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**Article:**

Costa, João, Fernandes, Bruno, Vaz, Stéphanie et al. (1 more author) (2016)  
(Pseudo-)Relatives and prepositional infinitival constructions in the acquisition of European Portuguese. *Probus*. pp. 119-143. ISSN: 0921-4771

<https://doi.org/10.1515/probus-2016-0006>

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# **(Pseudo-)Relatives and Prepositional Infinitival Constructions in the Acquisition of European Portuguese**

João Costa, Bruno Fernandes, Stéphanie Vaz, Nino Grillo  
FCSH/CLUNL/Universidade Nova de Lisboa

## **Abstract**

The literature on attachment preferences in relative clauses discusses a crosslinguistic difference in attachment, which, as Fodor (1998) remarks poses problems for acquisition. Following previous claims on the universality of the parser, and attempts to explain crosslinguistic variation in attachment with properties of the languages, in particular the availability of pseudo-relatives, we analyzed children's performance in attaching preferences with relative clauses and prepositional infinitival constructions and found that their preferences in parsing are guided by independently needed and crosslinguistically robust principles.

## **1. Introduction.**

This paper addresses the long-standing observation that there is crosslinguistic variation in attachment preferences in the interpretation of relative clauses in sentences like (1), as discussed by Cuetos & Mitchell (1988):

- (1) a. Someone shot the maid<sub>1</sub> of the actress<sub>2</sub> that was<sub>2</sub> standing on the balcony.  
b. Alguien disparó contra la criada<sub>1</sub> de la actriz<sub>2</sub> que estava<sub>1</sub> en el balcon.

The relative clauses in (1a) and (1b) have two potential antecedents: the first or the second DP (i.e. “the maid” or “the actress”). As signaled in the examples and described by Cuetos & Mitchell (1988), English and Spanish differ with respect to the preference in selecting the antecedent for the relative clause. Whereas most speakers of English prefer to attach low, i.e., to the second DP, most speakers of Spanish, on the contrary attach high, i.e. to the first DP.

The observation that languages may differ in attachment preferences cast doubt on the universality of parsing principles, and motivated a great deal of literature in the past two decades.

In this paper, we defend that it is not the parser that varies crosslinguistically, but the syntactic structures it manages, following the hypothesis presented in Grillo and Costa (in press). According to this hypothesis, it is the availability of pseudo-relatives in a group of languages that explains the preference for high attachment. Considering the examples in (1), Spanish has pseudo-relatives, which explains high attachment, whereas English does not have them, and the only parse available for (1a) is a relative clause analysis. European Portuguese has relative clauses and prepositional infinitival constructions, acting as the counterpart of pseudo-relatives, making it a relevant language to test Grillo and Costa's hypothesis, and for demonstrating that it is these syntactic properties, and no independent language-specific or parametrized parsing principle that drives low or high attachment preferences, as shown in Grillo et al. (2013) and Fernandes (2012). In order to further test the hypothesis, in the present paper, we test children with sentences containing relative clauses and prepositional infinitival constructions, checking their attachment preferences.

The goal of this paper is twofold: in line with previous work (Grillo and Costa (in press)), we contend that the variation found in attachment preferences is due to a crosslinguistic difference in the grammatical properties of the languages at stake, and not to some type of variation in the parser. In this paper we provide acquisition evidence in favor of this claim. We argue that children's performance in comprehending relative clauses and their behavior in what concerns attachment preferences are regulated by general universal parsing principles, and not by language-specific parsing devices. This favors the strong view that the parser is universal and that variations in the parser are the mirror of underlying crosslinguistic grammatical variation.

The paper is structured as follows:

In section 2, we summarize the observation that there is an alleged crosslinguistic difference in attachment preferences and present the problem this observation raises for acquisition.

Section 3 describes the behavior of pseudo-relatives in Italian, after a description by Cinque (1992), and shows that similar structures are not as easily available in European Portuguese. However, prepositional infinitival constructions appear to be the perfect match of Italian pseudo-relatives.

In section 4, we present the results of a picture selection task conducted with children speaking European Portuguese, allowing to check whether there are language-specific

parsing strategies or if, instead, the comprehension of different structures is guided by crosslinguistically robust strategies.

Finally, section 5 presents the main conclusions of the article.

## **2. Crosslinguistic variation in parsing: an acquisition problem.**

As mentioned in the introduction, speakers of different languages appear to differ with respect to the preference of attachment of relative clauses in sentences like (1). It is known that several factors influence attachment preferences, including the choice of lexical items in the structures tested or the prosody of the structures at stake. Yet, once such aspects are controlled for, the crosslinguistic asymmetries remain. Our goal is to explain these residual asymmetries found across languages, even after controlling for this type of factors.

The interest for this type of crosslinguistic asymmetry in parsing comes from the fact that it constitutes a serious challenge to the idea that parsing principles are universal, in particular Right Association (Kimball 1973), Late Closure (Frazier 1978), Recency (Gibson 1991) or Merge Right (Phillips 1996). Moreover, the finding that in some languages (like Spanish), there is a preference for high attachment is inconsistent with the general preference for local attachment found for other structures in the same languages (Phillips and Gibson 1997).

