con sus hijos.
01	18	NP1-attaching	El nieto fumaba delante del hospital.
01	19	NP1-attaching	El médico acosaba a su colega.
01	20	NP1-attaching	El cuñado nadaba en la piscina.
01	21	NP1-attaching	El hijo enseñaba en una escuela.
02	22	NP1-attaching	El cliente cantaba en el coro.
02	23	NP1-attaching	El abuelo silbaba como un pastor.
02	24	NP1-attaching	El maestro tosía por el asma.
02	25	NP1-attaching	El primo estudiaba en la biblioteca.
02	26	NP1-attaching	El cirujano salía con mi prima.
02	27	NP1-attaching	El tío jugaba a fútbol sala.
02	28	NP1-attaching	El criado corría en el parque.
02	29	NP1-attaching	El suegro cocinaba en la cafetería.
02	30	NP1-attaching	El criado comía en el comedor.
02	31	NP1-attaching	El abuelo conducía un viejo Seiscientos.
02	32	NP1-attaching	El colega caminaba con unas muletas.
02	33	NP1-attaching	El cocinero paseaba por el río.

02	34	NP1-attaching	El vecino robaba chicles del estanco.
02	35	NP1-attaching	El vecino bailaba danzas tradicionales vascas.
02	36	NP1-attaching	El nieto trabajaba con sus colegas.
02	37	NP1-attaching	El cuñado escribía poemas de amor.
02	38	NP1-attaching	El cocinero patinaba con sus hijos.
02	39	NP1-attaching	El sastre fumaba delante del hospital.
02	40	NP1-attaching	El tío acosaba a su colega.
02	41	NP1-attaching	El cliente nadaba en la piscina.
02	42	NP1-attaching	El cirujano enseñaba en una escuela.
03	01	NP2-attaching	El funcionario cantaba en el coro.
03	02	NP2-attaching	El estudiante silbaba como un pastor.
03	03	NP2-attaching	El bombero tosía por el asma.
03	04	NP2-attaching	El cantante estudiaba en la biblioteca.
03	05	NP2-attaching	El gobernador salía con mi prima.
03	06	NP2-attaching	El soldado jugaba a fútbol sala.
03	07	NP2-attaching	El investigador corría en el parque.
03	08	NP2-attaching	El joven cocinaba en la cafetería.
03	09	NP2-attaching	El funcionario comía en el restaurante.
03	10	NP2-attaching	El juez conducía un viejo Seiscientos.
03	11	NP2-attaching	El marqués caminaba con unas muletas.
03	12	NP2-attaching	El chico paseaba por el río.
03	13	NP2-attaching	El estudiante robaba chicles del estanco.
03	14	NP2-attaching	El policía bailaba danzas tradicionales vascas.
03	15	NP2-attaching	El bombero trabajaba con sus colegas.
03	16	NP2-attaching	El cazador escribía poemas de amor.
03	17	NP2-attaching	El director patinaba con sus hijos.
03	18	NP2-attaching	El comerciante fumaba delante del hospital.
03	19	NP2-attaching	El gobernador acosaba a su colega.
03	20	NP2-attaching	El cazador nadaba en la piscina.
03	21	NP2-attaching	El investigador enseñaba en una escuela.
04	22	NP2-attaching	El joven cantaba en el coro.
04	23	NP2-attaching	El camarero silbaba como un pastor.
04	24	NP2-attaching	El chico tosía por el asma.
04	25	NP2-attaching	El camarero estudiaba en la biblioteca.
04	26	NP2-attaching	El ministro salía con mi prima.
04	27	NP2-attaching	El músico jugaba a fútbol sala.
04	28	NP2-attaching	El marqués corría en el parque.
04	29	NP2-attaching	El especialista cocinaba en la cafetería.
04	30	NP2-attaching	El conde comía en el comedor.

04	31	NP2-attaching	El cantante conducía un viejo Seiscientos.
04	32	NP2-attaching	El corredor caminaba con unas muletas.
04	33	NP2-attaching	El conde paseaba por el río.
04	34	NP2-attaching	El corredor robaba chicles del estanco.
04	35	NP2-attaching	El soldado bailaba danzas tradicionales vascas.
04	36	NP2-attaching	El músico trabajaba con sus colegas.
04	37	NP2-attaching	El policía escribía poemas de amor.
04	38	NP2-attaching	El ministro patinaba con sus hijos.
04	39	NP2-attaching	El juez fumaba delante del hospital.
04	40	NP2-attaching	El especialista acosaba a su colega.
04	41	NP2-attaching	El comerciante nadaba en la piscina.
04	42	NP2-attaching	El director enseñaba en una escuela.

Filler items: Spanish (Norming Study 1)

Item	Acceptability	Stimulus
01	Acceptable	Ya van tres días que no puedo dormir.
02	Acceptable	Mi padre va al psicólogo cada semana.
03	Acceptable	La presentadora lleva un vestido verde.
04	Unacceptable	A mi gata las encanta dar paseos.
05	Unacceptable	El novio se maltrata por la madre.
06	Unacceptable	Las guerrilleras fermaron el fuego.
01	Acceptable	Esta es mi habitación.
02	Acceptable	Mi amigo imparte clases de costura.
03	Acceptable	Mi compañero de piso tiene la música alta.
04	Acceptable	Julio quisiera ir al cine.
05	Acceptable	El sábado votaremos para las elecciones.
06	Acceptable	Este trabajo es una muy buena oportunidad.
07	Acceptable	El dueño del piso es un buen hombre.
08	Acceptable	El peluquero hizo una estancia de trabajo en Londres.
09	Acceptable	A todos les gusta el helado.
10	Acceptable	El viudo está muy afligido.
11	Acceptable	La hija sacó el carnet de conducir.
12	Acceptable	La novia toca en un grupo de rock.
13	Acceptable	Marisa está perdidamente enamorada de Emily.
14	Acceptable	La profesora es muy asertiva.
15	Acceptable	Cambiarán el nombre de esta calle.
16	Acceptable	Estoy segura de que llegaremos a un acuerdo.

17	Acceptable	Me gusta mucho hacer papiroflexia.
18	Acceptable	En septiembre empezará la universidad.
19	Acceptable	El año que viene me mudaré a Holanda.
20	Acceptable	He tenido una discusión intensa con mi madre.
21	Acceptable	Mi novio trabaja de enfermero.
01	Unacceptable	El marqueses no amaba a los animales.
02	Unacceptable	Estimo mucho a la entrevistador de Telecinco.
03	Unacceptable	Los jefas de Alvaro eran muy estrictas.
04	Unacceptable	Mi amiga Ángeles no café bebe.
05	Unacceptable	Es muy bonito el abrigo que te has comprada.
06	Unacceptable	Josefa ha empujado que no le hacía caso.
07	Unacceptable	Esther coge una florero.
08	Unacceptable	Vimos a Gonzalo y que siempre se me olvidó.
09	Unacceptable	La fiesta se atrasará hasta el finde pasado.
10	Unacceptable	Sonia tenió un novio de Andalucía.
11	Unacceptable	Está la calle cerrado al paso.
12	Unacceptable	Isabel y yo vivo en el casco viejo.
13	Unacceptable	Dejé los cascos que me compraste en la despacho.
14	Unacceptable	Tomás celebraron su compleaños solo en casa.
15	Unacceptable	A mi gato le gustaba mirar por los ventana.
16	Unacceptable	Viviremos en Estocolmo durante muchos escritorios.
17	Unacceptable	El nene tiene mucha hambra.
18	Unacceptable	El pantalla se rompió ayer a la tarde.
19	Unacceptable	Mi jefa se mosqueó para haber llegado tarde.
20	Unacceptable	La profesoresa me hizo una pregunta.
21	Unacceptable	La baterística suena muy muy bien.
22	Unacceptable	La tennista cantaba el himno.
23	Unacceptable	El barman servía clavos por las mesas.
24	Unacceptable	El perdente se quedó triste tras la competición.
25	Unacceptable	El tendero hizo los saltos por la felicidad.
26	Unacceptable	Trabajiste como masajeador el año pasado.
27	Unacceptable	Hacer ganchillo me distresa.
28	Unacceptable	La pintura pintora.
29	Unacceptable	El luthier construye quitarras todos los días.
30	Unacceptable	La consejera ridiculiza un aire cansado.
31	Unacceptable	Las libres elecsiones son un derecho fundamental.
32	Unacceptable	Acabo de volver de la ferramentería.
33	Unacceptable	Los conciertos de ayer a la noche me despertaran muy tarde.
34	Unacceptable	Estamos viviendo un memento histórico.

35	Unacceptable	Compré dos racimos de ajo.
36	Unacceptable	La administradora está en un largo reunión.
37	Unacceptable	La bebé cayóse del carrusel.
38	Unacceptable	Tienes una manchia de tomate en el jersey.
39	Unacceptable	La homicidia de Kennedy fue un acontecimiento abrumador.
40	Unacceptable	La hija del surtidora estudia en Oxford.
41	Unacceptable	Tengo una amiga muy pardo.
42	Unacceptable	A la señores les gusta viajar por trabajo.

Experimental items: Italian (Norming Study 3)

List	Item	Condition	Stimulus
01	01	High Attachment	Il figlio cantava nel coro parrocchiale.
01	02	High Attachment	Il compagno fischiava come un pastore.
01	03	High Attachment	Il capo tossiva perché era asmatico.
01	04	High Attachment	Il bambino studiava nella biblioteca pubblica.
01	05	High Attachment	Il collega usciva con mia cugina.
01	06	High Attachment	Il medico giocava nella squadra cittadina.
01	07	High Attachment	Il bambino correva nel parco cittadino.
01	08	High Attachment	Il maestro cucinava nella mensa solidale.
01	09	High Attachment	Il capo mangiava al ristorante portoghese.
01	10	High Attachment	Il segretario guidava una vecchia Seicento.
01	11	High Attachment	Il sarto camminava con una stampella.
01	12	High Attachment	Il suocero passeggiava lungo il fiume.
01	13	High Attachment	Il fratello rubava caramelle dal tabaccaio.
01	14	High Attachment	Il compagno ballava danze tipiche tirolesi.
01	15	High Attachment	Il fratello lavorava con i colleghi.
01	16	High Attachment	Il cugino scriveva poesie di Natale.
01	17	High Attachment	Il segretario pattinava con i figli.
01	18	High Attachment	Il nipote fumava nel pronto soccorso.
01	19	High Attachment	Il medico molestava la sua collega.
01	20	High Attachment	Il cognato nuotava nella piscina comunale.
01	21	High Attachment	Il figlio insegnava in una scuola.
02	22	High Attachment	Il cliente cantava nel coro parrocchiale.
02	23	High Attachment	Il nonno fischiava come un pastore.
02	24	High Attachment	Il maestro tossiva perché era asmatico.
02	25	High Attachment	Il cugino studiava nella biblioteca pubblica.
02	26	High Attachment	Il chirurgo usciva con mia cugina.

02	27	High Attachment	Lo zio giocava nella squadra cittadina.
02	28	High Attachment	Il domestico correva nel parco cittadino.
02	29	High Attachment	Il suocero cucinava nella mensa solidale.
02	30	High Attachment	Il domestico mangiava al ristorante portoghese.
02	31	High Attachment	Il nonno guidava una vecchia Seicento.
02	32	High Attachment	Il collega camminava con una stampella.
02	33	High Attachment	Il cuoco passeggiava lungo il fiume.
02	34	High Attachment	Il vicino rubava caramelle dal tabaccaio.
02	35	High Attachment	Il vicino ballava danze tipiche tirolesi.
02	36	High Attachment	Il nipote lavorava con i colleghi.
02	37	High Attachment	Il cognato scriveva poesie di Natale.
02	38	High Attachment	Il cuoco pattinava con i figli.
02	39	High Attachment	Il sarto fumava nel pronto soccorso.
02	40	High Attachment	Lo zio molestava la sua collega.
02	41	High Attachment	Il cliente nuotava nella piscina comunale.
02	42	High Attachment	Il chirurgo insegnava in una scuola.
03	01	Low Attachment	Il funzionario cantava nel coro parrocchiale.
03	02	Low Attachment	Lo studente fischiava come un pastore.
03	03	Low Attachment	Il pompiere tossiva perché era asmatico.
03	04	Low Attachment	Il cantante studiava nella biblioteca pubblica.
03	05	Low Attachment	Il governatore usciva con mia cugina.
03	06	Low Attachment	Il soldato giocava nella squadra cittadina.
03	07	Low Attachment	Il ricercatore correva nel parco cittadino.
03	08	Low Attachment	Il giovane cucinava nella mensa solidale.
03	09	Low Attachment	Il funzionario mangiava al ristorante portoghese.
03	10	Low Attachment	Il giudice guidava una vecchia Seicento.
03	11	Low Attachment	Il marchese camminava con una stampella.
03	12	Low Attachment	Il ragazzo passeggiava lungo il fiume.
03	13	Low Attachment	Lo studente rubava caramelle dal tabaccaio.
03	14	Low Attachment	Il poliziotto ballava danze tipiche tirolesi.
03	15	Low Attachment	Il pompiere lavorava con ii colleghi.
03	16	Low Attachment	Il cacciatore scriveva poesie di Natale.
03	17	Low Attachment	Il direttore pattinava con i figli.
03	18	Low Attachment	Il commerciante fumava nel pronto soccorso.
03	19	Low Attachment	Il governatore molestava la sua collega.
03	20	Low Attachment	Il cacciatore nuotava nella piscina comunale.
03	21	Low Attachment	Il ricercatore insegnava in una scuola.
04	22	Low Attachment	Il giovane cantava nel coro parrocchiale.
04	23	Low Attachment	Il cameriere fischiava come un pastore.

