Universally local attachment: new evidence from Prepositional Infinitive Constructions

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Asymmetries of attachment preferences for Relative Clauses (across languages and structures),

Previously unnoticed grammatical distinction: the availability of Pseudo-Relatives,

Hypothesis: once PRs are ruled out, Local Attachment is Universal,

Results from 3 novel experiments and from previous work support the hypothesis,

Concluding remarks
Asymmetries in RCs Attachment

Variation in attachment preferences with Relative Clauses (RCs) across languages, Cuetos & Mitchell (1988)

(1)  
   a. Someone shot the maid$_1$ of the actress$_2$ that was$_2$ standing on the balcony
   b. Algúin disparó contra la criada$_1$ de la actriz$_2$ que estaba$_1$ en el balcón
Asymmetries in RC Attachment

Several factors have been shown to influence attachment, including lexical, prosodic and syntactic.

We aim at explaining the residual asymmetries still observable across languages once these factors are controlled for.
Asymmetries in attachment preference

- These findings at odds with uniform LOCAL / low attachment preference found for other structures in the same languages (e.g. PPs) i.e. strength of local attachment (Phillips & Gibson, 1997).

- They lead to question the universality of parsing principles, in particular of Right Association (Kimball, 1973) / Late Closure (Frazier, 1978) / Recency (Gibson, 1991) / Merge Right (Phillips, 1996);

- They pose serious problems to theories of acquisition and processing (Fodor, 1998a,b);
Several accounts have been proposed to explain these variations, e.g. the Tuning Hypothesis (Brysbaert & Mitchell, 1996), Construal (Gilboy et al., 1995; Frazier & Cliffton, 1996), Predicate Proximity (Gibson et al., 1996), Anaphoric Binding (Hemforth et al., 1998, 2000b,a; Konieczny & Hemforth, 2000), Implicit Prosody (Fodor, 1998a,b) we will not discuss them here (see Fernández, 2003; Augurzky, 2005, for discussion).

Our main goal is to show the relevance of a previously unnoticed grammatical factor, which might be held responsible for attachment asymmetries both within and across languages.
Grillo & Costa (2012) show that previous work on RC attachment has overlooked the role of Pseudo Relatives:

In some languages (e.g. Spanish) but not in others (e.g. English) the relevant string can be also read as a Pseudo Relative Small Clause:

(2) Ayer vi [SC a Juan que tocaba la guitarra]
*Yesterday I saw [SC John that played the guitar]
Yesterday I saw [SC John playing the guitar]
(3)  a. ✓Vi a Juan que corría / J’ai vu Jean qui courait / Ho visto Gianni che correva
*I saw John that ran
→I saw John running

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### A few distinctions between PR and RCs

<table>
<thead>
<tr>
<th>Property</th>
<th>RCs</th>
<th>PRs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refers to individuals</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>Available w. objects</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>Available w. Rel. Pronouns</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>NP modifier</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>Available w. Proper Names</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Available in SC environments</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>VP modifier</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Aspectual restrictions</td>
<td>❌</td>
<td>✓</td>
</tr>
<tr>
<td>Refers to propositions</td>
<td>❌</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Table:** RCs and PRs

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PIC Attachment
a fundamental distinction

a. Low Attachment

$V'$

$V$

DP$_1$

the

NP$_1$

N$

'$

PP

of

son$_1$

DP$_2$

the

NP$_2$

doctor

b. High Attachment

$V'$

V

DP$_1$

the

NP$_1$

N$

'$

PP

of

son$_1$

CP

that$_1$ ran

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PR reading, illusion of High Attachment

(4)

\[
\begin{array}{c}
V' \\
\downarrow \\
V \\
\downarrow \\
NP_1 \\
\downarrow \\
\text{the son}_i \\
\downarrow \\
PP \\
\downarrow \\
\text{of} \\
\downarrow \\
DP_2 \\
\downarrow \\
\text{the doctor}_j \\
\downarrow \\
CP \\
\downarrow \\
\text{that PRO}_{i,*j} \text{ ran}
\end{array}
\]

$\rightarrow$ WITH PRs AND SCs, DP2 IS NOT AN ACCESSIBLE SUBJECT
$\rightarrow$ V TAKES SC, AND NOT DP AS COMPLEMENT.

