The acquisition of A- and A'-bound pronouns in Brazilian Portuguese*

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Previous studies on the acquisition of pronouns have concentrated either on A-bound or on A'-bound (resumptive) pronouns. In both cases, children performed at chance-level. In this work, I argue that the poor performance is due to a single underlying cause. This conclusion receives support from results of tests I conducted with Brazilian Portuguese-speaking children, in which the same children performed poorly with both A-bound and resumptive pronouns. I follow Grodzinsky and Reinhart's (1993) claim that children's behavior is due to their limited working memory, but diverge from them in arguing that the problem resides in comparing syntactic computations, not semantic interpretations. The two analyses make different predictions for resumptive pronouns, where the interpretations for a derivation with a gap and a pronoun are the same and children still have problems.

1.   Introduction

This study is concerned with the acquisition of pronominal elements in Brazilian Portuguese (henceforth, BP). I investigate the acquisition of pronouns appearing in two distinct environments, namely, pronouns locally A-bound, as shown in (1), and pronouns A'-bound appearing inside relative clauses, as in (2):

(1) *O   elefante$_i$ está lavando ele$_i$.
     The elephant is   washing him
     '*The elephant is washing him.'

(2) O   sapo que (*ele) está esquiando está contente.
     The frog that he   is skating   is   happy
     'The frog that (*he) is skating is happy.'

Sentence (1), with the pronoun locally A-bound by the antecedent 'the elephant,' is unacceptable. In (2), we have a subject relative clause with a resumptive pronoun (RP) sitting in the relativized position. The sentence with the RP is unacceptable, but its gap counterpart is ok.

Studies on the acquisition of locally A-bound pronouns in various languages indicate that children behave differently from adults when sentences like (1) are tested. In Chien and Wexler's (1990) study in English, for example, children allowed the pronoun to corefer with a local DP antecedent around 50% of the time. Adults did not allow such coreference. In the case of RPs, McKee and McDaniel (2001) found out that children acquiring English judged the English counterpart of sentence (2) grammatical around 50% of the time, contrary to adults, who almost never accepted it.

The constructions in (1) and (2) have always been treated separately in acquisition studies. This is so because they involve pronominal elements appearing in different environments. In (1), the pronoun is bound by an antecedent sitting in A-position, while in (2) the pronoun is bound by the relative operator, which is sitting in an A'-position. Overall, studies dealing with the acquisition of RPs and local coreference have come up with interesting ways to account for children's problems. However, the crucial observation to be made here is that none of these studies have explored the possibility that children's behavior in both domains may be correlated. That is, none of these studies have considered the hypothesis that children perform poorly in contexts like (1) and (2) because the source of the problem is the same.

This is the hypothesis under investigation in this paper. The language under study is Brazilian Portuguese, but the analysis can be carried over to English as well, as the facts are similar in both adult languages and children's behavior is also the same in both languages. There are several reasons to pursue such a unifying approach for children's behavior in tests on A- and A'-bound pronouns. First, both constructions involve pronominal elements. Second, results of studies in various languages indicate that children perform similarly on both tests, that is, they incorrectly accept sentences like the ones in (1) and (2) around 50% of the time, behaving at chance. And third, the age-range when this chance performance is detected is the same in both cases, that is, around 4 and 5 years of age. In this paper, I discuss how such connection is plausible from the point of view of syntactic theory, and how this unification is worth pursuing from the point of view of language acquisition research.

I provide acquisition data that corroborate this claim. Using the grammaticality judgment task, I interviewed the same Brazilian Portuguese-speaking children on two experiments, one involving A-bound pronouns and another involving A'-bound pronouns. The data revealed that the majority of the children displayed chance level performance on the tests with A- and A'-bound pronouns. This result constitutes strong evidence in support of the hypothesis that children's chance performance on both domains has the same cause.

The paper is organized as follows. Section 2 is a brief overview of previous studies on the acquisition of pronominal elements. Section 3 outlines an analysis of bound pronouns as elsewhere elements. Section 4 lays out the predictions that such analysis makes for language acquisition. Section 5 discusses the experimental results of a study carried out with Brazilian Portuguese-speaking children. Section 6 is the conclusion.