Several accounts have been proposed to explain these variations, e.g. the *Tuning Hypothesis* (Brysbaert & Mitchell, 1996), *Construal* (Gilboy et al., 1995; Frazier & Clifton, 1996), *Predicate Proximity* (Gibson et al., 1996), *Anaphoric Binding* (Hemforth et al., 1998, 2000b,a; Konieczny & Hemforth, 2000), *Implicit Prosody* (Fodor, 1998a,b). While each of these account correctly captures an essential aspect of the problem, there is a general agreement that none of these accounts is fully satisfactory and we will not discuss them here (see Fernandez, 2003; Augurzky, 2005, for discussion). We will instead concentrate on providing further support for the recent proposal (Grillo (2012) and, more in detail, Grillo and Costa (in press)), that the residual crosslinguistic variation (both within and across languages) is largely (if not fully) dependent on the availability of Pseudo Relatives.

As pointed out by Fodor (1998a,b), the suggestion that there is crosslinguistic variation in parsing constitutes a serious challenge to acquisition. In her own words, “the whole explanatory project (that the processing mechanism is fully innate and

applies differently to different languages only to the extent that their grammars differ) is in peril”. If this suggestion is on the right track, one has to assume that somehow children have to “learn to parse”, that is, beyond finding out the language specific properties of the grammar they are acquiring, they also have to discover language specific principles ruling parsing.

If one thinks of structures for which it has been proposed that there is development due to processing constraints, there are no clear cases of crosslinguistic variation. Consider the case of relative clauses, widely discussed in the literature on L1 acquisition (Adams, 1990; Adani, 2008, 2011; Brown, 1972; Contemori and Garrafa, 2010; Corrêa, 1982, 1995; Costa et al., 2011; de Villiers et al., 1994; De Vincenzi, 1991; Friedmann et al., 2009; Friedmann and Novogrodsky, 2004; Hakansson and Hansson, 2000; McKee et al., 1998; Roth, 1984; Sheldon, 1974). Nearly all studies coincide in the identification of a subject-object asymmetry in the development of relative clauses. Children produce and comprehend subject relatives before they understand object relative clauses.<sup>1</sup> Grillo (2005), Friedmann, Belletti and Rizzi (2009), among others, have argued that the problem with object relative clauses is due to the presence of an intervening DP in between the displaced constituent and its trace, as illustrated in (2), where we show the difference between a subject dependency and an object dependency in terms of intervention:

- (2)    a.        DP<sub>subj</sub> t<sub>subj</sub>    V        DP<sub>obj</sub>  
           b.        DP<sub>obj</sub> DP<sub>subj</sub> V        t<sub>obj</sub>

Only in (2b) is there an intervening DP between the trace and the DP. According to Grillo (2005) and Friedmann, Belletti and Rizzi (2009), the intervention of the lexical DP induces a Relativized Minimality effect, imposing a burden on the processing of this dependency. Interestingly, this is a very robust crosslinguistic effect in the acquisition of dependencies. When we compare the performance of children

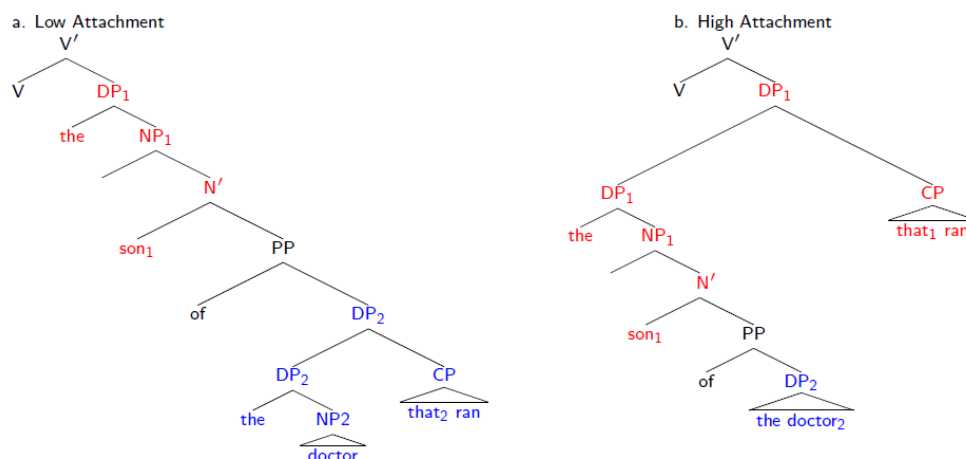
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<sup>1</sup> Documented exceptions to this asymmetry include Basque (Carreiras et al. 2010, Gutiérrez 2011) and Avar (Polinsky et al. 2012). This indicates that directionality and ergativity may be additional factors with explanatory force in the determination of difficulties in the acquisition of dependencies. For the purposes of this paper, these factors are not relevant, and we can compare European Portuguese with the great array of languages in which subject relatives are easier to comprehend than object relatives.

crosslinguistically, we observe that these effects emerge independently of the language being acquired (see, e.g. Friedmann et al. (in preparation) for a survey of 16 languages). This is relevant, since it is a clear example of a delay in acquisition due to processing constraints for which there is no evidence for crosslinguistic variation.