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PIC Attachment
Grillo & Costa (2012) propose the following generalization:

(5) Once other known factors are taken into account (e.g. lexical, prosodic etc.):

A. Low Attachment preference is observed, across languages and structures, with genuine restrictive RCs, i.e. when PRs are not available.

B. High Attachment preference is observed in languages and structures which allow for a PR reading.

C. High Attachment with Acc-ing construction in English (*I saw the son of the doctor running*) and Prepositional Infinitive Constructions (PIC) in Portuguese (*vi o filho do medico a correr*), i.e. string ambiguous between reduced RCs and correlates of PR.
## Variation Across Languages

<table>
<thead>
<tr>
<th>Language</th>
<th>Attachment</th>
<th>PRs</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Low</td>
<td>X</td>
</tr>
<tr>
<td>Romanian</td>
<td>Low</td>
<td>X</td>
</tr>
<tr>
<td>Basque</td>
<td>Low</td>
<td>X</td>
</tr>
<tr>
<td>Chinese</td>
<td>Low</td>
<td>X</td>
</tr>
<tr>
<td>German*</td>
<td>Low</td>
<td>X</td>
</tr>
<tr>
<td>Russian*</td>
<td>High</td>
<td>X</td>
</tr>
<tr>
<td>Spanish</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Dutch</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Italian</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Bulgarian</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>French</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Serbo-Croatian</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Japanese</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Korean</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Greek</td>
<td>High</td>
<td>✓</td>
</tr>
<tr>
<td>Portuguese</td>
<td>High</td>
<td>✓*</td>
</tr>
</tbody>
</table>

**Table**: Attachment Preferences and PR availability
Variation Across Structures

(6) SUBJECTS

a. The maid$_1$ of the actress$_2$ that was$_2$ on the balcony is blonde
b. La criada$_1$ de la actriz$_2$ que estava$_2$ en el balcón es rubia

(Hemforth et al., unpublished)
(7) NOMINALS

Gibson et al. (1996)

a. The lamp$_1$ near the painting$_2$ of the house$_3$
   that was$_3$ damaged by the flood
b. la lámpara$_1$ cerca de la pintura$_2$ de la casa$_2$
   que fue$_3$ dañada en la inundación
(8) **P** type

a. Qualcuno ha sparato alla governante$_1$ con l’attrice$_2$
che stava$_2$ seduta in balcone

b. Someone shot the maid$_1$ with the actress$_2$
(that was) sitting$_2$ on the balcony

(De Vincenzi & Job, 1993)
Variation Across Structures

(9) RELATIVE PRONOUNS (Fernández, 2003)
Vi al hijo$_1$ del medico$_2$ el cual$_2$ estava en el balcón
I saw the son$_1$ of the doctor$_2$
who[rel pron]$_2$ was on the balcony
A previous study in Italian

Previous findings in Italian have shown HA preference *in offline studies*

In a previous experiment in Italian we demonstrated a fundamental role of PR availability in attachment:

A. LA preference with genuine RCs
B. HA preference with ambiguous RC / PR sentences.
Previous findings in Portuguese

Tendency to attach High in Portuguese (Miyamoto, 1999, 2005; Ribeiro, 1998; Maia & Maia, 2001; Maia et al., 2004, 2006; Lourenço-Gomes, 2005; Lourenço-Gomes et al., 2011, a.o.)