04	24	Low Attachment	Il ragazzo tossiva perché era asmatico.
04	25	Low Attachment	Il cameriere studiava nella biblioteca pubblica.
04	26	Low Attachment	Il ministro usciva con mia cugina.
04	27	Low Attachment	Il musicista giocava nella squadra cittadina.
04	28	Low Attachment	Il marchese correva nel parco cittadino.
04	29	Low Attachment	Lo specialista cucinava nella mensa solidale.
04	30	Low Attachment	Il conte mangiava al ristorante portoghese.
04	31	Low Attachment	Il cantante guidava una vecchia Seicento.
04	32	Low Attachment	Il corridore camminava con una stampella.
04	33	Low Attachment	Il conte passeggiava lungo il fiume.
04	34	Low Attachment	Il corridore rubava caramelle dal tabaccaio.
04	35	Low Attachment	Il soldato ballava danze tipiche tirolesi.
04	36	Low Attachment	Il musicista lavorava con i colleghi.
04	37	Low Attachment	Il poliziotto scriveva poesie di Natale.
04	38	Low Attachment	Il ministro pattinava con i figli.
04	39	Low Attachment	Il giudice fumava nel pronto soccorso.
04	40	Low Attachment	Il specialista molestava la sua collega.
04	41	Low Attachment	Il commerciante nuotava nella piscina comunale.
04	42	Low Attachment	Il direttore insegnava in una scuola.

Filler items: Italian (Norming Study 3)

Item	Acceptability	Stimulus
01	Acceptable	Sono già tre giorni che non riesco a dormire.
02	Acceptable	Mio padre va dallo psicologo tutte le settimane.
03	Acceptable	La presentatrice porta un vestito verde.
04	Unacceptable	Alla mia gatta gli piace passeggiare.
05	Unacceptable	Il fidanzato si maltratta dalla madre.
06	Unacceptable	Le guerrigliere fermentono il fuoco.
01	Acceptable	Questa è la mia stanza.
02	Acceptable	Il mio amico dà lezioni di cucito.
03	Acceptable	Il mio coinquilino tiene la musica alta.
04	Acceptable	Giulio vorrebbe andare al cinema.
05	Acceptable	Sabato voteremo per le elezioni.
06	Acceptable	Questo lavoro è un'ottima opportunità.
07	Acceptable	Il proprietario di casa è una brava persona.
08	Acceptable	Il parrucchiere ha fatto uno stage a Londra.
09	Acceptable	A tutti piace il gelato.

10	Acceptable	Il vedovo è molto affranto.
11	Acceptable	La figlia ha preso la patente.
12	Acceptable	La fidanzata suona in un gruppo rock.
13	Acceptable	Marisa è perdutamente innamorata di Emilia.
14	Acceptable	La professoressa è molto assertiva.
15	Acceptable	Cambieranno il nome della strada.
16	Acceptable	Sono certa che arriveremo a un accordo.
17	Acceptable	Mi piace molto fare gli origami.
18	Acceptable	A settembre comincerà l'università.
19	Acceptable	L'anno prossimo mi trasferirò in Olanda.
20	Acceptable	Ho avuto un'intensa discussione con mia madre.
21	Acceptable	Il mio fidanzato lavora come infermiere.
01	Unacceptable	Il marchesi non amava gli animali.
02	Unacceptable	Apprezzo molto al presentatrice di Canale Cinque.
03	Unacceptable	Le capi di Alvaro erano molto severe.
04	Unacceptable	La mia amica Ginevra non caffè beve.
05	Unacceptable	È molto carino il cappotto che ti hai comprata.
06	Unacceptable	Giuseppina ha spinto che non le dava retta.
07	Unacceptable	Ester prende un fioriera.
08	Unacceptable	Abbiamo visto Matilde e che mi dimentico sempre.
09	Unacceptable	La festa sarà spostata al finesettimana scorso.
10	Unacceptable	Sonia avesse un fidanzato molisano.
11	Unacceptable	La strada è chiuso al traffico.
12	Unacceptable	Io e Isabella vivo nel centro storico.
13	Unacceptable	Sono lasciato le cuffie che mi hai regalato in ufficio.
14	Unacceptable	Ludovica festeggiarono il suo compleanno sola in casa.
15	Unacceptable	Al mio gatto piaceva guardare fuori dagli finestre.
16	Unacceptable	Vivremo a Stoccolma per molti altri banchi.
17	Unacceptable	Il bambino ha molto famo.
18	Unacceptable	La schermo si è rotta ieri sera.
19	Unacceptable	Il mio superiore si è arrabbiato arrivato tardi.
20	Unacceptable	La professora mi ha fatto una domanda.
21	Unacceptable	La batteristica suona davvero bene.
22	Unacceptable	La tenista cantava l'inno nazionale.
23	Unacceptable	Il barista serviva chiodi ai tavoli.
24	Unacceptable	Il perditore restò triste dopo la gara.
25	Unacceptable	Il negoziante ha fatto le salte di gioia.
26	Unacceptable	Lavoresti come massaggiatore lo scorso anno.
27	Unacceptable	Fare l'uncinetto mi distressa.

28	Unacceptable	La pittora pittura.
29	Unacceptable	Il liutaio costruisce ghitarre tutti i giorni.
30	Unacceptable	La consigliera motteggia un'aria stanca.
31	Unacceptable	Le libere elezzioni sono un diritto fondamentale.
32	Unacceptable	Sono appena tornato dal negozio di ferramento.
33	Unacceptable	I concerti di ieri sera mi svegliassero molto tardi.
34	Unacceptable	Stiamo vivendo un memento storico.
35	Unacceptable	Ho comprato due grappoli d'aglio.
36	Unacceptable	L'amministratrice è in un lungo riunione.
37	Unacceptable	La bimba è caduto dalla giostra.
38	Unacceptable	Hai una maccia di pomodoro sulla blusa.
39	Unacceptable	L'omicidia di Kennedy fu un evento sconvolgente.
40	Unacceptable	La figlia del magazziniera studia a Oxford.
41	Unacceptable	Ho una amica molto maldestri.
42	Unacceptable	Alla signore piace viaggiare per lavoro.

Appendix B: supplementary materials for Norming Studies 2 and 4

Experimental items: Spanish (Norming Study 2)

List	Item	Stimulus
1	01	Entreví a David que corría en el parque.
1	02	Cotilleé a Manuel que patinaba con sus amigas.
1	03	Vigilé a Marisa que jugaba a futbol.
1	04	Pillé a Irene que esquiaba por la pista.
1	05	Miré a Borja que caminaba por el río.
1	06	Vislumbré a Inés que lloraba por el duelo.
1	07	Retraté a Paco que fumaba un puro cubano.
1	08	Dibujé a Antonio que jugaba con el cachorro.
1	09	Espié a Javier que fregaba los platos.
1	10	Imaginé a Pablo que entrenaba para la competición.
1	11	Descubrí a Teresa que tocaba el saxophone.
1	12	Oí a Luis que tocaba la guitarra.
1	13	Percibí a Rocío que cantaba mi canción favorita.
1	14	Entreoí a Isabel que tocaba el piano.
2	15	Noté a Carlos que corría en el parque.
2	16	Reconocí a Juan que patinaba con sus amigas.
2	17	Vi a Marta que jugaba a futbol.
2	18	Estudié a Rosa que esquiaba por la pista.
2	19	Soñé con Paola que caminaba por el río.
2	20	Observé a Javier que lloraba por el duelo.
2	21	Delineé a Pedro que fumaba un puro cubano.
2	22	Atisbé a Marisol que jugaba con el cachorro.
2	23	Contemplé a Marisol que fregaba los platos.
2	24	Fotografié a Isabel que entrenaba para la competición.
2	25	Sorprendí a Alberto que tocaba el saxophone.
2	26	Sentí a María que tocaba la guitarra.
2	27	Escuché a Sergio que cantaba mi canción favorita.
2	28	Grabé a Beatriz que tocaba el piano.

Filler items: Spanish (Norming Study 2)

Item	Acceptability	Stimulus

Train	Acceptable	Tengo el ordenador roto.
Train	Acceptable	El chico del gorro está muy guapo.
Train	Acceptable	Tengo un gato muy torpe.
Train	Unacceptable	El pingüínos es un animal muy elegante.
Train	Unacceptable	El año pasado leí unas libros de Bernardo Atxaga.
Train	Unacceptable	Nuestra pelicula feverita es Siete Apellidos Vascos.
01	Acceptable	Nunca he estado en Alemania.
02	Acceptable	Lorena le escribió una carta al concejal.
03	Acceptable	He comido con Gregorio al mediodía.
04	Acceptable	Mi hermano trabaja de modelo.
05	Acceptable	José Luis es muy gracioso.
06	Acceptable	Conocemos a ese señor que lleva sandalias.
07	Acceptable	César se lastimó un tobillo.
08	Acceptable	No traje bombones para ti.
09	Acceptable	Felipe lloraba como un crío.
10	Acceptable	Ismael es un chico muy majo de Zaragoza.
11	Acceptable	El verano pasado estuve en Cáceres.
12	Acceptable	Dile a Ignacio que tiene los cordones sueltos.
13	Acceptable	No soporto a Hector y a su novia.
14	Acceptable	Me contaron que su abuela se había muerto.
15	Acceptable	Samuel no tiene la culpa.
16	Acceptable	Espero que te lo pases bien de vacaciones.
17	Acceptable	Ése es el profesor que viene al gimnasio conmigo.
18	Acceptable	Fidel Castro fue un presidente cubano.
19	Acceptable	Falleció ayer el niño que tenía leucemia.
20	Acceptable	Los sindicatos convocaron una huelga.
21	Acceptable	El periodista publicó un libro muy interesante.
01	Unacceptable	Picasso ha pintó este cuadro.
02	Unacceptable	He avisaba a Paco.
03	Unacceptable	Nuestro perro amabas los calcetines.
04	Unacceptable	El alcalde peatonalizó al vecino.
05	Unacceptable	La modista creí a Begoña que paseaba.
06	Unacceptable	Vivo con el chica que bostezaba.
07	Unacceptable	El jovencito amistaba a sus pantalones.
08	Unacceptable	El zapato no me cabo.
09	Unacceptable	El ordenador agobiamos al hermano.
10	Unacceptable	Cotejé a Asunción.
11	Unacceptable	El señorito jadeó al cotilleo.
12	Unacceptable	La peluquera no gustaba su perro.

13	Unacceptable	El alienigena corro y se tumbó en el suelo.
14	Unacceptable	La gata se zampé todos los bollos.
15	Unacceptable	Avisé a la vecina que no corbata gris.
16	Unacceptable	La secretaria de Rafael han muerto.
17	Unacceptable	El paleontólogo quedaba a la enfermera que saltaba.
18	Unacceptable	La chica del colegio ha estada enferma.
19	Unacceptable	Soy licenciata en derecho.
20	Unacceptable	La arquitecta pensaba a sus hijos.
21	Unacceptable	Yo ayer se fueron al gimnasio.

Experimental items: Italian (Norming Study 4)

List	Item	Stimulus
1	1	Ho adocchiato Giulia che correva nel parco.
1	2	Ho avvistato Laura che pattinava con le amiche.
1	3	Ho beccato Marco che giocava a calcio.
1	4	Ho osservato Francesca che sciava sulla pista nera.
1	5	Ho visto Giuseppe che camminava lungo il fiume.
1	6	Ho guardato Paolo che piangeva per il lutto.
1	7	Ho individuato Alessandro che fumava un sigaro cubano.
1	8	Ho immaginato Angela che giocava con il cucciolo.
1	9	Ho intravisto Michela che lavava i piatti.
1	10	Ho fotografato Cristian che si allenava per la gara.
1	11	Ho notato Bruno che suonava il sassofono.
1	12	Ho ritratto Sergio che suonava la chitarra.
1	13	Ho udito Luca che cantava una vecchia canzone.
1	14	Ho registrato Beatrice che suonava il pianoforte.
2	15	Ho scoperto Giovanni che correva nel parco.
2	16	Ho scrutato Michela che pattinava con le amiche.
2	17	Ho rivisto Matteo che giocava a calcio.
2	18	Ho sognato Paola che sciava sulla pista nera.
2	19	Ho riconosciuto Luisa che camminava lungo il fiume.
2	20	Ho contemplato Giulio che piangeva per il lutto
2	21	Ho fissato Angelo che fumava un sigaro cubano.
2	22	Ho disegnato Cristian che giocava con il cucciolo.
2	23	Ho sorpreso Andrea che lavava i piatti.
2	24	Ho spiato Francesca che si allenava per la gara.
2	25	Ho squadrato Giulio che suonava il sassofono.