Grillo & Costa (in press) have proposed that there is no variation in the parser. Instead, they argue that the crosslinguistic variation in the attachment preferences mirrors underlying syntactic differences between the languages under test. In particular, the proposal is that high attachment, that is association with the higher DP, emerges if the syntax of the languages allows for pseudo-relatives (as in the Italian sentence *Ho visto Gianni che correva* “I saw John running”), which, according to Cinque (1992), have the same distribution of small clauses. Grillo and Costa propose that pseudo relatives are easier to parse than restrictive relatives, because they are simpler to represent both structurally (being Small Clauses) and interpretively (because they do not require the representation of a contextually determined set of alternatives, as restrictive relatives do). For this reason they are preferred by the parser. Crucially, pseudo relatives “force High Attachment”, as the second NP is not an accessible subject under the Small Clause parse. The consequence of this is that if the parser is dealing with a relative clause, under local attachment, it will associate it with the second DP; if, on the contrary, the relative sequence is a small clause predicate – a pseudo-relative, under local attachment, it will be associated with the highest DP, given the dominance relation. (3) illustrates the representation for restrictive relative clauses (3a) and pseudo-relatives (3b):

(3)



Grillo and Costa provide evidence in support of this account (dubbed the *PR-first Hypothesis*) from both previous literature and two novel experiments in Italian which directly manipulate pseudo relatives availability. Analysis of the previous literature reveals a striking overlap between pseudo relatives availability (both across languages and across structures) and attachment preferences: all languages classified as high attachment type allow pseudo relatives (e.g. Spanish, French, Dutch, Italian, Greek, Japanese, Korean, Galician), while languages that do not allow pseudo relatives tend to attach low (e.g. English, Basque, Romanian).<sup>2</sup> Direct comparison of attachment preferences in pseudo relative compatible environments with unambiguous relative clause environments lead to the same results: Italian speakers preferred high attachment around 80% of the time when pseudo relatives were made available. This preference went down to 20% with unambiguous relative clauses.

If this hypothesis is on the right track, it may be maintained that acquisition follows general rules, and that there is no “learning to parse”. It can be expected that children display some sensitivity to the syntactic structure, and that the acquisition of attachment is guided by general processing principles.

In the remainder of this paper, we will test this hypothesis in the acquisition of European Portuguese. Before we do so, we will show, following Grillo and Costa (in press) and Fernandes (2012), that European Portuguese is very restrictive in the availability of pseudo-relatives, and what their correlate is in this language. This is the topic of the next section.

### **3. Properties of pseudo-relatives and prepositional infinitival clauses**

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<sup>2</sup> A notable exception to this pattern is constituted by German, Russian and Bulgarian, three languages that do not allow pseudo relatives and have been classified as high attachment languages (albeit with mixed results). However, besides pseudo relatives availability, other factors are known to influence attachment (e.g. prosody, referentiality) and might be at stake here. Crucially each of these languages require a comma to precede the relative pronoun in writing (which might trigger the stipulation of a prosodic break and thus favor high attachment for prosodic reasons) and display obligatory relative pronouns, a property which has been claimed to favor high attachment for independent reasons, (see Hemforth et al. 1998, and Grillo and Costa in press for discussion).

In order to check the predictions of Grillo and Costa (in press) for the acquisition of European Portuguese, we need to establish the syntactic facts concerning the availability of pseudo-relatives in this language.

In what follows, we describe the properties of pseudo-relatives, comparing them with true relative clauses, Prepositional Infinitival Constructions in Portuguese and reduced gerund relatives in English, and argue, with Cinque (1992), that they have the distribution of small clauses. The arguments presented complement the demonstration by Rafel (2000) that Prepositional Infinitival Constructions are the correlate of pseudo-relatives, and are a kind of small clause.

The comparison with Italian permits establishing a minimal pair with European Portuguese, since we will be looking at two languages with superficially similar constructions behaving differently.

The comparison between Italian pseudo-relatives and European Portuguese Prepositional Infinitival Constructions (Raposo 1989, Duarte 1992, Barbosa and Cochofel 2005) is important, since we identify a correlate of the Italian pseudo-relative functioning as a control condition for testing attachment preferences.

Finally, the comparison between the Italian pseudo-relative, the European Portuguese Prepositional Infinitival Construction and the gerund relatives in English is important to establish that this is no idiosyncrasy of these languages. As shown in Grillo et al. (2013), *-ing* constructions behave like Italian pseudo-relatives and European Portuguese Prepositional Infinitival Constructions in terms of attachment preferences.

We will consider the following properties:

- a) Ban on non restrictive interpretation for relative clauses after proper names;
- b) Ban on relative clauses modifying a clitic;
- c) Free alternation with adjectival small clauses.

Let us consider each of these properties separately. It is well known that restrictive relative clauses cannot modify proper names. These are only compatible with appositive relative clauses:

- (3) a. \*Ho visto Pietro che Gianni conosce.  
have seen Pietro that Gianni knows



- b. Ho visto Pietro, che Gianni conosce.  
 Have seen Pietro that Gianni knows  
 “I have seen Pietro, that Gianni knows.”

On the contrary, adjectival predicates may modify proper names:

- (4) Ho visto Pietro malato.  
 Have seen Pietro sick  
 “I have seen Pietro sick.”