See Maia et al. (2006) for an overview
PRs in European Portuguese

PRs are allowed in EP universally in some contexts (10-a), Regional and individual variation apply in other contexts (10-b) Not allowed in as many contexts as in e.g. Italian (10-c):

(10)   a. Eis o João que chega
       Ecco Gianni che arriva
       *There’s John that arrives
       There’s John arriving

b. Vejo o João que fuma
   Vedo Gianni che fuma
   *I see your son that smokes
   I see your son smoking

b. ??A foto do João que fuma é muito fixe
   La foto di Gianni che fuma e’ molto bella
   *The picture of John that smokes is very beautiful
   The picture of John smoking is very beautiful
Experiment 1: Materials and Design

- *Participants*: (n=20) EP Speakers.
- *Materials and Design*: 2x2 crossing *type* (SC and noSC) and *position* (Right Branching vs. Center Embedding);
- 24 sets of target sentences (4 versions each), 80 fillers; materials and questions.
Experiment 1: Stimuli

A. *PR, Right Branching*
   O João viu o filho do medico que estava a correr  
   John saw the son of the doctor (that was) running
   PR & RC

B. *noPR, Center Embedding*
   A foto do filho do medico que estava a correr é muito linda
   The picture of the son of the doctor that was running is very nice
   RC only

C. *noSC, Right Branching*
   O João vive com o filho do medico que estava a correr
   John lives with the son of the doctor that was running
   RC only

D. *noSC, Center Embedding*
   A moto do filho do medico que estava a correr é muito linda
   The bike of the son of the doctor that was running is very nice
   RC only

A. o filho corre
B. o medico corre
Experiment 1: Results

<table>
<thead>
<tr>
<th>% HA, Experiment 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object</strong></td>
</tr>
<tr>
<td>PR</td>
</tr>
<tr>
<td>no PR</td>
</tr>
</tbody>
</table>

*Table: Percentage of High Attachment Preferences*
Results

![Graph showing attachment preferences under different conditions]

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Experiment 1: Analysis

Data were fit with mixed effects logistic regression using the lmer() function of the lme4 package (Bates, Maechler, Bolker, 2011) of the R analysis program (R core development team).

**Main Model**

**fixed factors:** type, position and type*position,

**random effects:** subject, item

**random slopes** included for both fixed effects and their interaction.
Analysis

- **Significant effect of type** (coefficient = 1.2543, SE = 0.2876, z-score = 4.361, p < .001).
- **Significant interaction type*position** (coefficient = -1.2610, SE = 0.6357, z-score = -1.984, p <0.5).
Analysis

Additional analyses, separating position and type (with random slopes for both fixed effects), show:

- **significant effect of type** for the object position (coefficient = 1.9860, SE = 0.5749, z-score = 3.454, p < .001), with > HA for SC than noSC.

- **significant effect of position** for PR type (coefficient = -1.1534, SE = 0.4955, z-score = -2.328, p < .05), with > HA for object than subject;

- **marginally significant effect of type** for the subject position, (z score = 1.955, p < .1), with > HA for PR than noPR.
→ Low Attachment preference in all conditions in which RC is only possible reading and PRs are not available;
→ High attachment preference is observed only in condition A, i.e. when PRs are available.
As predicted, LA was found in all RC only conditions.
HA was found only in condition A, in which PRs were allowed.

Languages differ in allowing PRs in “picture of” NPs, OK in Italian, *Spanish / Catalan (see Rafel, 1999, p.56 for discussion).

Portuguese matches Spanish in this respect, but PICs allow testing nominals in EP.
PICs and SCs

(11)  

a. Complement small clauses:  
   EP: Não suporto o João e o Mário a fumar.  
   I can’t stand João and Mário smoking

b. Adjunct small clauses predicated of a subject:  
   EP: O João deixou a sala a beber.  
   João left the room drunk

c. Small clauses in absolute with contexts:  
   EP: Com o Joo a fumar, no podemos partir.  
   With João smoking, we can’t leave.
PICs and SCs