2	26	Ho ascoltato Giacomo che suonava la chitarra.
2	27	Ho origliato Roberta che cantava una vecchia canzone.
2	28	Ho sentito Maria che suonava il pianoforte.

Filler items: Italian (Norming Study 4)

Item	Acceptability	Stimulus
Train	Acceptable	Ho il computer rotto.
Train	Acceptable	Il ragazzo col cappello è molto bello.
Train	Acceptable	Ho un gatto molto maldestro.
Train	Unacceptable	Il pinguino è un animale molto elegante.
Train	Unacceptable	L'anno scorso ho letto delle libri di Luigi Pirandello.
Train	Unacceptable	Il nostro film prefarito è La meglio gioventù.
01	Acceptable	Non sono mai stato in Germania.
02	Acceptable	Lorena ha scritto una lettera al consigliere.
03	Acceptable	Ho pranzato con Gregorio a mezzogiorno.
04	Acceptable	Mio fratello lavora come modello.
05	Acceptable	Gianluigi è molto divertente.
06	Acceptable	Conosciamo quel signore che porta i sandali.
07	Acceptable	Alex si è fatto male alla caviglia.
08	Acceptable	Non ti ho portato delle caramelle.
09	Acceptable	Riccardo piangeva come un bimbo.
10	Acceptable	Adam è un ragazzo romano molto simpatico.
11	Acceptable	L'estate scorsa sono stato a Venezia.
12	Acceptable	Di' a Ignazio che ha le scarpe slacciate.
13	Acceptable	Non sopporto Ettore e la sua ragazza.
14	Acceptable	Mi hanno raccontato che sua nonna è morta.
15	Acceptable	Non è colpa di Samuele.
16	Acceptable	Spero che ti diverta in vacanza.
17	Acceptable	Quello è il professore che viene in palestra con me.
18	Acceptable	Fidel Castro è stato un presidente cubano.
19	Acceptable	È morto ieri il bambino che aveva la leucemia.
20	Acceptable	I sindacati hanno convocato uno sciopero.
21	Acceptable	Il giornalista ha pubblicato un libro molto interessante
01	Unacceptable	Picasso ha dipinse questo quadro.
02	Unacceptable	Ho avvisavo Paco.
03	Unacceptable	Il nostro cane adoravi i calzini.
04	Unacceptable	Il sindaco ha pedonalizzato il vicino.

05	Unacceptable	La sarta credetti a Aurora che passeggiava.
06	Unacceptable	Vivo con il ragazza che sbadigliava.
07	Unacceptable	Il ragazzino faceva amicizia con i suoi pantaloni.
08	Unacceptable	La scarpa non mi entrasse.
09	Unacceptable	Il computer infastidiamo il fratello.
10	Unacceptable	Ho collazionato Nicolas.
11	Unacceptable	Il signorino alitò il gossip.
12	Unacceptable	La parrucchiera non piaceva il cane.
13	Unacceptable	L'alieno corro e si sdraiò a terra.
14	Unacceptable	La gatta si sono mangiata tutti i cornetti.
15	Unacceptable	Ho avvisato la vicina che non cravatta grigia.
16	Unacceptable	La segretaria di Raffaele sono morti.
17	Unacceptable	Il paleontologo rimaneva l'infermiera che saltava.
18	Unacceptable	La ragazza del liceo è stato malata.
19	Unacceptable	Siamo laureata in legge.
20	Unacceptable	L'architetta pensava nei suoi figli.
21	Unacceptable	Io ieri andarono in palestra.

Appendix C: supplementary materials for Experiments 1 and 3

Experimental items: Spanish (Experiment 1)

Item	Matrix verb	Attachment	Stimulus
01	Perceptual	Low	María escuchó al hijo de los funcionarios que cantaban en el coro.
01	Perceptual	High	María escuchó a los hijos del funcionario que cantaban en el coro.
01	Non-perceptual	Low	María entrenó al hijo de los funcionarios que cantaban en el coro.
01	Non-perceptual	High	María entrenó a los hijos del funcionario que cantaban en el coro.
02	Perceptual	Low	Teresa miró al jefe de los bomberos que tosían por el asma.
02	Perceptual	High	Teresa miró a los jefes del bombero que tosían por el asma.
02	Non-perceptual	Low	Teresa esperó al jefe de los bomberos que tosían por el asma.
02	Non-perceptual	High	Teresa esperó a los jefes del bombero que tosían por el asma.
03	Perceptual	Low	Luis contempló al niño de los cantantes que estudiaban en la biblioteca.
03	Perceptual	High	Luis contempló a los niños del cantante que estudiaban en la biblioteca.
03	Non-perceptual	Low	Luis ayudó al niño de los cantantes que estudiaban en la biblioteca.
03	Non-perceptual	High	Luis ayudó a los niños del cantante que estudiaban en la biblioteca.
04	Perceptual	Low	Alberto atisbó al colega de los gobernadores que salían con mi prima.
04	Perceptual	High	Alberto atisbó a los colegas del gobernador que salían con mi prima.
04	Non-perceptual	Low	Alberto envidió al colega de los gobernadores que salían con mi prima.
04	Non-perceptual	High	Alberto envidió a los colegas del gobernador que salían con mi prima.

05	Perceptual	Low	Amparo fotografió al médico de los soldados que jugaban a fútbol sala.
05	Perceptual	High	Amparo fotografió a los médicos del soldado que jugaban a fútbol sala.
05	Non-perceptual	Low	Amparo señaló al médico de los soldados que jugaban a fútbol sala.
05	Non-perceptual	High	Amparo señaló a los médicos del soldado que jugaban a fútbol sala.
06	Perceptual	Low	Sergio reconoció al niño de los investigadores que corrían en el parque.
06	Perceptual	High	Sergio reconoció a los niños del investigador que corrían en el parque.
06	Non-perceptual	Low	Sergio regañó al niño de los investigadores que corrían en el parque.
06	Non-perceptual	High	Sergio regañó a los niños del investigador que corrían en el parque.
07	Perceptual	Low	Rocío vio al maestro de los jóvenes que cocinaban en la cafetería.
07	Perceptual	High	Rocío vio a los maestros del joven que cocinaban en la cafetería.
07	Non-perceptual	Low	Rocío llamó al maestro de los jóvenes que cocinaban en la cafetería.
07	Non-perceptual	High	Rocío llamó a los maestros del joven que cocinaban en la cafetería.
08	Perceptual	Low	Beatriz observó al jefe de los funcionarios que comían en el restaurante.
08	Perceptual	High	Beatriz observó a los jefes del funcionario que comían en el restaurante.
08	Non-perceptual	Low	Beatriz abrazó al jefe de los funcionarios que comían en el restaurante.
08	Non-perceptual	High	Beatriz abrazó a los jefes del funcionario que comían en el restaurante.
09	Perceptual	Low	Marta grabó al secretario de los jueces que conducían unos viejos Seiscientos.
09	Perceptual	High	Marta grabó a los secretarios del juez que conducían unos viejos Seiscientos.
09	Non-perceptual	Low	Marta dejó al secretario de los jueces que conducían unos viejos Seiscientos.

09	Non-perceptual	High	Marta dejó a los secretarios del juez que conducían unos viejos Seiscientos.
10	Perceptual	Low	Pilar vigiló al sastre de los marqueses que caminaban con unas muletas.
10	Perceptual	High	Pilar vigiló a los sastres del marqués que caminaban con unas muletas.
10	Non-perceptual	Low	Pilar visitó al sastre de los marqueses que caminaban con unas muletas.
10	Non-perceptual	High	Pilar visitó a los sastres del marqués que caminaban con unas muletas.
11	Perceptual	Low	Juan escuchó al compañero de los estudiantes que silbaban como un pastor.
11	Perceptual	High	Juan escuchó a los compañeros del estudiante que silbaban como un pastor.
11	Non-perceptual	Low	Juan entrenó al compañero de los estudiantes que silbaban como un pastor.
11	Non-perceptual	High	Juan entrenó a los compañeros del estudiante que silbaban como un pastor.
12	Perceptual	Low	José miró al suegro de los chicos que paseaban por el río.
12	Perceptual	High	José miró a los suegros del chico que paseaban por el río.
12	Non-perceptual	Low	José esperó al suegro de los chicos que paseaban por el río.
12	Non-perceptual	High	José esperó a los suegros del chico que paseaban por el río.
13	Perceptual	Low	Borja contempló al hermano de los estudiantes que robaban chicles del estanco.
13	Perceptual	High	Borja contempló a los hermanos del estudiante que robaban chicles del estanco.
13	Non-perceptual	Low	Borja ayudó al hermano de los estudiantes que robaban chicles del estanco.
13	Non-perceptual	High	Borja ayudó a los hermanos del estudiante que robaban chicles del estanco.
14	Perceptual	Low	Irene atisbó al compañero de los policías que bailaban danzas tradicionales vascas.
14	Perceptual	High	Irene atisbó a los compañeros del policía que bailaban danzas tradicionales vascas.

14	Non-perceptual	Low	Irene envidió al compañero de los policías que bailaban danzas tradicionales vascas.
14	Non-perceptual	High	Irene envidió a los compañeros del policía que bailaban danzas tradicionales vascas.
15	Perceptual	Low	Javier fotografió al primo de los cazadores que escribían poemas de amor.
15	Perceptual	High	Javier fotografió a los primos del cazador que escribían poemas de amor.
15	Non-perceptual	Low	Javier señaló al primo de los cazadores que escribían poemas de amor.
15	Non-perceptual	High	Javier señaló a los primos del cazador que escribían poemas de amor.
16	Perceptual	Low	David reconoció al secretario de los directores que patinaban con sus hijos.
16	Perceptual	High	David reconoció a los secretarios del director que patinaban con sus hijos.
16	Non-perceptual	Low	David regañó al secretario de los directores que patinaban con sus hijos.
16	Non-perceptual	High	David regañó a los secretarios del director que patinaban con sus hijos.
17	Perceptual	Low	Carmen vio al nieto de los comerciantes que fumaban delante del hospital.
17	Perceptual	High	Carmen vio a los nietos del comerciante que fumaban delante del hospital.
17	Non-perceptual	Low	Carmen llamó al nieto de los comerciantes que fumaban delante del hospital.
17	Non-perceptual	High	Carmen llamó a los nietos del comerciante que fumaban delante del hospital.
18	Perceptual	Low	Marisol observó al médico de los gobernadores que acosaban a su colega.
18	Perceptual	High	Marisol observó a los médicos del gobernador que acosaban a su colega.
18	Non-perceptual	Low	Marisol abrazó al médico de los gobernadores que acosaban a su colega.
18	Non-perceptual	High	Marisol abrazó a los médicos del gobernador que acosaban a su colega.
19	Perceptual	Low	Marijo grabó al cuñado de los cazadores que nadaban en la piscina.

19	Perceptual	High	Marijo grabó a los cuñados del cazador que nadaban en la piscina.
19	Non-perceptual	Low	Marijo dejó al cuñado de los cazadores que nadaban en la piscina.
19	Non-perceptual	High	Marijo dejó a los cuñados del cazador que nadaban en la piscina.
20	Perceptual	Low	Ana vigiló al hijo de los investigadores que enseñaban en una escuela.
20	Perceptual	High	Ana vigiló a los hijos del investigador que enseñaban en una escuela.
20	Non-perceptual	Low	Ana visitó al hijo de los investigadores que enseñaban en una escuela.
20	Non-perceptual	High	Ana visitó a los hijos del investigador que enseñaban en una escuela.
21	Perceptual	Low	Isabel escuchó al cliente de los jóvenes que cantaban en el coro.
21	Perceptual	High	Isabel escuchó a los clientes del joven que cantaban en el coro.
21	Non-perceptual	Low	Isabel entrenó al cliente de los jóvenes que cantaban en el coro.
21	Non-perceptual	High	Isabel entrenó a los clientes del joven que cantaban en el coro.
22	Perceptual	Low	Antonio miró al maestro de los chicos que tosían por el asma.
22	Perceptual	High	Antonio miró a los maestros del chico que tosían por el asma.
22	Non-perceptual	Low	Antonio esperó al maestro de los chicos que tosían por el asma.
22	Non-perceptual	High	Antonio esperó a los maestros del chico que tosían por el asma.
23	Perceptual	Low	Paco contempló al primo de los camareros que estudiaban en la biblioteca.
23	Perceptual	High	Paco contempló a los primos del camarero que estudiaban en la biblioteca.
23	Non-perceptual	Low	Paco ayudó al primo de los camareros que estudiaban en la biblioteca.
23	Non-perceptual	High	Paco ayudó a los primos del camarero que estudiaban en la biblioteca.