In a language lacking pseudo-relatives, like English or European Portuguese<sup>3</sup>, relative clauses cannot modify proper names, as shown in (5):

- (5) a. \*Eu vi o Pedro que ria. (*European Portuguese*)  
 b. \*I saw Pedro that laughed. (*English*)

In the very same context in which pseudo-relatives can be found in a language like Italian (6a), English uses gerund constructions (6b), and European Portuguese uses prepositional infinitival constructions (6c):

- (6) a. Ho visto Pietro che correva. (*Italian*)  
 Have.I seen Pietro that run.impf.

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<sup>3</sup> Brito (1995) argues that pseudo-relatives are available in a restricted set of contexts. Specifically, pseudo-relative interpretation is available in presentation contexts introduced by the adverb *eis* (i) or in restricted contexts with the imperfect tense:

- (i) Eis o comboio que chega.  
 Here’s the train that arrives  
 “Here’s the train arriving.”  
 (ii) Eu ouvi o bebé que chorava.  
 I heard the baby that cried  
 “I heard the baby crying.”

Crucially, we are leaving this restricted set of contexts out of the discussion. Leaving it aside, it is fair to affirm that European Portuguese lacks pseudo-relatives of the Italian type (cf. Fernandes 2012), although there still is some variation. Fernandes (in progress) is analyzing the variables that condition the emergence of pseudo-relative readings for relative clauses in European Portuguese. As will be argued below, we think the residual availability of pseudo-relatives has an effect on the results on attachment of relative clauses.

- b. I saw Peter running. (*English*)
- c. Eu vi o Pedro a correr. (*European Portuguese*)  
I saw the Pedro P run-inf.

Interestingly, this is the same context in which adjectival small clauses can be found in the three languages:

- (7) a. Ho visto Pietro malato. (*Italian*)  
Have.I seen Pietro sick.
- b. I saw Peter sick. (*English*)
- c. Eu vi o Pedro doente. (*European Portuguese*)

Given this similarity in distribution, we will now show, following Cinque's (1992) argumentation, that, for the other properties, there is robust evidence to show that pseudo-relatives behave like small clauses, and not as regular restrictive relative clauses.

Having shown that pseudo-relatives can follow proper names, let us consider the property mentioned in b): the possibility of having a relative clause modifying a pronoun. As shown in (8), this is possible in Italian, but not in Portuguese or in English:

- (8) a. L'ho visto che correva. (*Italian*)  
him have seen that ran
- b. \*Eu vi-o que corria. (*European Portuguese*)  
I saw him that ran
- c. \*I saw him that ran. (*English*)

In the same context in which Italian uses the pseudo-relative, European Portuguese and English use the prepositional infinitival construction and the gerund construction, respectively, to convey the same meaning:

- (9) a. Eu vi-o a correr. (*European Portuguese*)  
I saw him P run-inf

- b. I saw him running. (English)

If pseudo-relatives are not genuine relative clauses, but rather small clause environments, as argued in Cinque (1992), the expectation is that they alternate freely with small clause contexts. This is in fact true, and has been demonstrated in Cinque (1992). In A-F, we list six contexts in which small clauses and pseudo-relatives exhibit the exact same distribution. We also show that, in English and Portuguese, these are not legitimate contexts for relative clauses, but they are good environments for small clauses and gerund constructions (in English) and prepositional infinitival constructions (in Portuguese).

A. *Complement small clauses:*

As shown in (10), in Italian, both an adjectival small clause and a pseudo-relative can occur as complements of transitive-predicative verbs:

- (10) a. Non sopporto Gianni e Mario vestiti così.  
I can't stand Gianni and Mario dressed this way  
b. Non sopporto Gianni e Mario che fumano in casa mia.  
I can't stand Gianni and Mario that smoke in house mine

In (11), we show that this is not a good context for relative clauses in English and in European Portuguese, which argues in favor of the claim that these two languages lack pseudo-relatives:

- (11) a. \*I can't stand Gianni and Mario that smoke at my place.  
b. \*Não suporto o Gianni e o Mário que fumam em minha casa.

It is however a good context for small clauses, and for gerunds and prepositional infinitival constructions:

(11) *European Portuguese:*

- a. Não suporto o Gianni e o Mário vestidos assim.  
Not stand Gianni and Mario dressed like-this  
b. Não suporto o Gianni e o Mário a fumar em minha casa.

Not stand Gianni and Mario P smoke-inf in my house

*English:*

- c. I can't stand Gianni and Mario dressed like this.
- d. I can't stand Gianni and Mario smoking at my place.

*B. Pseudo-relative and small clauses predicated of a subject.*

As shown in (12), in Italian, both an adjectival small clause and a pseudo-relative can occur as secondary predicates, predicating of a subject:

- (12)
- a. Gianni lasciò la stanza ubriaco.  
Gianni left the room drunk
  - b. Gianni lasciò la stanza che era ancora sotto l'effetto dell'alcohol.  
Gianni left the room that was still under the effect of the alcohol

In (13), we show that this is not a good context for relative clauses in English and in European Portuguese, which argues in favor of the claim that these two languages lack pseudo-relatives:

- (13)
- a. \* Gianni left the room that was still under the effect of the alcohol.
  - b. \*O Gianni deixou a sala que estava ainda sob o efeito do álcool.