2.   Previous studies on the acquisition of pronouns

The vast literature on the acquisition of pronouns has essentially reported two developmental problems in this area, as mentioned above. The first one is that children acquiring languages such as English, Russian, Icelandic and Dutch sometimes accept sentences in which a pronoun is coreferent with a local DP antecedent. The other problem relates to the placement of RPs inside relative clauses. Young children allow RPs to appear in syntactic positions where adult speakers do not allow them.

Commenting first on the acquisition of locally A-bound pronouns, Chien and Wexler (1990) is one of the most influential studies in this area. These authors interviewed 177 children on the age range of 2;6 to 7;0 years. They showed children pictures of cartoon characters, such as Mama Bear and Goldilocks, with one character performing a reflexive action and the other watching the scene. In one of the trials, the picture showed Mama Bear touching herself, and Goldilocks next to her. The experimenter then said to the child:

(3)   This is Mama Bear, this is Goldilocks. Is Mama Bear touching her?

Children responded 'yes' around 50% of the time, in contrast to adults, who answered 'no' close to 100% of the time. When children answered 'yes,' they were presumably taking 'Mama Bear' as the antecedent for the pronoun. This type of response indicates that sometimes children allow the pronoun to corefer with a local antecedent. Interestingly, a different result emerged when Chien and Wexler tested sentences involving quantified antecedents. Test sentences were like the following:

(4)   These are the bears, this is Goldilocks. Is every bear touching her?

The picture accompanying this question depicted three female bears touching themselves and Goldilocks next to them, watching. Children could pick either the QP 'every bear' or the DP 'Goldilocks' as the antecedent for the pronoun. If children took the QP 'every bear' as the pronoun antecedent, then they should have answered the question affirmatively, as the picture indeed displayed the bears touching themselves. However, if they took 'Goldilocks' as the antecedent for the pronoun, they should have answered the question negatively, as the bears were not touching Goldilocks in the picture. Contrary to what happened with sentences like (3), children did not allow the pronoun to be locally A-bound in the case of (4), behaving like adults. That is, they correctly answered question (4) negatively 84% of the time (for the 5 year-olds).

Since Chien and Wexler's experiment, other researchers have replicated these results not only for English, but for other languages as well, generally making use of a similar methodology (see Avrutin 1999; Avrutin & Thornton 1994; Avrutin & Wexler 1992; Boster 1994; Cairns, McDaniel, Hsu, & Konstantyn 1995; Deutsch, Koster, & Koster 1986; Grimshaw & Rosen 1990; McDaniel, Cairns, & Hsu 1990; McDaniel & Maxfield 1992; Philip & Coopmans 1996; Sigurjónsdóttir & Hyams 1992; Thornton & Wexler 1999; Wexler & Chien 1985; among others).

Interestingly enough, children acquiring languages such as Italian, French, Catalan and Spanish are adult-like with respect to Principle B (see, among others, Baauw, Escobar, & Philip 1997; Cardinaletti & Starke 1995; Escobar & Gavarró 1999; Hamann 2002; Hamann, Kowalsky, & Philip 1997; Jakubowicz 1984; Lust, Loveland, & Kornet 1980; McKee 1992; McKee, Nicol, & McDaniel 1993; Silva 1989; Solan 1983; and Varela 1988). The main difference between the group of languages where children are adult-like with respect to Principle B and where they are not is the presence or absence of clitics. In languages such as Italian and Spanish, the sentences used in experiments on Principle B contained a clitic instead of a full pronoun and children correctly rejected sentences involving a locally A-bound clitic. The morphological differences between full pronouns and clitics are usually taken as the main factor in explaining children's different behavior in these two groups of languages.