24	Perceptual	Low	Pablo atisbó al cirujano de los ministros que salían con mi prima.
24	Perceptual	High	Pablo atisbó a los cirujanos del ministro que salían con mi prima.
24	Non-perceptual	Low	Pablo envidió al cirujano de los ministros que salían con mi prima.
24	Non-perceptual	High	Pablo envidió a los cirujanos del ministro que salían con mi prima.
25	Perceptual	Low	Pedro fotografió al tío de los músicos que jugaban a fútbol sala.
25	Perceptual	High	Pedro fotografió a los tíos del músico que jugaban a fútbol sala.
25	Non-perceptual	Low	Pedro señaló al tío de los músicos que jugaban a fútbol sala.
25	Non-perceptual	High	Pedro señaló a los tíos del músico que jugaban a fútbol sala.
26	Perceptual	Low	Carlos reconoció al criado de los marqueses que corrían en el parque.
26	Perceptual	High	Carlos reconoció a los criados del marqués que corrían en el parque.
26	Non-perceptual	Low	Carlos regañó al criado de los marqueses que corrían en el parque.
26	Non-perceptual	High	Carlos regañó a los criados del marqués que corrían en el parque.
27	Perceptual	Low	Jesús vio al suegro de los especialistas que cocinaban en la cafetería.
27	Perceptual	High	Jesús vio a los suegros del especialista que cocinaban en la cafetería.
27	Non-perceptual	Low	Jesús llamó al suegro de los especialistas que cocinaban en la cafetería.
27	Non-perceptual	High	Jesús llamó a los suegros del especialista que cocinaban en la cafetería.
28	Perceptual	Low	Rafael observó al criado de los condes que comían en el comedor.
28	Perceptual	High	Rafael observó a los criados del conde que comían en el comedor.
28	Non-perceptual	Low	Rafael abrazó al criado de los condes que comían en el comedor.

28	Non-perceptual	High	Rafael abrazó a los criados del conde que comían en el comedor.
29	Perceptual	Low	Miguel grabó al abuelo de los cantantes que conducían unos viejos Seiscientos.
29	Perceptual	High	Miguel grabó a los abuelos del cantante que conducían unos viejos Seiscientos.
29	Non-perceptual	Low	Miguel dejó al abuelo de los cantantes que conducían unos viejos Seiscientos.
29	Non-perceptual	High	Miguel dejó a los abuelos del cantante que conducían unos viejos Seiscientos.
30	Perceptual	Low	Elena vigiló al colega de los corredores que caminaban con unas muletas.
30	Perceptual	High	Elena vigiló a los colegas del corredor que caminaban con unas muletas.
30	Non-perceptual	Low	Elena visitó al colega de los corredores que caminaban con unas muletas.
30	Non-perceptual	High	Elena visitó a los colegas del corredor que caminaban con unas muletas.
31	Perceptual	Low	Manuel escuchó al abuelo de los camareros que silbaban como un pastor.
31	Perceptual	High	Manuel escuchó a los abuelos del camarero que silbaban como un pastor.
31	Non-perceptual	Low	Manuel entrenó al abuelo de los camareros que silbaban como un pastor.
31	Non-perceptual	High	Manuel entrenó a los abuelos del camarero que silbaban como un pastor.
32	Perceptual	Low	Nuria miró al cocinero de los condes que paseaban por el río.
32	Perceptual	High	Nuria miró a los cocineros del conde que paseaban por el río.
32	Non-perceptual	Low	Nuria esperó al cocinero de los condes que paseaban por el río.
32	Non-perceptual	High	Nuria esperó a los cocineros del conde que paseaban por el río.
33	Perceptual	Low	Josefa contempló al vecino de los corredores que robaban chicles del estanco.
33	Perceptual	High	Josefa contempló a los vecinos del corredor que robaban chicles del estanco.

33	Non-perceptual	Low	Josefa ayudó al vecino de los corredores que robaban chicles del estanco.
33	Non-perceptual	High	Josefa ayudó a los vecinos del corredor que robaban chicles del estanco.
34	Perceptual	Low	Cristina atisbó al vecino de los soldados que bailaban danzas tradicionales vascas.
34	Perceptual	High	Cristina atisbó a los vecinos del soldado que bailaban danzas tradicionales vascas.
34	Non-perceptual	Low	Cristina envidió al vecino de los soldados que bailaban danzas tradicionales vascas.
34	Non-perceptual	High	Cristina envidió a los vecinos del soldado que bailaban danzas tradicionales vascas.
35	Perceptual	Low	Ángeles fotografió al nieto de los músicos que trabajaban con sus colegas.
35	Perceptual	High	Ángeles fotografió a los primos del músico que trabajaban con sus colegas.
35	Non-perceptual	Low	Ángeles señaló al nieto de los músicos que trabajaban con sus colegas.
35	Non-perceptual	High	Ángeles señaló a los primos del músico que trabajaban con sus colegas.
36	Perceptual	Low	Laura reconoció al cuñado de los policías que escribían poemas de amor.
36	Perceptual	High	Laura reconoció a los cuñados del policía que escribían poemas de amor.
36	Non-perceptual	Low	Laura regañó al cuñado de los policías que escribían poemas de amor.
36	Non-perceptual	High	Laura regañó a los cuñados del policía que escribían poemas de amor.
37	Perceptual	Low	Sofía vio al cocinero de los ministros que patinaban con sus hijos.
37	Perceptual	High	Sofía vio a los cocineros del ministro que patinaban con sus hijos.
37	Non-perceptual	Low	Sofía llamó al cocinero de los ministros que patinaban con sus hijos.
37	Non-perceptual	High	Sofía llamó a los cocineros del ministro que patinaban con sus hijos.
38	Perceptual	Low	Julia observó al sastre de los jueces que fumaban delante del hospital.

38	Perceptual	High	Julia observó a los sastres del juez que fumaban delante del hospital.
38	Non-perceptual	Low	Julia abrazó al sastre de los jueces que fumaban delante del hospital.
38	Non-perceptual	High	Julia abrazó a los sastres del juez que fumaban delante del hospital.
39	Perceptual	Low	Lara grabó al cliente de los comerciantes que nadaban en la piscina.
39	Perceptual	High	Lara grabó a los clientes del comerciante que nadaban en la piscina.
39	Non-perceptual	Low	Lara dejó al cliente de los comerciantes que nadaban en la piscina.
39	Non-perceptual	High	Lara dejó a los clientes del comerciante que nadaban en la piscina.
40	Perceptual	Low	Francisco vigiló al cirujano de los directores que enseñaban en una escuela.
40	Perceptual	High	Francisco vigiló a los cirujanos del director que enseñaban en una escuela.
40	Non-perceptual	Low	Francisco visitó al cirujano de los directores que enseñaban en una escuela.
40	Non-perceptual	High	Francisco visitó a los cirujanos del director que enseñaban en una escuela.

Filler items: Spanish (Experiment 1)

Item	**Stimulus**
Train	Su sobrina estudia en la Universidad del País Vasco para ser ingeniera mecánica.
Train	Victoria siempre exige mucho a sus empleados porque está al mando de una empresa importante.
Train	Al grupo de jóvenes escritores estadounidenses de los años sesenta se les conoce como Beat Generation.
Train	La música jazz parece caótica pero en realidad tiene un complejo sistema de reglas armónicas.
Train	Sherlock Holmes es el renombradísimo investigador en los libros de Arthur Conan Doyle.
Train	No hay gatos a los que no les guste el contacto humano de vez en cuando.
01	Mi amiga Minori se llama así porque su familia es de Japón.
02	La música que más me gusta es el rock pero también me gusta Joaquín Sabina.
03	Francisco conoció a su novia actual gracias a Tinder.

04 Parece que han encontrado el cadáver de un hombre en los lagos de Covadonga.
05 Al periodista le faltaba el aliento porque acababa de llegar.
06 Los padres de Fátima se separaron cuando era niña.
07 El servicio de atención al cliente me dejó en espera durante un montón de tiempo.
08 El asesor de ventas de la sucursal de Toledo fue extremadamente grosero.
09 Llamo al número de apoyo técnico porque creo que la impresora se ha atascado.
10 El primer novio de mi amiga Nuria era muy irritante y soberbio.
11 Tiago es nuestro compañero portugués que se ocupa de investigación genética.
12 A día de hoy muchos chicos deciden depilarse las piernas por razones estéticas.
13 El caricaturista de ese periódico decidió dejar el puesto para dedicarse a su familia.
14 El lutier de Laura Pausini le construyó una guitarra preciosa.
15 Pedro Almodóvar fue compañero de colegio de mi padre.
16 Desde hace algunos años estudio japonés porque me gustaría ir a vivir a Kyoto.
17 Gemma tiene una relación a distancia con una universitaria de Estocolmo.
18 Pepe soñó que el año que viene Donald Trump ganará un premio Nobel.
19 Admiro muchísimo la belleza delicada de Agustín.
20 El accidente tuvo lugar en un estrecho camino del Teide.
21 Me he enterado de que la madre del restaurador se mudó a Huesca.
22 Damián persiguió al detective privado porque sospechaba de él.
23 Mi mejor amiga se ha enamorado de un becario mucho más jóven que ella.
24 Marcos nunca se pone la mascarilla por encima de la nariz.
25 Yolanda trabaja en nuestra oficina y no podríamos prescindir de ella.
26 La boda de Adrián fue realmente hermosa y conmovedora.
27 A nuestros hijos les gusta muchísimo el dibujo animado de Pixar Monstruos S.A.
28 La noticia de la hospitalización de Javier Ortega Smith se divulgó inmediatamente.
29 El barco pirata abordó el galeón español sin ninguna dificultad.
30 Muchas personas creen que la tierra es plana en vez de esférica.
31 Los huevos que Rubén compró en el mercado estaban medio podridos.
32 Después de la cena brindamos alegremente con un vaso de pacharán cada uno.
33 Es incuestionable que el hermano del bombero se haya ofendido por tus palabras.
34 El tío de Aida me contó que sufres pesadillas recurrentes.
35 Espero que hayas acudido a un especialista para que investigue este gran dolor de estómago.
36 La chica a la que molestaron el mes pasado denunció a su agresor.

37 Julián estudió inglés durante muchos años en una academia de idiomas y ahora ha obtenido una certificación.
38 Mi padre se ha cambiado de compañía telefónica hace poco y ahora está muy satisfecho con el servicio.
39 A mi gata le gusta muchísimo esconderse debajo de las mantas y fingir que está durmiendo.
40 La ponente de la conferencia de ayer también es mi profesora de física aplicada.
41 Viví durante muchos años en La Rioja porque quería trabajar de catador.
42 Dile a Juanjo que llene la botella de agua que está vacía.
43 El microondas que nos regaló mi suegra es un modelo nuevo.
44 Fuimos en coche a la boda de mis amigos y llovió durante todo el camino.
45 Este verano el aspersor automático se ha roto y se me han muerto todas las plantas.
46 Todos deberíamos llevar siempre desinfectante para cualquier eventualidad.
47 Justo cuando empezaba a llover se me ha roto el paraguas rojo.
48 Los compañeros de clase de Pelayo le han gastado una broma muy cruel.
49 La caza de brujas duró mucho más de un siglo en los Estados Unidos.
50 El viaje a Cuba fue muy estresante porque el avión era muy pequeño.
51 El presidente del consejo tropezó y se cayó durante la visita oficial en Francia.
52 Bebo mucho café porque por la mañana siempre estoy demasiado somnolienta para trabajar.
53 El nutricionista de Dolores le ha prohibido comer pasta a la hora de cenar.
54 Sufrimos muchísimo los cambios de temperatura en esta ciudad.
55 Sería genial vivir en un mundo sin religiones y sin odio.
56 Los Beatles cantaban canciones muy juveniles que hablaban sobre todo de amor.
57 El diccionario de la Real Academia Española está muy bien planteado.
58 Mi pareja es una brillante escritora de novelas policíacas.
59 Los trenes a Vitoria arrancan desde la estación de San Sebastián con una frecuencia de dos trenes por hora.
60 No envidia para nada la mala suerte de quien es alérgico al chocolate.
61 El auge del fascismo en los países europeos fue precedido por el descontento público.
62 Por fin me han llamado para esa entrevista de trabajo en el ayuntamiento.
63 Leo muchos libros pero últimamente prefiero escuchar audiolibros.
64 Nunca he visto la serie de televisión de la que me estás hablando.
65 El año pasado Tomás estuvo en una preciosa exposición de Hiroshige en Cuenca.
66 Noelia va hasta su oficina andando porque le gusta mucho pasear por el centro de Barcelona.