It is however a good context for small clauses, and for gerunds and prepositional infinitival constructions:

(14) *European Portuguese:*

- a. O Gianni deixou a sala embriagado.  
Gianni left the the room drunk
- b. O Gianni deixou a sala ainda a beber.  
Gianni left the room still P drink-inf

*English:*

- c. Gianni left the room drunk.
- d. Gianni left the room drinking.

*C. Small clauses in absolute “with” contexts:*

As shown in (15), in Italian, both an adjectival small clause and a pseudo-relative can occur in absolute contexts introduced by the preposition “with”:

- (15) a. Con Gianni malato, non possiamo partire.  
With Gianni sick, not can leave  
b. Con Gianni che fuma, non possiamo partire.  
With Gianni that smokes, not can leave

In (16), we show that this is not a good context for relative clauses in English and in European Portuguese, which argues in favor of the claim that these two languages lack pseudo-relatives:

- (16) a. \*With Gianni that smokes, we cannot leave.  
b. \*Com o Gianni que fuma, não podemos partir.

It is however a good context for small clauses, and for gerunds and prepositional infinitival constructions:

(17) *European Portuguese:*

- a. Com o Gianni doente, não podemos partir.  
With Gianni sick, not can leave  
b. Com o Gianni a fumar, não podemos partir.  
With Gianni P smoke-inf, not can leave

*English:*

- c. With Gianni sick, we cannot leave.  
d. With Gianni smoking, we cannot leave.

*D. Progressive interpretation in existential constructions:*

As shown in (18), in Italian, both an adjectival small clause and a pseudo-relative can occur in existential constructions conveying a progressive or ongoing interpretation:

- (18) a. C'è qualcuno malato.  
           There is someone sick  
       b. C'è qualcuno che fuma.  
           There is someone that smokes

In (19), we show that this is not a good context for relative clauses in English and in European Portuguese, which argues in favor of the claim that these two languages lack pseudo-relatives:

- (19) a. \* There's someone that smokes.  
       b. \*/??Há alguém que fuma.<sup>4</sup>

It is however a good context for small clauses, and for gerunds and prepositional infinitival constructions:

- (20) *European Portuguese:*  
       a. Há alguém doente.  
           There's someone sick  
       b. Há alguém a fumar.  
           There's someone P smoke-inf  
       *English:*  
       c. There's someone sick.  
       d. There's someone smoking.

#### *E. "Mad Men Magazine" contexts.*

As shown in (21), in Italian, both an adjectival small clause and a pseudo-relative can occur in the so-called "Mad Men Magazine" contexts, in which a subject and a predicate appear in an exclamative without any copula connecting them:

- (21) a. Gianni ubriaco?! È impossibile.

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<sup>4</sup> This is one of the contexts like those reported in Brito (1995), in which some speakers of European Portuguese (marginally) accept pseudo-relatives.

- Gianni drunk?! Is impossible
- b. Gianni che fuma?! È impossibile.  
Gianni that smokes?! Is impossible

In (22), we show that this is not a good context for relative clauses in English and in European Portuguese, which argues in favor of the claim that these two languages lack pseudo-relatives:

- (22) a. \* Gianni that smokes?! It's impossible!  
b. \*O Gianni que fuma?! É impossível!

It is however a good context for small clauses, and for gerunds and prepositional infinitival constructions:

- (23) *European Portuguese:*
- a. O Gianni bêbedo?! É impossível!  
Gianni drunk?! Is impossible
  - b. O Gianni a fumar?! É impossível!  
Gianni P smoke-inf?! Is impossible!
- English:*
- c. Gianni drunk?! It's impossible!
  - d. Gianni smoking?! It's impossible!

#### *F. Coordination between small clauses and (pseudo-)relative clauses:*

If pseudo-relatives are small clause environments, it is expected that they can coordinate with typical small clause predicates. This is indeed the case in Italian, as shown in (24):

- (24) Ho visto Mario ubriaco e che fumava in casa mia.  
Have seen Mario drunk and that smoked in house mine

If English and Portuguese lack pseudo-relatives, it is predicted that relatives appearing in this context are genuine restrictive relative clauses, and, therefore,

unable to coordinate with small clause predicates, which is correctly confirmed by the data in (25):

- (24) a. \*I saw Mario drunk and that smoked at my place.  
b. \*Eu vi o Mário bêbedo e que fumava em minha casa.

As expected, given the description made for the preceding properties, English gerunds and Portuguese prepositional infinitival constructions are legitimate in this context:

- (26) a. I saw Mario drunk and smoking at my place.  
b. Eu vi o Mário bêbedo e a fumar em minha casa.

On the basis of these descriptions, we can draw the following sound conclusions, based on Cinque (1992):

- a) Not all languages have pseudo-relatives – e.g. Italian has them, but English lacks them.
- b) Pseudo-relatives do not have the same distribution of genuine restrictive relative clauses.
- c) Pseudo-relatives have the same distribution of adjectival small clauses.
- d) Gerund constructions are the English correlate of Italian pseudo-relatives.
- e) Prepositional infinitival constructions are the Portuguese correlate of Italian pseudo-relatives.