Turning now to the acquisition of RPs, Labelle (1988) discovered that children acquiring French produced RPs in relative clauses where adult speakers did not allow these elements. Since this work, various other languages have been studied and similar results have been found (see Bar-Shalom & Vinnitskaya 2001; Goodluck & Stojanovic 1996; Grolla 2004; Kang 2003; McKee & McDaniel 2001; Pérez-Leroux 1995; and Varlokosta & Armon-Lotem 1998, among others). Mainly, children produce (or judge grammatical) relative clauses with RPs in a manner many times inconsistent with the languages being acquired. Consider the relative clauses below used in McKee and McDaniel's (2001) study. In (5a), the RP is in the highest subject position and in (5b) it is placed inside an island:

(5)   a.   *This is the man that he's swimming.
      b.   This is the troll that Ariel doesn't know what he's eating.

Using a grammaticality judgment task, McKee and McDaniel (2001) interviewed 38 English-speaking children between the ages of 3;5 to 5;11 and 34 adults.[1] Children judged sentence (5a) acceptable 47% of the time. English adult speakers judged this sentence acceptable 2% of the time. Sentence (5b) was accepted 80% of the time by adults and 78% of the time by children.

McKee and McDaniel's results demonstrate that children behave like adults when RPs are placed in unextractable positions, but perform poorly when RPs are inserted in extractable positions. These results seem puzzling: if children did not know the rules regulating the use of RPs, they should have performed poorly in both contexts. On the other hand, if they knew these rules, they should have behaved like adults in both cases. As we will see in the next section, the analysis to be proposed here can explain this seemingly puzzling behavior not only for the case of RPs, but for the cases of A-bound pronouns as well.

3.   Pronouns as elsewhere elements

The proposal to be advocated here assumes Hornstein's (2001) analysis of bound pronouns. Hornstein proposes that bound pronouns are elsewhere elements that can only be inserted in a derivation if movement is not possible. According to this hypothesis, pronouns are not present in the numeration and their insertion in a derivation is highly costly. The application of movement is considered cheaper than insertion of pronouns. In order to appreciate his proposal in deeper detail, let us consider the relative clauses below involving A'-bound pronouns:

(6) a.   The man that __ is swimming
     b. *The man that he is swimming

(7) a. *The pirate that Minnie Mouse laughed when __ arrived
     b.   The pirate that Minnie Mouse laughed when he arrived

The contrast in (6) shows that, when a gap is possible, the presence of a pronoun is banned. In (7), we see that when the gap is impossible, the pronoun is allowed. Assuming that the constructions displaying gaps involve movement of the relative operator from the relativized position to spec,CP, and that the gap corresponds to a trace left by movement, the contrasts above can be restated as follows. When movement is possible, insertion of the pronoun is prohibited; when movement is impossible, insertion of the pronoun is obligatory. In other words, Hornstein claims that pronouns are parasitic on the impossibility of movement. So, the contrasts above constitute evidence for Hornstein's proposal.

   Turning now to A-bound pronouns, anaphors and pronouns are conventionally analyzed as being regulated by Principles A and B of Binding Theory respectively. These Principles are stated below (Chomsky 1981:188):

(8)   Principle A: An anaphor is bound in its governing category
      Principle B: A pronominal is free in its governing category[2]

That is, Principles A and B state opposite requirements: anaphors must be *close* to their antecedents, while pronouns must be *far* from their antecedents. The existence of such principles is challenged in Hornstein (2001), who claims that it is possible to eliminate both Principles A and B from the theory of grammar if we allow movement to occur more generally. In particular, in his system movement into theta-positions is permitted.

   In the case of anaphors, Hornstein suggests that structures containing these elements involve movement. Several studies have made this claim. Chomsky (1986), for example, proposed that anaphors move to a (non-theta) position close to their antecedents at LF, in a type of LF cliticization. This movement can account for the locality condition of anaphors, which need to be close to their antecedents. Other researchers have also made the claim that anaphor constructions involve movement, although the implementations of this idea vary. Instead of proposing that anaphors involve LF cliti-

cization, Hornstein (2001), Lidz and Idsardi (1997) and Zwart (2002) have proposed that this movement takes place in overt syntax and that the anaphor is the residue of movement. This movement generates a structure like the following:

(9)   Bert$_1$ admires [t$_1$ himself].