(12) a. Progressive interpretation in existential constructions:
There’s someone smoking

b. Mad Men Magazine contexts.
EP: O Mário a fumar?! É impossível!
Mario smoking?! Impossible!

c. Coordination between Small Clause and relative clause:
EP: Vi o Mário bêbedo e a fumar.
I saw Mario drunk and smoking
PICs and SCs in NPs

PIC, like Italian PRs can also appear with NPs that can introduce events:

(13) A foto do João a correr é muito fixe
The picture of John running is very cool

Conclusion: PICs are the Portuguese correlate of Italian PRs.
Beyond PR: SCs and attachment

Same method, procedure and (adapted) stimuli from previous experiment, 20 Portuguese native speakers participated in the experiment.

With PIC, we expect High Attachment to emerge also in subject position, but ONLY with “picture of- NPs”, i.e. NPs that can select for events.

Importantly, this change makes SC reading available in condition B.
Experiment 2: Stimuli

(14) **Stimuli**

a. *SC / RC, Right Branching*
   
   O João viu o filho do medico a correr  
   John saw the son of the doctor running

b. *SC /RC, Center Embedding*
   
   A foto do filho do medico a correr é muito linda  
   The picture of the son of the doctor running is very nice

c. *RC only, Right Branching*
   
   O João vive com o filho do medico a correr  
   John lives with the son of the doctor running

d. *RC only, Center Embedding*
   
   A moto do filho do medico a correr é muito linda  
   The motorbike of the son of the doctor running is very nice

A. o FILHO CORRE

B. o MEDICO CORRE
## Experiment 2: Results

<table>
<thead>
<tr>
<th></th>
<th>Object</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PR</strong></td>
<td>77.8%</td>
<td>70.5%</td>
</tr>
<tr>
<td><strong>no PR</strong></td>
<td>20.1%</td>
<td>37.5%</td>
</tr>
</tbody>
</table>

Table: Percentage of High Attachment Preferences
Results

Conditions
HA Preference
0.0 0.2 0.4 0.6 0.8
PR  noPR

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PIC Attachment
Experiment 2: Analysis

- Significant effect of type (coefficient = 2.3851, SE = 0.2944, z-score = 8.102, \( p < .001 \)). HA in PR than noPR

- Significant interaction type*position (coefficient = -1.2284, SE = 0.4615, z-score = -2.662, \( p < .01 \)).
Analysis

Separate analyses for the two factors were conducted showing:

- **significant effect of position for the noPR condition only** (coefficient = 0.9070, SE = 0.3203, z-score = 2.832, p < .01):
  > HA preference in subject than object, and no effects of position for the PR condition.

- **Significant type*position interaction** (t value = -2.05):
  > High Attachment for RB than CE
Analysis

→ Strong preference for Low Attachment when only RC reading is available;

→ Very strong High Attachment preference is observed when SC reading is available, in both subject and object position.
A Pilot study in Spanish

We conducted a Pilot Study (N=7) in Spanish using a translation of the stimuli of experiment 1.

<table>
<thead>
<tr>
<th>% HA, Pilot Spanish</th>
<th>Object</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR</td>
<td>45.2%</td>
<td>28.5%</td>
</tr>
<tr>
<td>no PR</td>
<td>16.3%</td>
<td>27.5%</td>
</tr>
</tbody>
</table>

Table: Percentage of High Attachment Preferences

The preliminary results show the predicted tendency also in Spanish. Analysis shows similar results as Portuguese experiment. We are now improving the stimuli and will start final test soon.
We have shown, on the basis of both previous and original results that PRs availability modulates attachment both across languages and syntactic structures. Speakers of those languages that allow for PRs in the relevant contexts have been reported to prefer High Attachment, while speakers of languages that disallow PRs in those same contexts prefer Low Attachment.
Moreover, within the same language, whenever PRs are not available, uniform Low Attachment preference emerges.

On these bases we have argued that once PRs are taken into the equation, the Universality of Parsing principles of locality can be stated once again.
Thank you!

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