Based on these conclusions, we follow standard analyses for small clause complements of perception verbs, and for genuine restrictive relative clauses.

Crucially, a restrictive relative clause attaches to the DP it modifies, as in (27a), whereas a complement small clause attaches to the verb selecting it, as in (27b):

- (27) a. I know [the boy [ that smokes]]  
b. Ho visto [<sub>sc</sub>[il ragazzo] [che correva]]

The immediate consequence of this difference for attachment is that, in the presence of two DPs, only the restrictive relative clause can attach to the most embedded one,



as shown in (28a). Such a possibility is not available in pseudo-relative contexts, as shown in (28b):

- (28) a. I know [the son of [the boy [that smokes]]]  
b. Ho visto [<sub>SC</sub> [il figlio [del ragazzo]] [che correva]]

For the embedded clause to attach to the second DP in (28b), it ought to be embedded within the DP, and the small clause would lack a predicate, which would yield an ungrammatical result.

Bearing these differences in mind, the other properties distinguishing restrictive relative clauses from pseudo-relatives become clear. If pseudo-relatives in the context of perception verbs are small clause complements, they have clausal properties. As such, they are expected to refer to events and not to individuals, which is shown in the contrast in (29):

- (29) a. Ho visto il ragazzo che correva, Questo mi ha sorpreso.  
have seen the boy that ran. That surprised me.  
b. Vi o rapaz que corria. \*Isso surpreendeu-me.  
Saw the boy that ran. That surprised me.

The pronoun “isso” in Portuguese is not felicitous in this context, since it forces an eventive reading that is not available in the antecedent, contrary to what happens in Italian. As expected, the same pronoun can be used if the relative is replaced by a prepositional infinitival construction, as in (30):

- (30) Vi o rapaz a correr. Isso surpreendeu-me.  
“I saw that boy running. That surprised me.”

Given this description and the proposal of Grillo and Costa (in press) for attachment preferences, the prediction is that in European Portuguese relative clauses attach low (or at least that there is variation to the extent that Brito (1995) describes that pseudo-relatives are not entirely ruled out), whereas Prepositional Infinitival Constructions attach high, as correlates of Italian pseudo-relatives. This prediction was tested in

Grillo and Costa (in press), in Fernandes (2012), and in Grillo et al. (2013). The following results were obtained:

- a) There is a general tendency for a correlation between the availability of pseudo-relatives and the preference for attaching high (Grillo and Costa (in press));
- b) Prepositional infinitival constructions in European Portuguese attach high (Fernandes 2012), like pseudo-relatives in the languages in which they exist;
- c) Gerund relatives in English attach high (Grillo et al. 2013), like pseudo-relatives in the languages in which they exist.

Bearing these results in mind, we may now turn to the acquisition results.

#### **4. Acquisition of attachment preferences in European Portuguese.**

##### *4.1. Hypothesis.*

Recall the discussion in section 2: if there is crosslinguistic variation in the parser, it is expected that children have to learn to parse. If, on the contrary, the parser is universal, it is expected that children's performance is guided by general processing principles.

European Portuguese provides a good testing ground for these issues, since, as shown in the previous section, both attachment tendencies may be expected with the two types of structures: variable attachment with relative clauses (arguably due to some variation in the language in the sense that pseudo-relatives are available in certain contexts), higher attachment with prepositional infinitival constructions.

We will test the following hypothesis:

##### *(31) Hypothesis:*

Attachment preferences in language development is determined by the properties of the syntactic structures, and not by language-particular parsing principles.

##### *4.2. Methodology and participants.*

In order to test this hypothesis, we ran a picture selection task to check attachment

preferences with relative clauses and prepositional infinitival constructions. The task consisted of 15 relative clauses, 15 prepositional infinitival constructions and 20 fillers. The test had, therefore, a total of 30 items and 20 fillers. The order of presentation of the items was randomized, in order to avoid that the same image appeared twice in a sequence. The task had an average duration of 10 minutes for each child.

In the following examples we illustrate the type of materials used (cf. Annex 1 for the full set of items):

(32) *Relative clause condition:*

Mostra-me o amigo do caçador que está a saltar.<sup>5</sup>

Show me the friend of the hunter that jumps

“Show me the friend of the hunter that jumps.”



(32) *Prepositional infinitival construction:*

Mostra-me o amigo do caçador a saltar.

Show me the friend of the hunter P jump-inf

“Show me the friend of the hunter jumping.”

<sup>5</sup> We used the progressive in the relative clause condition in order to ensure comparability with the PIC. In Costa, Lobo and Silva (2011), the comprehension of relative clauses with present tense and with the progressive revealed no effect for the interpretation of images of this type. In ongoing work, Oana Lungu is exploring the relevance of tense variation in the interplay with attachment preferences, which will complement these data.