Leaving aside the technical implementations of this idea, let us concentrate on the intuition that anaphors involve movement.[3] If so, consider the contrast below, intended to have the pronoun and the anaphor locally bound by 'Bert:'

(10)   a.   *Bert* admires *himself*.
       b.   **Bert* admires *him*.

This contrast illustrates the complementarity between anaphors and pronouns. (10a) is a structure involving movement, while (10b) does not involve movement and contains a pronoun in the place of the anaphor. The structure with the pronoun is not acceptable, while the structure involving movement is. If we analyze pronouns as elsewhere elements that can only be inserted when movement has failed to apply, we can rule out cases like (10b) without the need of a stipulation like Principle B. Given that a derivation involving movement is available, the insertion of the pronoun is blocked. So, (10b) is excluded because it violates economy conditions.[4] In addition, we can explain the locality requirement on anaphors, without the need of Principle A. Anaphors need to be close to their antecedents due to movement. Thus, this contrast can be taken as corroborating evidence for Hornstein's proposal.

In this system, when movement is impossible, pronouns can be inserted. This is what happens in the examples below (the items in italics are intended as coreferential):

(11)   a.   *John* likes *his* mother.
       b.   *Peter* thinks that *he* is a genius.

In (11a), movement of 'John' from inside the DP 'his mother' to spec,IP violates the Left Branch Condition. Therefore, the insertion of the pronoun inside the DP is licit. The derivation of this sentence will involve the insertion of the pronoun inside the DP and the merge of 'John' in the subject position of 'likes'. In (11b), movement of 'Peter' from the embedded spec,IP to the matrix clause is not possible for Case reasons. In Hornstein's system, DPs can check Case only once, and after a DP checks Case, it is frozen in place and cannot move further. So, if 'Peter' checks nominative Case in the embedded spec,IP, it cannot move up to the matrix clause. Therefore, the alternative is to insert the pronoun in the embedded subject position and merge 'Peter' in the matrix sentence, as in (11b).

3.1 Brazilian Portuguese

Hornstein's analysis works in a similar way in Brazilian Portuguese. Starting with RPs, in the examples below it is shown these elements are not possible in local subject position, but are required inside islands:[5]

(12) a. O menino que (*ele) chegou
     The boy   that he   arrived
     'The boy that arrived'
   b. O menino que a Maria saiu quando *(ele) chegou
     The boy   that the Maria left when he   arrived
     'The boy that Mary left when he arrived'

In (12a), the RP is not possible in subject position because movement of the relative operator from spec,IP to spec,CP is possible. Movement being possible, the pronoun is banned. In (12b), movement out of islands is not licit. Thus, with movement being impossible, the insertion of RP is obligatory. Consider next structures with the oblique position relativized:

(13) a. O menino que a Maria conversou com *(ele)
     The boy   that the Maria talked   with him
     'The boy that Mary talked with'
   b. O menino que a Maria conversou __
     The boy   that the Maria talked
     'The boy that Mary talked with'

There are two possibilities for oblique relatives: either the PP is present with a RP as the complement of the preposition, as in (13a), or the whole PP is absent, as in (13b). BP does not exhibit preposition stranding, which means that movement out of PPs is impossible. So, if the preposition is present, there must be a RP as its complement.[6]

The case in (13b) can be analyzed in a number of ways. The gap in the complement position of 'talk' could be analyzed as a null object that, instead of being a DP, is a PP. This would entail that BP has null PPs. Another possibility is that the relative operator moved from oblique position to spec, CP and then deletion of P occurred. As this issue is not relevant to the acquisition study to be discussed below, I will not pursue it here. For a discussion, see Kato (1993) and Tarallo (1983).

Turning now to the case of locally A-bound pronouns, observe in (14a) that the pronoun *ele* 'him' cannot be locally A-bound.[7] In (14b), we see that the clitic anaphor *se* is the appropriate form:

(14) a. *O Pedro$_i$ admira ele$_i$.
      The Pedro admires him
   b. O Pedro$_i$ se$_i$ admira.
     The Pedro himself admires
     'Peter admires himself.'