67 El acceso a internet que facilita la universidad siempre da algún problema de navegación.
68 Detrás de ese edificio grande y marrón está el quiosco del barrio.
69 Arturo Pérez-Reverte presentó ayer su libro en la biblioteca de Cartagena.
70 La discusión con tu novio se escuchaba incluso desde la cocina.
71 Escribí mi trabajo de fin de grado con muchísima antelación porque en julio quería irme de vacaciones.
72 La máquina que tenemos en la oficina es vieja y hace un café pésimo.
73 Los pandas están en peligro de extinción porque no pueden reproducirse en los zoos.
74 Montse quiere adoptar un pato porque su sueño es ser agricultora y granjera.
75 El traductor de Haruki Murakami ha publicado un estupendo ensayo sobre cultura japonesa.
76 El frutero de la calle Mayor estará cerrado todo el mes de Julio por vacaciones.
77 La directora preparó una buena intervención para la inauguración del año escolar.
78 Los premios Nobel de este año se los dieron a varias científicas renombradas.
79 El chico peruano que contrataron para la fiesta tiene una voz realmente bonita.
80 No conocía las novelas de la escritora galardonada el mes pasado.
81 Raúl cenó con la mujer del obrero que habían arrestado por fraude.
82 Ignacio está muy contento con la au pair porque cuida muy bien de sus hijos.
83 En las semanas de la cosecha muchos granjeros y pocos ganaderos encuentran empleo estacional.
84 Iker es animador turístico y trabaja junto a su novia que es socorrista.
85 Las amantes de esos gerentes muy distinguidos compraron el regalo de despedida.
86 Trabajé de profesor de inglés para una clase de vendedores de coches de lujo.
87 Jaime trabajó en el festival de música y conoció a muchos promotores pero sólo a un manager.
88 El patrocinador del premio literario dio un discurso conmovedor.
89 Fue el benefactor de los vagabundos el que se presentó a esa cena.
90 Manolo bebió un cóctel delicioso preparado por el asistente de sus anfitriones en Florencia.
91 La canguro de la sobrina del mecenas tiene unos ojos azules que son preciosos.
92 El monitor que había sonreído a la modista competía con su grupo de atletas.
93 Los arquitectos junto al cartero que vive al lado del colegio se quejaron de la administración municipal.
94 El escultor al que los pintores habían halagado sufrió un accidente de coche.
95 Esos autónomos antes trabajaban de artesanos del rey.

96 El albañil les reprochó a sus mecánicos de confianza un error en las facturas.
97 Me gusta mucho el logo del diseñador del bufete de abogados de mi pareja.
98 El doctorando les pidió consejo a esos científicos renombrados y ellos le ayudaron.
99 Los psicólogos no suelen tener chófer porque no tienen un sueldo estable.
100 En aquella tienda trabajan varios masajistas y un peluquero muy famoso.
101 Un señor extranjero le pidió dinero mientras los limpiaparabrisas del semáforo descansaban.
102 Los socorristas de la playa de Marbella suelen salir de fiesta con el barman de ese hotel.
103 Los granjeros se aliaron con el agricultor porque era muy amigo del alcalde.
104 El entrenador del equipo de atletas federados les mandó comprar las camisetas diseñadas por él.
105 Conozco al cartero de mi pueblo pero no conozco a su mujer.
106 Los parientes de la doctoranda le siguen preguntando qué hará de mayor y ella no sabe qué responder.
107 El dueño del estanco maltrató a sus dependientes que habían dejado escapar al ladrón.
108 Por fin el becario aprendió a ponerse la mascarilla adecuadamente gracias a la ayuda de su enamorada.
109 Óscar se percató de que los familiares del biólogo le estaban tomando el pelo.
110 Los esgrimistas se enfadaron mucho con los técnicos del ayuntamiento por su incompetencia.
111 Andrés se percató de que el esgrimista les hacía muecas a las mujeres que pasaban por la calle.
112 Josema ama a la madre de los dos actores mellizos que fueron galardonados el año pasado.
113 El astrólogo estima al astrónomo pero el astrónomo odia a todos los astrólogos.
114 El fiscal de Almería tiene una relación clandestina con una abogada casada con tres hijos.
115 Los dentistas le alquilan un despacho al fisioterapeuta porque andan justos de dinero.
116 El ahijado del fotógrafo que trabajó en mi boda es un chaval muy tímido y correcto.
117 Los padrinos de la boda le pidieron al pescadero que no viniera.
118 El torero presumido les escupió a los repartidores de pizzas mientras le pasaban al lado.
119 El mago de Disneylandia obtuvo el apoyo de los payasos y montó un sindicato.

120 La madre de Alejandro se casó con un cirujano aun teniendo a muchos otros pretendientes.

Experimental items: Italian (Experiment 3)

Item	Matrix verb	Attachment	Stimulus
01	Perceptual	Low	Maria ha sentito il figlio dei funzionari che cantavano nel coro parrocchiale.
01	Perceptual	High	Maria ha sentito i figli del funzionario che cantavano nel coro parrocchiale.
01	Non-perceptual	Low	Maria ha allenato il figlio dei funzionari che cantavano nel coro parrocchiale.
01	Non-perceptual	High	Maria ha allenato i figli del funzionario che cantavano nel coro parrocchiale.
02	Perceptual	Low	Giovanni ha visto il capo dei pompieri che tossivano perché erano asmatici.
02	Perceptual	High	Giovanni ha visto i capi del pompiere che tossivano perché erano asmatici.
02	Non-perceptual	Low	Giovanni ha aspettato il capo dei pompieri che tossivano perché erano asmatici.
02	Non-perceptual	High	Giovanni ha aspettato i capi del pompiere che tossivano perché erano asmatici.
03	Perceptual	Low	Luca ha beccato il bambino dei cantanti che studiavano nella biblioteca pubblica
03	Perceptual	High	Luca ha beccato i bambini del cantante che studiavano nella biblioteca pubblica
03	Non-perceptual	Low	Luca ha aiutato il bambino dei cantanti che studiavano nella biblioteca pubblica
03	Non-perceptual	High	Luca ha aiutato i bambini del cantante che studiavano nella biblioteca pubblica
04	Perceptual	Low	Andrea ha sorpreso il collega dei governatori che uscivano con mia cugina.
04	Perceptual	High	Andrea ha sorpreso i colleghi del governatore che uscivano con mia cugina.
04	Non-perceptual	Low	Andrea ha invidiato il collega dei governatori che uscivano con mia cugina.
04	Non-perceptual	High	Andrea ha invidiato i colleghi del governatore che uscivano con mia cugina.
05	Perceptual	Low	Elisa ha registrato il medico dei soldati che giocavano nella squadra cittadina.

05	Perceptual	High	Elisa ha registrato i medici del soldato che giocavano nella squadra cittadina.
05	Non-perceptual	Low	Elisa ha indicato il medico dei soldati che giocavano nella squadra cittadina.
05	Non-perceptual	High	Elisa ha indicato i medici del soldato che giocavano nella squadra cittadina.
06	Perceptual	Low	Giacomo ha disegnato il bambino dei ricercatori che correvano nel parco cittadino.
06	Perceptual	High	Giacomo ha disegnato i bambini del ricercatore che correvano nel parco cittadino.
06	Non-perceptual	Low	Giacomo ha rimproverato il bambino dei ricercatori che correvano nel parco cittadino.
06	Non-perceptual	High	Giacomo ha rimproverato i bambini del ricercatore che correvano nel parco cittadino.
07	Perceptual	Low	Rosa ha immaginato il maestro dei giovani che cucinavano nella mensa solidale.
07	Perceptual	High	Rosa ha immaginato i maestri del giovane che cucinavano nella mensa solidale.
07	Non-perceptual	Low	Rosa ha chiamato il maestro dei giovani che cucinavano nella mensa solidale.
07	Non-perceptual	High	Rosa ha chiamato i maestri del giovane che cucinavano nella mensa solidale.
08	Perceptual	Low	Beatrice ha riconosciuto il capo dei funzionari che mangiavano al ristorante portoghese.
08	Perceptual	High	Beatrice ha riconosciuto i capi del funzionario che mangiavano al ristorante portoghese.
08	Non-perceptual	Low	Beatrice ha abbracciato il capo dei funzionari che mangiavano al ristorante portoghese.
08	Non-perceptual	High	Beatrice ha abbracciato i capi del funzionario che mangiavano al ristorante portoghese.

09[7]	Perceptual	Low	Giuseppe ha fotografato il segretario dei giudici che guidavano delle vecchie Seicento.
09	Perceptual	High	Giuseppe ha fotografato i segretari del giudice che guidavano delle vecchie Seicento.
09	Non-perceptual	Low	Giuseppe ha lasciato il segretario dei giudici che guidavano delle vecchie Seicento.
09	Non-perceptual	High	Giuseppe ha lasciato i segretari del giudice che guidavano delle vecchie Seicento.
10	Perceptual	Low	Alberto ha sognato il sarto dei marchesi che camminavano con le stampelle.
10	Perceptual	High	Alberto ha sognato i sarti del marchese che camminavano con le stampelle.
10	Non-perceptual	Low	Alberto ha visitato il sarto dei marchesi che camminavano con le stampelle.
10	Non-perceptual	High	Alberto ha visitato i sarti del marchese che camminavano con le stampelle.
11	Perceptual	Low	Luisa ha sentito il compagno degli studenti che fischiavano come un pastore.
11	Perceptual	High	Luisa ha sentito i compagni dello studente che fischiavano come un pastore.
11	Non-perceptual	Low	Luisa ha allenato il compagno degli studenti che fischiavano come un pastore.
11	Non-perceptual	High	Luisa ha allenato i compagni dello studente che fischiavano come un pastore.
12	Perceptual	Low	Patrizia ha visto il suocero dei ragazzi che passeggiavano lungo il fiume.
12	Perceptual	High	Patrizia ha visto i suoceri del ragazzo che passeggiavano lungo il fiume.
12	Non-perceptual	Low	Patrizia ha aspettato il suocero dei ragazzi che passeggiavano lungo il fiume.
12	Non-perceptual	High	Patrizia ha aspettato i suoceri del ragazzo che passeggiavano lungo il fiume.
13	Perceptual	Low	Marta ha beccato il fratello degli studenti che rubavano caramelle dal tabaccaio.
13	Perceptual	High	Marta ha beccato i fratelli dello studente che rubavano caramelle dal tabaccaio.

[7] Item 9 was discarded from the analyses because of a typo in its presentation.

13	Non-perceptual	Low	Marta ha aiutato il fratello degli studenti che rubavano caramelle dal tabaccaio.
13	Non-perceptual	High	Marta ha aiutato i fratelli dello studente che rubavano caramelle dal tabaccaio.
14	Perceptual	Low	Marco ha sorpreso il compagno dei poliziotti che ballavano danze tipiche tirolesi.
14	Perceptual	High	Marco ha sorpreso i compagni del poliziotto che ballavano danze tipiche tirolesi.
14	Non-perceptual	Low	Marco ha invidiato il compagno dei poliziotti che ballavano danze tipiche tirolesi.
14	Non-perceptual	High	Marco ha invidiato i compagni del poliziotto che ballavano danze tipiche tirolesi.
15	Perceptual	Low	Francesca ha registrato il cugino dei cacciatori che scrivevano poesie di Natale.
15	Perceptual	High	Francesca ha registrato i cugini del cacciatore che scrivevano poesie di Natale.
15	Non-perceptual	Low	Francesca ha indicato il cugino dei cacciatori che scrivevano poesie di Natale.
15	Non-perceptual	High	Francesca ha indicato i cugini del cacciatore che scrivevano poesie di Natale.
16	Perceptual	Low	Bruno ha disegnato il segretario dei direttori che pattinavano con i figli.
16	Perceptual	High	Bruno ha disegnato i segretari del direttore che pattinavano con i figli.
16	Non-perceptual	Low	Bruno ha rimproverato il segretario dei direttori che pattinavano con i figli.
16	Non-perceptual	High	Bruno ha rimproverato i segretari del direttore che pattinavano con i figli.
17	Perceptual	Low	Alessandro ha immaginato il nipote dei commercianti che fumavano nel pronto soccorso.
17	Perceptual	High	Alessandro ha immaginato i nipoti del commerciante che fumavano nel pronto soccorso.
17	Non-perceptual	Low	Alessandro ha chiamato il nipote dei commercianti che fumavano nel pronto soccorso.

17	Non-perceptual	High	Alessandro ha chiamato i nipoti del commerciante che fumavano nel pronto soccorso.
18	Perceptual	Low	Giulio ha riconosciuto il medico dei governatori che molestavano la sua collega.
18	Perceptual	High	Giulio ha riconosciuto i medici del governatore che molestavano la sua collega.
18	Non-perceptual	Low	Giulio ha abbracciato il medico dei governatori che molestavano la sua collega.
18	Non-perceptual	High	Giulio ha abbracciato i medici del governatore che molestavano la sua collega.
19	Perceptual	Low	Giulia ha fotografato il cognato dei cacciatori che nuotavano nella piscina comunale.
19	Perceptual	High	Giulia ha fotografato i cognati del cacciatore che nuotavano nella piscina comunale.
19	Non-perceptual	Low	Giulia ha lasciato il cognato dei cacciatori che nuotavano nella piscina comunale.
19	Non-perceptual	High	Giulia ha lasciato i cognati del cacciatore che nuotavano nella piscina comunale.
20	Perceptual	Low	Laura ha sognato il figlio dei ricercatori che insegnavano in una scuola.
20	Perceptual	High	Laura ha sognato i figli del ricercatore che insegnavano in una scuola.
20	Non-perceptual	Low	Laura ha visitato il figlio dei ricercatori che insegnavano in una scuola.
20	Non-perceptual	High	Laura ha visitato i figli del ricercatore che insegnavano in una scuola.
21	Perceptual	Low	Cristian ha sentito il cliente dei giovani che cantavano nel coro parrocchiale.
21	Perceptual	High	Cristian ha sentito i clienti del giovane che cantavano nel coro parrocchiale.
21	Non-perceptual	Low	Cristian ha allenato il cliente dei giovani che cantavano nel coro parrocchiale.
21	Non-perceptual	High	Cristian ha allenato i clienti del giovane che cantavano nel coro parrocchiale.
22	Perceptual	Low	Angela ha visto il maestro dei ragazzi che tossivano perché erano asmatici.