The same pictures were used in both conditions, so that they could be compared. The test was applied to 20 4 year typically developing children (age range: 4;0,2 – 4;11,7, mean: 4;6,13, SD: 3,17), 22 5 year old typically developing children (age range: 5;0,17 – 5;11,30, mean: 5;7,8, SD: 4), and 20 adult controls. According to school information, the children included in the experiment had no report of malfunction in language or any other type of impairment. Children were tested individually in a quiet room. No response-contingent stimulus was given, and children were only rewarded after completion of the whole task. Data were coded and transcribed by two experimenters. We separated the 4 and 5 year old children in two groups, since in previous studies we observed significant differences between these two age groups for the comprehension of relative clauses (cf. Costa, Grillo and Lobo 2012).

#### 4.3. Results.

In the following table, we present the results of the experiment.

Group	Relative Clauses		PICs	
	Low Attachment	High Attachment	Low Attachment	High Attachment
4 year-olds	42,2%	57,8%	33,7%	66,3%
5 year-olds	30,4%	69,6%	17,7%	82,3%
Adults	38%	62%	9,4%	906%

Table 1: Results of the picture selection task

As shown in Table 1, the adult control group behaves as expected: in the Prepositional Infinitival construction, there is a clear preference for High attachment. There is a remarkable difference with respect to the relative clause condition, in which low attachment emerges at a much higher rate than in the Prepositional Infinitival Construction, although there is variation. This asymmetry is expected according to the

description in section 3 regarding the availability of pseudo-relatives in the language. Since, as argued in Brito (1995), pseudo-relatives are not entirely excluded, one expects to find some variation, which is confirmed by the data.

Let us now consider children's performance. The 5 year old group mirrors the adult behavior: like the adult group, 5 year olds exhibit an asymmetry between the two conditions, with a strong preference for high attachment with prepositional infinitival constructions. We find a difference between 4 year olds and 5 year olds. The 4 year old group compares to the other groups in the relative clause condition, but does not display a preference for attaching high in the prepositional infinitival construction condition.

*Analysis.* Data were fit with mixed effects logistic regression using the *lmer()* function of the *lme4* package (Bates et al., 2011) of the R analysis program (R code development team). In the main model *sentence type* and *age* were fit as fixed factors, and subject and item as random factors. Intercept and random slopes were fit for the fixed effects.<sup>6</sup> The analysis showed a significant effect of *sentence type* ( $p < .0001$ ) and group ( $p < .0001$ ). A significant interaction was found ( $p < .0001$ ). Analysis of the interaction showed a significant difference between the 4 year old and 5 year old groups ( $p = .0006$ ), no significant difference between the 5 year olds and adults and a significant interaction between the 4 years old and adults ( $p < .0001$ ), with significantly higher proportion of HA in adults than 4 years old in the PIC condition only.

This different behavior of the 4 year old group calls for an explanation.

#### *4.4. Discussion and conclusions.*

The results of the experiment reported in the previous section reveal that:

- a) As predicted in Grillo and Costa (in press), adults opt for high attachment in the PIC condition, whereas they display variation in the relative clause condition.
- b) The 5 year old group performance replicates the adult pattern. There is a stronger preference for high attachment in the PIC condition than in the relative clause condition.
- c) Differently from the 5 year old group, the 4 year old children displayed a stronger tendency for low attachment in the PIC condition.

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<sup>6</sup> A two-way ANOVA was also run, which yielded comparable results.

In short, two of the groups are conform to the predictions, but there is a difference between 4 and 5 year olds that deserves an explanation. Crucially, the relevant difference is across ages. The surprising effect is the low performance on high attachment in the PIC in the 4 year old group only. In what follows, we explain this behavior showing that it does not follow from any learning to parse principle.

Let us recall children's behavior in the comprehension of subject and object dependencies, presented in section 2. As mentioned then and abundantly demonstrated in the literature, children at age 4 still have difficulties comprehending object relatives when there is an intervening DP in between the displaced object and its trace. Friedmann and Costa (2010) show that similar intervention effects obtain even in the absence of the movement, as long as the same configuration obtains. They showed, for Hebrew and European Portuguese, a correlation between the comprehension of object relative clauses and sentences like (33):

(33) O João viu o Pedro e \_\_\_\_ sorriu.

João saw Pedro and \_\_\_\_ smiled

In (33), the interpretation of the gap, which should be co-referent with the subject of the first coordinate sentence, is impaired because of the intervening object.

If we now compare these structures with the structures under test, we observe that there is a similar surface intervention configuration:

(34) a. Mostra-me o filho do caçador que salta.

b. Mostra-me o filho do caçador a saltar.

In both cases, if high attachment is wanted, associating the relative clause or the prepositional infinitival construction involves linking it with the first DP, skipping over the second DP. This is highly similar with the configuration in object relative clauses.

If we compare children's performance in high attachment with the results obtained by Costa, Lobo and Silva (2011) for the comprehension of object relative clauses, a similar performance obtains:

	PIC (current study)	Object Relative Clauses (Costa, Lobo & Silva 2011)
4 year olds	66,3%	68%
5 year olds	82,3%	72%

This similarity makes it legitimate to hypothesize that the same underlying mechanism accounts for children's performance. If one assumes that intervention effects affect the comprehension of Prepositional Infinitival Constructions, we have a principled explanation for the similarity in performance between the latter and object relative clauses. Interestingly, in the Prepositional Infinitival Construction, the second DP does not c-command the gap, which adds evidence to question whether intervention effects emerge only in cases in which there is c-command, or whether linear intervention can also play a role, an issue discussed in Friedmann and Costa (2010) and Costa and Lobo (2014), where contexts of intervention without movement or c-command are compared with relative clauses.