22	Perceptual	High	Angela ha visto i maestri del ragazzo che tossivano perché erano asmatici.
22	Non-perceptual	Low	Angela ha aspettato il maestro dei ragazzi che tossivano perché erano asmatici.
22	Non-perceptual	High	Angela ha aspettato i maestri del ragazzo che tossivano perché erano asmatici.
23	Perceptual	Low	Angelo ha beccato il cugino dei camerieri che studiavano nella biblioteca pubblica
23	Perceptual	High	Angelo ha beccato i cugini del cameriere che studiavano nella biblioteca pubblica
23	Non-perceptual	Low	Angelo ha aiutato il cugino dei camerieri che studiavano nella biblioteca pubblica
23	Non-perceptual	High	Angelo ha aiutato i cugini del cameriere che studiavano nella biblioteca pubblica
24	Perceptual	Low	Roberta ha sorpreso il chirurgo dei ministri che uscivano con mia cugina.
24	Perceptual	High	Roberta ha sorpreso i chirurghi del ministro che uscivano con mia cugina.
24	Non-perceptual	Low	Roberta ha invidiato il chirurgo dei ministri che uscivano con mia cugina.
24	Non-perceptual	High	Roberta ha invidiato i chirurghi del ministro che uscivano con mia cugina.
25	Perceptual	Low	Roberto ha registrato lo zio dei musicisti che giocavano nella squadra cittadina.
25	Perceptual	High	Roberto ha registrato gli zii del musicista che giocavano nella squadra cittadina.
25	Non-perceptual	Low	Roberto ha indicato lo zio dei musicisti che giocavano nella squadra cittadina.
25	Non-perceptual	High	Roberto ha indicato gli zii del musicista che giocavano nella squadra cittadina.
26	Perceptual	Low	Davide ha disegnato il domestico dei marchesi che correvano nel parco cittadino.
26	Perceptual	High	Davide ha disegnato i domestici del marchese che correvano nel parco cittadino.
26	Non-perceptual	Low	Davide ha rimproverato il domestico dei marchesi che correvano nel parco cittadino.
26	Non-perceptual	High	Davide ha rimproverato i domestici del marchese che correvano nel parco cittadino.

27	Perceptual	Low	Riccardo ha immaginato il suocero degli specialisti che cucinavano nella mensa solidale.
27	Perceptual	High	Riccardo ha immaginato i suoceri dello specialista che cucinavano nella mensa solidale.
27	Non-perceptual	Low	Riccardo ha chiamato il suocero degli specialisti che cucinavano nella mensa solidale.
27	Non-perceptual	High	Riccardo ha chiamato i suoceri dello specialista che cucinavano nella mensa solidale.
28	Perceptual	Low	Cesare ha riconosciuto il domestico dei conti che mangiavano al ristorante portoghese.
28	Perceptual	High	Cesare ha riconosciuto i domestici del conte che mangiavano al ristorante portoghese.
28	Non-perceptual	Low	Cesare ha abbracciato il domestico dei conti che mangiavano al ristorante portoghese.
28	Non-perceptual	High	Cesare ha abbracciato i domestici del conte che mangiavano al ristorante portoghese.
29	Perceptual	Low	Mario ha fotografato il nonno dei cantanti che guidavano delle vecchie Seicento.
29	Perceptual	High	Mario ha fotografato i nonni del cantante che guidavano delle vecchie Seicento.
29	Non-perceptual	Low	Mario ha lasciato il nonno dei cantanti che guidavano delle vecchie Seicento.
29	Non-perceptual	High	Mario ha lasciato i nonni del cantante che guidavano delle vecchie Seicento.
30	Perceptual	Low	Luigi ha sognato il collega dei corridori che camminavano con le stampelle.
30	Perceptual	High	Luigi ha sognato i colleghi del corridore che camminavano con le stampelle.
30	Non-perceptual	Low	Luigi ha visitato il collega dei corridori che camminavano con le stampelle.
30	Non-perceptual	High	Luigi ha visitato i colleghi del corridore che camminavano con le stampelle.
31	Perceptual	Low	Sergio ha sentito il nonno dei camerieri che fischiavano come un pastore.

31	Perceptual	High	Sergio ha sentito i nonni del cameriere che fischiavano come un pastore.
31	Non-perceptual	Low	Sergio ha allenato il nonno dei camerieri che fischiavano come un pastore.
31	Non-perceptual	High	Sergio ha allenato i nonni del cameriere che fischiavano come un pastore.
32	Perceptual	Low	Grazia ha visto il cuoco dei conti che passeggiavano lungo il fiume.
32	Perceptual	High	Grazia ha visto i cuochi del conte che passeggiavano lungo il fiume.
32	Non-perceptual	Low	Grazia ha aspettato il cuoco dei conti che passeggiavano lungo il fiume.
32	Non-perceptual	High	Grazia ha aspettato i cuochi del conte che passeggiavano lungo il fiume.
33	Perceptual	Low	Michela ha beccato il vicino dei corridori che rubavano caramelle dal tabaccaio.
33	Perceptual	High	Michela ha beccato i vicini del corridore che rubavano caramelle dal tabaccaio.
33	Non-perceptual	Low	Michela ha aiutato il vicino dei corridori che rubavano caramelle dal tabaccaio.
33	Non-perceptual	High	Michela ha aiutato i vicini del corridore che rubavano caramelle dal tabaccaio.
34	Perceptual	Low	Matteo ha sorpreso il vicino dei soldati che ballavano danze tipiche tirolesi.
34	Perceptual	High	Matteo ha sorpreso i vicini del soldato che ballavano danze tipiche tirolesi.
34	Non-perceptual	Low	Matteo ha invidiato il vicino dei soldati che ballavano danze tipiche tirolesi.
34	Non-perceptual	High	Matteo ha invidiato i vicini del soldato che ballavano danze tipiche tirolesi.
35	Perceptual	Low	Alessio ha registrato il nipote dei musicisti che lavoravano con i colleghi.
35	Perceptual	High	Alessio ha registrato i nipoti del musicista che lavoravano con i colleghi.
35	Non-perceptual	Low	Alessio ha indicato il nipote dei musicisti che lavoravano con i colleghi.
35	Non-perceptual	High	Alessio ha indicato i nipoti del musicista che lavoravano con i colleghi.

36	Perceptual	Low	Mariagrazia ha disegnato il cognato dei poliziotti che scrivevano poesie di Natale.
36	Perceptual	High	Mariagrazia ha disegnato i cognati del poliziotto che scrivevano poesie di Natale.
36	Non-perceptual	Low	Mariagrazia ha rimproverato il cognato dei poliziotti che scrivevano poesie di Natale.
36	Non-perceptual	High	Mariagrazia ha rimproverato i cognati del poliziotto che scrivevano poesie di Natale.
37	Perceptual	Low	Lara ha immaginato il cuoco dei ministri che pattinavano con i figli.
37	Perceptual	High	Lara ha immaginato i cuochi del ministro che pattinavano con i figli.
37	Non-perceptual	Low	Lara ha chiamato il cuoco dei ministri che pattinavano con i figli.
37	Non-perceptual	High	Lara ha chiamato i cuochi del ministro che pattinavano con i figli.
38	Perceptual	Low	Emilia ha riconosciuto il sarto dei giudici che fumavano nel pronto soccorso.
38	Perceptual	High	Emilia ha riconosciuto i sarti del giudice che fumavano nel pronto soccorso.
38	Non-perceptual	Low	Emilia ha abbracciato il sarto dei giudici che fumavano nel pronto soccorso.
38	Non-perceptual	High	Emilia ha abbracciato i sarti del giudice che fumavano nel pronto soccorso.
39	Perceptual	Low	Enzo ha fotografato il cliente dei commercianti che nuotavano nella piscina comunale.
39	Perceptual	High	Enzo ha fotografato i clienti del commerciante che nuotavano nella piscina comunale.
39	Non-perceptual	Low	Enzo ha lasciato il cliente dei commercianti che nuotavano nella piscina comunale.
39	Non-perceptual	High	Enzo ha lasciato i clienti del commerciante che nuotavano nella piscina comunale.
40	Perceptual	Low	Donatella ha sognato il chirurgo dei direttori che insegnavano in una scuola.
40	Perceptual	High	Donatella ha sognato i chirurghi del direttore che insegnavano in una scuola.

40	Non-perceptual	Low	Donatella ha visitato il chirurgo dei direttori che insegnavano in una scuola.
40	Non-perceptual	High	Donatella ha visitato i chirurghi del direttore che insegnavano in una scuola.

Filler items: Italian (Experiment 3)

Train	Sua nipote studia all'università di Venezia per diventare ingegnere meccanico.
Train	Diletta pretende sempre molto dai suoi dipendenti perché è a capo di una ditta importante.
Train	Il gruppo di giovani scrittori statunitensi degli anni sessanta è conosciuto come Beat Generation.
Train	La musica jazz sembra caotica ma in realtà ha un complesso sistema di regole armoniche.
Train	Sherlock Holmes è il notissimo investigatore dei libri di Arthur Conan Doyle.
Train	Non ci sono gatti a cui non piaccia il contatto umano una volta ogni tanto.
01	La mia amica Minori si chiama così perché la sua famiglia è giapponese.
02	La mia musica preferita è il rock ma mi piace anche Fabrizio De André.
03	Francesco ha conosciuto la sua attuale ragazza grazie a Tinder.
04	Pare che abbiano trovato il cadavere di un uomo nel lago di Bolsena.
05	Il giornalista aveva il fiato corto perché era appena arrivato.
06	I genitori di Benedetta si sono separati quando era bambina.
07	Il servizio di attenzione al cliente mi ha lasciato in attesa per un sacco di tempo.
08	Il consulente commerciale della filiale di Milano è stato estremamente sgarbato.
09	Chiamo il numero del supporto tecnico perché credo che la stampante si sia inceppata.
10	Il primo fidanzato della mia amica Doralice era molto irritante e superbo.
11	Tiago è il nostro collega portoghese che si occupa di ricerca genetica.
12	Oggigiorno molti ragazzi decidono di depilarsi le gambe per motivi estetici.
13	Il vignettista di quel giornale ha deciso di lasciare l'incarico per dedicarsi alla sua famiglia.
14	Il liutaio di Laura Pausini le ha costruito una bellissima chitarra.
15	Ennio Morricone è stato un compagno di liceo di mio papà.
16	Da qualche anno studio giapponese perché vorrei andare a vivere a Kyoto.
17	Gemma ha una relazione a distanza con una universitaria di Stoccolma.
18	Nicola ha sognato che l'anno prossimo Donald Trump vincerà un premio Nobel.
19	Ammiro tantissimo la bellezza delicata di Tiziano.
20	L'incidente ebbe luogo su una stretta stradina del Gran Sasso.

21 Ho saputo che la mamma del restauratore si è trasferita ad Anzio.
22 Damiano ha seguito l'investigatore privato che sospettava di lui.
23 La mia migliore amica si è innamorata di uno stagista molto più giovane di lei.
24 Mattia non mette mai la mascherina fin sopra il naso.
25 Iolanda lavora nel nostro ufficio e non potremmo fare a meno di lei.
26 Il matrimonio di Adriano è stato davvero bello e commovente.
27 Ai nostri figli piace moltissimo il cartone della Pixar Monsters and Co.
28 La notizia del ricovero di Silvio Berlusconi è stata divulgata immediatamente.
29 La nave pirata abbordò il galeone spagnolo senza alcuna difficoltà.
30 Molte persone credono che la terra sia piatta invece che sferica.
31 Le uova che Vittorio ha comprato al mercato erano mezze marce.
32 Dopo la cena brindammo allegramente con un bicchiere di nocino a testa.
33 È indubbio che il fratello del pompiere sia rimasto offeso dalle tue parole.
34 Lo zio di Carmela mi ha raccontato che soffre di incubi ricorrenti.
35 Spero tu sia stato da uno specialista per farti controllare questo brutto mal di pancia.
36 La ragazza che è stata molestata lo scorso mese ha denunciato il suo aggressore.
37 Aldo ha studiato inglese per tanti anni in una scuola di lingue e ora ha ottenuto un diploma.
38 Mio papà ha cambiato gestore telefonico da poco e ora è molto soddisfatto del servizio.
39 Alla mia gatta piace moltissimo nascondersi sotto le coperte e fare finta di dormire.
40 La relatrice della conferenza di ieri è anche la mia professoressa di fisica applicata.
41 Ho vissuto per molti anni in Toscana perché volevo lavorare come sommelier.
42 Di' a Gianpiero di riempire la bottiglia d'acqua che è vuota.
43 Il microonde che ci ha regalato mia suocera è un nuovo modello.
44 Siamo andati in macchina al matrimonio dei miei amici e ha piovuto durante tutto il tragitto.
45 Quest'estate l'irrigatore automatico si è rotto e mi sono morte tutte le piante.
46 Dovremmo tutti portare del disinfettante appresso per ogni evenienza.
47 Proprio mentre cominciava a piovere mi si è rotto l'ombrello rosso.
48 I compagni di classe di Brando gli hanno fatto uno scherzo molto crudele.
49 La caccia alle streghe durò più di un secolo negli Stati Uniti.
50 Il viaggio per Cuba è stato molto stressante perché l'aereo era molto piccolo.
51 Il Presidente del Consiglio inciampò e cadde durante la visita ufficiale in Francia.
52 Bevo molto caffè perché la mattina sono sempre troppo assonnata per lavorare.
53 Il nutrizionista di Immacolata le ha proibito di mangiare pasta all'ora di cena.

54 Soffriamo moltissimo gli sbalzi di temperatura in questa città.
55 Sarebbe bellissimo vivere in un mondo senza religioni e senza odio.
56 I Beatles cantavano canzoni molto giovanili che parlavano soprattutto di amore.
57 Il dizionario dell'Accademia della Crusca è molto ben ponderato.
58 La mia compagna è una brillante scrittrice di romanzi gialli.
59 I treni per Como partono dalla stazione di Crema con una frequenza di due treni all'ora.
60 Lui non invidia per niente la sfortuna di chi è allergico al cioccolato.
61 L'ascesa del fascismo nei paesi europei è stata preceduta dal malcontento popolare.
62 Mi hanno finalmente chiamato per quella intervista di lavoro al Comune.
63 Leggo molti libri ma ultimamente preferisco ascoltare degli audiolibri.
64 Non ho mai visto la serie tv di cui mi stai parlando.
65 Lo scorso anno Tommaso è stato a una bellissima mostra su Hiroshige a Bologna.
66 Eletta va fino al suo ufficio a piedi perché le piace molto camminare per il centro di Roma.
67 La connessione internet che fornisce l'università dà sempre qualche problema di navigazione.
68 Oltre quell'edificio grande e marrone trovi l'edicola di quartiere.
69 Stefano Benni ha presentato ieri il suo libro nella biblioteca di Casalecchio.
70 La discussione con il tuo fidanzato si sentiva persino dalla cucina.
71 Ho scritto la mia tesi di laurea con larghissimo anticipo perché a luglio volevo andare in vacanza.
72 La macchinetta che abbiamo in ufficio è vecchia e fa un pessimo caffè.
73 I panda sono in via d'estinzione perché non riescono a riprodursi negli zoo.
74 Marisa vuole adottare una papera perché il suo sogno è diventare agricoltrice e allevatrice.
75 Il traduttore di Haruki Murakami ha pubblicato uno splendido saggio sulla cultura giapponese.
76 Il fruttivendolo di via Nazionale chiuderà tutto il mese di luglio per ferie.
77 La preside ha preparato un bel discorso per l'inaugurazione dell'anno scolastico.
78 I premi Nobel di quest'anno sono stati dati a diverse scienziate rinomate.
79 Il ragazzo peruviano che è stato ingaggiato per la festa ha davvero una bella voce.
80 Non conoscevo i romanzi della scrittrice premiata lo scorso mese.
81 Raul ha cenato con la moglie dell'operaio che avevano arrestato per frode.
82 Ignazio è molto soddisfatto della colf perché si occupa molto bene dei suoi figli.

83 Nelle settimane del raccolto molti agricoltori e pochi allevatori trovano un impiego stagionale.
84 Agostino è animatore turistico e lavora insieme alla fidanzata che è bagnina.
85 Le amanti di quei capiufficio molto distinti hanno comprato il regalo di pensionamento.
86 Ho lavorato come professore di inglese per una classe di venditori di macchine di lusso.
87 Alfonso ha lavorato nel festival di musica e ha conosciuto molti promoter ma solo un manager.
88 Il patrocinatore del premio letterario fece un discorso commovente.
89 È stato il benefattore dei senzatetto quello che si è presentato a quella cena.
90 Manolo bevve un cocktail delizioso preparato dall'assistente dei suoi anfitrioni a Firenze.
91 La baby-sitter della nipote del mecenate ha degli occhi azzurri che sono bellissimi.
92 L'istruttore che aveva sorriso alla stilista gareggiava con la sua squadra di atleti.
93 Gli architetti insieme al postino che vive accanto alla scuola si lamentarono dell'amministrazione comunale.
94 Lo scultore che i pittori avevano lodato subì un incidente d'auto.
95 Quei freelance prima lavoravano come artigiani del re.
96 Il muratore sgridò i suoi meccanici di fiducia per un errore nelle fatture.
97 Mi piace molto il logo del designer della ditta di avvocati della mia partner.
98 Il dottorando chiese consiglio a quegli scienziati rinomati e loro lo aiutarono.
99 Gli psicologi di solito non hanno un autista perché non hanno uno stipendio stabile.
100 In quel negozio lavorano vari massaggiatori e un parrucchiere molto famoso.
101 Un signore straniero gli chiese dei soldi mentre i lavavetri del semaforo si riposavano.
102 I bagnini della spiaggia di Talamone di solito escono la sera con il barman di quell'hotel.
103 I contadini si sono alleati con l'agricoltore perché era molto amico del sindaco.
104 L'allenatore della squadra di atleti federati li obbligò a comprare le magliette create da lui.
105 Conosco il postino del mio paese ma non conosco sua moglie.
106 I parenti della dottoranda continuano a chiederle cosa farà da grande e lei non sa cosa rispondere.
107 Il proprietario della tabaccheria maltrattò i suoi dipendenti che avevano lasciato scappare il ladro.

108 Finalmente lo stagista ha imparato a mettersi bene la mascherina grazie all'aiuto della sua innamorata.
109 Oscar si è reso conto del fatto che i familiari del biologo lo stavano prendendo in giro.
110 Gli schermidori si sono arrabbiati molto con i tecnici del comune per la loro incompetenza.
111 Agata si rese conto che lo spadaccino faceva le boccacce alle donne che passavano per strada.
112 Alex ama la madre dei due attori gemelli che vennero premiati l'anno scorso.
113 L'astrologo stima l'astronomo ma l'astronomo odia tutti gli astrologi.
114 Il procuratore di Ancona ha una relazione clandestina con un'avvocatessa sposata e con tre figli.
115 I dentisti affittano un ufficio al fisioterapista perché sono a corto di soldi.
116 Il figlioccio del fotografo che lavorò al mio matrimonio è un ragazzo molto timido e corretto.
117 I testimoni del matrimonio hanno chiesto al pescivendolo di non andare.
118 Il torero presuntuoso sputò ai fattorini delle pizze mentre gli passavano accanto.
119 Il mago di Disneyland ha ottenuto l'appoggio dei pagliacci e ha organizzato un sindacato.
120 La madre di Benedetto si è sposata con un chirurgo nonostante avesse molti altri pretendenti.

Appendix D: supplementary materials for Experiments 2 and 4

Note: Filler items for Experiments 2 and 4 are the same as in Experiments 1 and 3.

Experimental items: Spanish (Experiment 2)

Item	Matrix verb	Stimulus
01	Perceptual	María escuchó al hijo del funcionario que cantaba en el coro.
01	Non-perceptual	María entrenó al hijo del funcionario que cantaba en el coro.
02	Perceptual	Teresa miró al jefe del bombero que tosía por el asma.
02	Non-perceptual	Teresa esperó al jefe del bombero que tosía por el asma.
03	Perceptual	Luis contempló al niño del cantante que estudiaba en la biblioteca.
03	Non-perceptual	Luis ayudó al niño del cantante que estudiaba en la biblioteca.
04	Perceptual	Alberto atisbó al colega del gobernador que salía con mi prima.
04	Non-perceptual	Alberto envidió al colega del gobernador que salía con mi prima.
05	Perceptual	Amparo fotografió al médico del soldado que jugaba a fútbol sala.
05	Non-perceptual	Amparo señaló al médico del soldado que jugaba a fútbol sala.
06	Perceptual	Sergio reconoció al niño del investigador que corría en el parque.
06	Non-perceptual	Sergio regañó al niño del investigador que corría en el parque.
07	Perceptual	Rocío vio al maestro del joven que cocinaba en la cafetería.
07	Non-perceptual	Rocío llamó al maestro del joven que cocinaba en la cafetería.
08	Perceptual	Beatriz observó al jefe del funcionario que comía en el restaurante.
08	Non-perceptual	Beatriz abrazó al jefe del funcionario que comía en el restaurante.
09	Perceptual	Marta grabó al secretario del juez que conducía un viejo Seiscientos.

09	Non-perceptual	Marta dejó al secretario del juez que conducía un viejo Seiscientos.
10	Perceptual	Pilar vigiló al sastre del marqués que caminaba con unas muletas.
10	Non-perceptual	Pilar visitó al sastre del marqués que caminaba con unas muletas.
11	Perceptual	Juan escuchó al compañero del estudiante que silbaba como un pastor.
11	Non-perceptual	Juan entrenó al compañero del estudiante que silbaba como un pastor.
12	Perceptual	José miró al suegro del chico que paseaba por el río.
12	Non-perceptual	José esperó al suegro del chico que paseaba por el río.
13	Perceptual	Borja contempló al hermano del estudiante que robaba chicles del estanco.
13	Non-perceptual	Borja ayudó al hermano del estudiante que robaba chicles del estanco.
14	Perceptual	Irene atisbó al compañero del policía que bailaba danzas tradicionales vascas.
14	Non-perceptual	Irene envidió al compañero del policía que bailaba danzas tradicionales vascas.
15	Perceptual	Javier fotografió al primo del cazador que escribía poemas de amor.
15	Non-perceptual	Javier señaló al primo del cazador que escribía poemas de amor.
16	Perceptual	David reconoció al secretario del director que patinaba con sus hijos.
16	Non-perceptual	David regañó al secretario del director que patinaba con sus hijos.
17	Perceptual	Carmen vio al nieto del comerciante que fumaba delante del hospital.
17	Non-perceptual	Carmen llamó al nieto del comerciante que fumaba delante del hospital.
18	Perceptual	Marisol observó al médico del gobernador que acosaba a su colega.
18	Non-perceptual	Marisol abrazó al médico del gobernador que acosaba a su colega.
19	Perceptual	Marijo grabó al cuñado del cazador que nadaba en la piscina.
19	Non-perceptual	Marijo dejó al cuñado del cazador que nadaba en la piscina.

20	Perceptual	Ana vigiló al hijo del investigador que enseñaba en una escuela.
20	Non-perceptual	Ana visitó al hijo del investigador que enseñaba en una escuela.
21	Perceptual	Isabel escuchó al cliente del joven que cantaba en el coro.
21	Non-perceptual	Isabel entrenó al cliente del joven que cantaba en el coro.
22	Perceptual	Antonio miró al maestro del chico que tosía por el asma.
22	Non-perceptual	Antonio esperó al maestro del chico que tosía por el asma.
23	Perceptual	Paco contempló al primo del camarero que estudiaba en la biblioteca.
23	Non-perceptual	Paco ayudó al primo del camarero que estudiaba en la biblioteca.
24	Perceptual	Pablo atisbó al cirujano del ministro que salía con mi prima.
24	Non-perceptual	Pablo envidió al cirujano del ministro que salía con mi prima.
25	Perceptual	Pedro fotografió al tío del músico que jugaba a fútbol sala.
25	Non-perceptual	Pedro señaló al tío del músico que jugaba a fútbol sala.
26	Perceptual	Carlos reconoció al criado del marqués que corría en el parque.
26	Non-perceptual	Carlos regañó al criado del marqués que corría en el parque.
27	Perceptual	Jesús vio al suegro del especialista que cocinaba en la cafetería.
27	Non-perceptual	Jesús llamó al suegro del especialista que cocinaba en la cafetería.
28	Perceptual	Rafael observó al criado del conde que comía en el comedor.
28	Non-perceptual	Rafael abrazó al criado del conde que comía en el comedor.
29	Perceptual	Miguel grabó al abuelo del cantante que conducía un viejo Seiscientos.
29	Non-perceptual	Miguel dejó al abuelo del cantante que conducía un viejo Seiscientos.
30	Perceptual	Elena vigiló al colega del corredor que caminaba con unas muletas.
30	Non-perceptual	Elena visitó al colega del corredor que caminaba con unas muletas.
31	Perceptual	Manuel escuchó al abuelo del camarero que silbaba como un pastor.
31	Non-perceptual	Manuel entrenó al abuelo del camarero que silbaba como un pastor.