Importantly, if this approach is on the right track, the attachment preferences by children are guided by principles that are independently needed to account for their behavior in the comprehension of relative clauses. The fact that the comprehension of prepositional infinitival clauses develops faster than relative clauses can be attributed to the unambiguity of the former.

Under this view, these data bring no evidence to posit that there are language specific principles behind the development of parsing, since a crosslinguistically robust processing effect provides a unified explanation for the development of different structures. A final note is worth making regarding Swets et al. (2007) conjecture that subjects with low memory constraints will prefer to attach high. Our data do not corroborate this view. On the contrary, even in a condition strongly favoring high attachment, we found that the youngest group does not generally attach high – instead, they appear to have a random behavior.

Coming back to our original research questions and hypothesis, the acquisition evidence presented here supports the view that crosslinguistic variation in the availability of Pseudo Relative Clauses and Prepositional Infinitival Constructions accounts for apparent variation in parsing. Accordingly, Grillo and Costa's (in press) strong view that parser is universal, and variation is grammatical can be maintained,

which predicts that there are no language-particular constraints on parsing to be acquired. The acquisition findings confirmed the idea that the development of attachment is guided by independently needed principles. In particular, it was shown that intervention effects emerge both in relative clause comprehension and in attachment preferences.

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#### Annex I:

List of the stimuli sentences used in the test:

##### PIC:

- 1 Mostra-me onde está o filho do polícia a dormir.  
*Show me where is the son of the doctor sleeping.*
- 2 Mostra-me onde está o tio da menina a pescar.  
*Show me where is the oncle of the girl fishing.*
- 3 Mostra-me onde está o filho do gato a miar.  
*Show me where the son of cat meowing.*
- 4 Mostra-me onde está a médica do menino a beber.  
*Show me where is the doctor of the boy drinking.*
- 5 Mostra-me onde está o amigo do caçador a saltar.  
*Show me where is the friend of the hunter jumping.*
- 6 Mostra-me onde está o cavaleiro do rei a correr.  
*Show me where is the knight of the king running.*
- 7 Mostra-me onde está a amiga da rainha a ler.  
*Show me where is the friend of the queen reading.*
- 8 Mostra-me onde está o amigo do pirata a comer.  
*Show me where is the friend of the pirate eating.*
- 9 Mostra-me onde está a mulher do mecânico a cantar.  
*Show me where is the woman of the mechanic singing.*
- 10 Mostra-me onde está o primo do piloto a chorar.  
*Show me where is the cousin of the pilot crying.*
- 11 Mostra-me onde está a amiga do agricultor a cozinhar.  
*Show me where is the friend of the farmer cooking.*
- 12 Mostra-me onde está o pai do doente a pintar.  
*Show me where is the father of the patient painting.*
- 13 Mostra-me onde está o avô do aluno a regar.  
*Show me where is the grandfather of the student watering.*
- 14 Mostra-me onde está a avó da menina a rir.  
*Show me where is the grandmother of the girl laughing.*
- 15 Mostra-me onde está a mãe do mergulhador a conduzir.  
*Show me where is the mother of the diver driving.*

##### Relative Clauses

- 1 Mostra-me onde está o filho do polícia que está a dormir.  
*Show me where is the son of the doctor that is sleeping.*
- 2 Mostra-me onde está o tio da menina que está a pescar.  
*Show me where is the oncle of the girl that is fishing.*
- 3 Mostra-me onde está o filho do gato que está a miar.  
*Show me where the son of cat that is meowing.*
- 4 Mostra-me onde está a médica do menino que está a beber.

- Show me where is the doctor of the boy that is drinking.*
- 5 Mostra-me onde está o amigo do caçador que está a saltar.  
*Show me where is the friend of the hunter that is jumping.*
- 6 Mostra-me onde está o cavaleiro do rei que está a correr.  
*Show me where is the knight of the king that is running.*
- 7 Mostra-me onde está a amiga da rainha que está a ler.  
*Show me where is the friend of the queen that is reading.*
- 8 Mostra-me onde está o amigo do pirata que está a comer.  
*Show me where is the friend of the pirate that is eating.*
- 9 Mostra-me onde está a mulher do mecânico que está a cantar.  
*Show me where is the woman of the mechanic that is singing.*
- 10 Mostra-me onde está o primo do piloto que está a chorar.  
*Show me where is the cousin of the pilot that is crying.*
- 11 Mostra-me onde está a amiga do agricultor que está a cozinhar.  
*Show me where is the friend of the farmer that is cooking.*
- 12 Mostra-me onde está o pai do doente que está a pintar.  
*Show me where is the father of the patient that is painting.*
- 13 Mostra-me onde está o avô do aluno que está a regar.  
*Show me where is the grandfather of the student that is watering.*
- 14 Mostra-me onde está a avó da menina que está a rir.  
*Show me where is the grandmother of the girl that is laughing.*
- 15 Mostra-me onde está a mãe do mergulhador que está a conduzir.  
*Show me where is the mother of the diver that is driving.*