32	Perceptual	Nuria miró al cocinero del conde que paseaba por el río.
32	Non-perceptual	Nuria esperó al cocinero del conde que paseaba por el río.
33	Perceptual	Josefa contempló al vecino del corredor que robaba chicles del estanco.
33	Non-perceptual	Josefa ayudó al vecino del corredor que robaba chicles del estanco.
34	Perceptual	Cristina atisbó al vecino del soldado que bailaba danzas tradicionales vascas.
34	Non-perceptual	Cristina envidió al vecino del soldado que bailaba danzas tradicionales vascas.
35	Perceptual	Ángeles fotografió al nieto del músico que trabajaba con sus colegas.
35	Non-perceptual	Ángeles señaló al nieto del músico que trabajaba con sus colegas.
36	Perceptual	Laura reconoció al cuñado del policía que escribía poemas de amor.
36	Non-perceptual	Laura regañó al cuñado del policía que escribía poemas de amor.
37	Perceptual	Sofía vio al cocinero del ministro que patinaba con sus hijos.
37	Non-perceptual	Sofía llamó al cocinero del ministro que patinaba con sus hijos.
38	Perceptual	Julia observó al sastre del juez que fumaba delante del hospital.
38	Non-perceptual	Julia abrazó al sastre del juez que fumaba delante del hospital.
39	Perceptual	Lara grabó al cliente del comerciante que nadaba en la piscina.
39	Non-perceptual	Lara dejó al cliente del comerciante que nadaba en la piscina.
40	Perceptual	Francisco vigiló al cirujano del director que enseñaba en una escuela.
40	Non-perceptual	Francisco visitó al cirujano del director que enseñaba en una escuela.

Experimental items: Italian (Experiment 4)

Item	**Matrix verb**	**Stimulus**
01	Perceptual	Maria ha sentito il figlio del funzionario che cantava nel coro parrocchiale.

01	Non-perceptual	Maria ha allenato il figlio del funzionario che cantava nel coro parrocchiale.
02	Perceptual	Giovanni ha visto il capo del pompiere che tossiva perché era asmatico.
02	Non-perceptual	Giovanni ha aspettato il capo del pompiere che tossiva perché era asmatico.
03	Perceptual	Luca ha beccato il bambino del cantante che studiava nella biblioteca pubblica
03	Non-perceptual	Luca ha aiutato il bambino del cantante che studiava nella biblioteca pubblica
04	Perceptual	Andrea ha sorpreso il collega del governatore che usciva con mia cugina.
04	Non-perceptual	Andrea ha invidiato il collega del governatore che usciva con mia cugina.
05	Perceptual	Elisa ha registrato il medico del soldato che giocava nella squadra cittadina.
05	Non-perceptual	Elisa ha indicato il medico del soldato che giocava nella squadra cittadina.
06	Perceptual	Giacomo ha disegnato il bambino del ricercatore che correva nel parco cittadino.
06	Non-perceptual	Giacomo ha rimproverato il bambino del ricercatore che correva nel parco cittadino.
07	Perceptual	Rosa ha immaginato il maestro del giovane che cucinava nella mensa solidale.
07	Non-perceptual	Rosa ha chiamato il maestro del giovane che cucinava nella mensa solidale.
08	Perceptual	Beatrice ha riconosciuto il capo del funzionario che mangiava al ristorante portoghese.
08	Non-perceptual	Beatrice ha abbracciato il capo del funzionario che mangiava al ristorante portoghese.
09[8]	Perceptual	Giuseppe ha fotografato il segretario del giudice che guidava una vecchia Seicento.
09	Non-perceptual	Giuseppe ha lasciato il segretario del giudice che guidava una vecchia Seicento.
10	Perceptual	Alberto ha sognato il sarto del marchese che camminava con le stampelle.

[8] Due to an error in the presentation of the stimuli, this item was not shown in any of the conditions or modalities.

10	Non-perceptual	Alberto ha visitato il sarto del marchese che camminava con le stampelle.
11	Perceptual	Luisa ha sentito il compagno dello studente che fischiava come un pastore.
11	Non-perceptual	Luisa ha allenato il compagno dello studente che fischiava come un pastore.
12	Perceptual	Patrizia ha visto il suocero del ragazzo che passeggiava lungo il fiume.
12	Non-perceptual	Patrizia ha aspettato il suocero del ragazzo che passeggiava lungo il fiume.
13	Perceptual	Marta ha beccato il fratello dello studente che rubava caramelle dal tabaccaio.
13	Non-perceptual	Marta ha aiutato il fratello dello studente che rubava caramelle dal tabaccaio.
14	Perceptual	Marco ha sorpreso il compagno del poliziotto che ballava danze tipiche tirolesi.
14	Non-perceptual	Marco ha invidiato il compagno del poliziotto che ballava danze tipiche tirolesi.
15	Perceptual	Francesca ha registrato il cugino del cacciatore che scriveva poesie di Natale.
15	Non-perceptual	Francesca ha indicato il cugino del cacciatore che scriveva poesie di Natale.
16	Perceptual	Bruno ha disegnato il segretario del direttore che pattinava con i figli.
16	Non-perceptual	Bruno ha rimproverato il segretario del direttore che pattinava con i figli.
17	Perceptual	Alessandro ha immaginato il nipote del commerciante che fumava nel pronto soccorso.
17	Non-perceptual	Alessandro ha chiamato il nipote del commerciante che fumava nel pronto soccorso.
18	Perceptual	Giulio ha riconosciuto il medico del governatore che molestava la sua collega.
18	Non-perceptual	Giulio ha abbracciato il medico del governatore che molestava la sua collega.
19	Perceptual	Giulia ha fotografato il cognato del cacciatore che nuotava nella piscina comunale.
19	Non-perceptual	Giulia ha lasciato il cognato del cacciatore che nuotava nella piscina comunale.

20	Perceptual	Laura ha sognato il figlio del ricercatore che insegnava in una scuola.
20	Non-perceptual	Laura ha visitato il figlio del ricercatore che insegnava in una scuola.
21	Perceptual	Cristian ha sentito il cliente del giovane che cantava nel coro parrocchiale.
21	Non-perceptual	Cristian ha allenato il cliente del giovane che cantava nel coro parrocchiale.
22	Perceptual	Angela ha visto il maestro del ragazzo che tossiva perché era asmatico.
22	Non-perceptual	Angela ha aspettato il maestro del ragazzo che tossiva perché era asmatico.
23	Perceptual	Angelo ha beccato il cugino del cameriere che studiava nella biblioteca pubblica
23	Non-perceptual	Angelo ha aiutato il cugino del cameriere che studiava nella biblioteca pubblica
24	Perceptual	Roberta ha sorpreso il chirurgo del ministro che usciva con mia cugina.
24	Non-perceptual	Roberta ha invidiato il chirurgo del ministro che usciva con mia cugina.
25	Perceptual	Roberto ha registrato lo zio del musicista che giocava nella squadra cittadina.
25	Non-perceptual	Roberto ha indicato lo zio del musicista che giocava nella squadra cittadina.
26	Perceptual	Davide ha disegnato il domestico del marchese che correva nel parco cittadino.
26	Non-perceptual	Davide ha rimproverato il domestico del marchese che correva nel parco cittadino.
27	Perceptual	Riccardo ha immaginato il suocero dello specialista che cucinava nella mensa solidale.
27	Non-perceptual	Riccardo ha chiamato il suocero dello specialista che cucinava nella mensa solidale.
28	Perceptual	Cesare ha riconosciuto il domestico del conte che mangiava al ristorante portoghese.
28	Non-perceptual	Cesare ha abbracciato il domestico del conte che mangiava al ristorante portoghese.
29	Perceptual	Mario ha fotografato il nonno del cantante che guidava una vecchia Seicento.

29	Non-perceptual	Mario ha lasciato il nonno del cantante che guidava una vecchia Seicento.
30	Perceptual	Luigi ha sognato il collega del corridore che camminava con le stampelle.
30	Non-perceptual	Luigi ha visitato il collega del corridore che camminava con le stampelle.
31	Perceptual	Sergio ha sentito il nonno del cameriere che fischiava come un pastore.
31	Non-perceptual	Sergio ha allenato il nonno del cameriere che fischiava come un pastore.
32	Perceptual	Grazia ha visto il cuoco del conte che passeggiava lungo il fiume.
32	Non-perceptual	Grazia ha aspettato il cuoco del conte che passeggiava lungo il fiume.
33	Perceptual	Michela ha beccato il vicino del corridore che rubava caramelle dal tabaccaio.
33	Non-perceptual	Michela ha aiutato il vicino del corridore che rubava caramelle dal tabaccaio.
34	Perceptual	Matteo ha sorpreso il vicino del soldato che ballava danze tipiche tirolesi.
34	Non-perceptual	Matteo ha invidiato il vicino del soldato che ballava danze tipiche tirolesi.
35	Perceptual	Alessio ha registrato il nipote del musicista che lavorava con i colleghi.
35	Non-perceptual	Alessio ha indicato il nipote del musicista che lavorava con i colleghi.
36	Perceptual	Mariagrazia ha disegnato il cognato del poliziotto che scriveva poesie di Natale.
36	Non-perceptual	Mariagrazia ha rimproverato il cognato del poliziotto che scriveva poesie di Natale.
37	Perceptual	Lara ha immaginato il cuoco del ministro che pattinava con i figli.
37	Non-perceptual	Lara ha chiamato il cuoco del ministro che pattinava con i figli.
38	Perceptual	Emilia ha riconosciuto il sarto del giudice che fumava nel pronto soccorso.
38	Non-perceptual	Emilia ha abbracciato il sarto del giudice che fumava nel pronto soccorso.

39	Perceptual	Enzo ha fotografato il cliente del commerciante che nuotava nella piscina comunale.
39	Non-perceptual	Enzo ha lasciato il cliente del commerciante che nuotava nella piscina comunale.
40	Perceptual	Donatella ha sognato il chirurgo del direttore che insegnava in una scuola.
40	Non-perceptual	Donatella ha visitato il chirurgo del direttore che insegnava in una scuola.

Appendix E: a side note on the results at chance level

In Section **Error! Reference source not found.**, I pointed out that any result in s upport of the PR-First Hypothesis would display a preference for high attachment significantly higher than chance in PR-available environments, and a preference for low attachment significantly higher than chance in RC-only conditions. Focussing on the second part of these requirements, and in order to investigate the issue thoroughly, I ran a t-test against $\mu = 0.5$ on the data from Experiments 1 and 3 from Hemforth et al. (2015). In said contribution, in which they tested the Balanced Sisters Hypothesis by Fodor (1998), the authors investigated whether the length of the RC modulates attachment in subject and object position, in four different languages. I was able to carry out this analysis because the authors reported means and standard errors for each of the languages. Below in Table 15 are the results of the analysis for each condition. The studies in bold are the ones where the results did not significantly differ from chance:

	Mean ± SE	Obs	t	p
German 1	**45 ± 5.7**	**256**	**-0.88**	**0.38**
German 2	**48 ± 5.7**	**256**	**-0.35**	**0.73**
German 3	**55 ± 4.4**	**256**	**1.14**	**0.26**
German 4	62 ± 4.3	256	2.79	0.006
Spanish 1	29 ± 3.6	384	-5.83	< 0.001
Spanish 2	39 ± 4.6	384	-2.39	0.02
Spanish 3	41 ± 3.9	384	-2.31	0.02
Spanish 4	**55 ± 4.1**	**384**	**1.22**	**0.22**
English 1	36 ± 4.4	384	-3.18	0.002
English 2	**42 ± 4.9**	**384**	**-1.63**	**0.1**
English 3	33 ± 3.8	384	-4.47	< 0.001
English 4	84 ± 4.2	384	-0.48	< 0.001
French 1	**51 ± 4.7**	**320**	**0.21**	**0.83**
French 2	64 ± 4.26	320	3.29	0.001
French 3	**53 ± 4.2**	**320**	**0.71**	**0.48**
French 4	62 ± 3.9	320	3.08	0.002

Table 15. Descriptives and statistics for the results of the experiments in Hemforth et al. (2015). "Mean" is the average high attachment preferences, "SE" the standard error and "Obs" the number of observations in that condition.

Without going into details about the experimental manipulations carried out in this study, we can see that 7 conditions out of 16 show at-chance preferences, thus suggesting that, in fact, participants had no clear preference for either attachment. I argue that at-chance results do not support any conclusions about the participants' attachment preferences, and that most researchers dealing with RC attachment and the PR-First Hypothesis either overlooked or disregarded this issue and never tested their data for an actual, non-random preference for high or low attachment.

One could object that there is another reason why I found at-chance results in Hemforth et al. (2015), at least in Spanish and French. Indeed, Hemforth et al. (2015) did not control for PR availability. As Grillo and Costa (2014) pointed out, those studies in which researchers did not take into account PR availability while preparing their materials are not reliable, for failing to control for PR availability would systematically bias the results towards high attachment, thus finding evidence for high attachment preference or results at chance level. However, one should also consider how frequent PRs are, compared to RCs. In fact, in Hemforth et al. (2015), only one condition for one item (item number 12, out of 32 items) actually admitted a PR reading. Therefore, it is implausible that the at-chance results were due to PR availability.

Cuetos and Mitchell (1988) did not take into account PR availability in their experiments, either. However, none of their items admitted pseudorelatives. Therefore, the high-attachment facilitation and preference found in their work are not due to PR availability, as Grillo and Costa (2014) claim.

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