If we assume that the derivation with the anaphor *se* involves movement and that the pronoun *ele* 'him' is an elsewhere element only used in case movement cannot be applied, then the facts in (14) are comparable to what happens in English.

Note that BP displays a mixed pronominal system. While the anaphor is a clitic pronoun, the object pronoun 'ele' is a full pronoun, not a clitic. BP displayed object

clitics in the past, but now these forms are only used in formal written registers. The only object pronouns now available for singular third person are the non-clitic forms *ele* (him) / *ela* (her).

As the presentation above shows, Hornstein's analysis has the advantage of explaining the complementarity between (local) anaphors and A-bound pronouns: every time the anaphor is possible, the pronoun isn't. It is also valuable as it is an attempt to eliminate stipulations like the Binding Principles from the theory of grammar. For the acquisition issues under investigation here, this system is relevant as it analyzes both A- and A'-bound pronouns as elsewhere elements.

3.2 Elsewhere elements and reference-set computation

As we saw above, it is possible to analyze both A- and A'-bound pronouns in English and BP as elsewhere elements. In both cases, these elements can be inserted in a derivation only if movement cannot occur. This analysis then requires a comparison of derivations in order to decide if pronouns are licit or not. The comparison that takes place in these cases is called 'reference-set computation.' The reference-set is comprised of the convergent derivations being compared.

Thus, in order to decide if the pronoun is possible in the sentences below, they need to be compared to their movement counterparts. In both cases, given that the movement counterparts (shown in the b sentences) are possible, the insertion of the pronoun is banned:

(15)   a.   *John admires him.*
       b.   John admires himself.

(16)   a.   *This is the boy that he likes ice cream.
       b.   This is the boy that __ likes ice cream.

In the minimalist framework, only convergent derivations can be compared. This is the case in the derivations above. In the case of (15), both (15a) and (15b) are convergent. Although the derivation with the pronoun does not win the comparison, it is convergent, as it does not violate any other constraint besides economy, which is precisely the issue being evaluated. The same considerations hold for the pair in (16). Both (16a) and (16b) are convergent and so can be compared.

Things are different when pronouns appear inside islands, as the derivation involving movement does not converge:

(17)   a.   This is the boy that Mary left when he arrived.
       b.   *This is the boy that Mary left when __ arrived.

Derivation (17b) involves illicit movement out of an island and is not convergent. Therefore, this derivation is not included in the reference-set. Thus, in order to check if the pronoun is licit in derivation (17a), the reference-set contains only one derivation: the structure with the pronoun is derived without reference-set computation.

Thus, in some environments like the one in (17), reference-set computation is not needed to check if pronouns are licit or not.[8] In other cases, as in (15) and (16), reference-set computation is required in order to exclude a derivation with a pronoun.

4. The acquisition of pronouns

As discussed in Section 2, English-speaking children are not adult-like in cases like (15a) and (16a), where pronouns are inserted in extractable positions. Children are adult-like when the pronoun is inserted in unextractable positions, like in (17a). It is interesting that in the cases where children have problems, they behave similarly. Children accept RPs in extractable positions at roughly the same rate that they accept locally A-bound pronouns, that is, around 50% of the time. Another significant fact is that children of the same age range exhibit chance level performance on these tests, roughly from 4 to 5 years of age. The question to be addressed then is this: is it a coincidence that both constructions with which children have problems involve pronouns in extractable positions and that children at around the same age range behave at chance level in both cases? My claim is that this is not a coincidence; it is precisely the fact that both cases involve pronouns in extractable positions that is critical. It is also relevant that children accept both of these constructions at chance level. For if they did not know the rules regulating when pronouns can be present in such constructions, we would expect them to accept these constructions close to 100% of the time, not 50%.

According to what was discussed in the previous section, we could characterize children's problems in the following way. Children exhibit chance level performance in cases that require reference-set computation. In the cases where reference-set computation is not required, as in island contexts, children behave like adults.

In a (1999) paper, Reinhart discussed another case where reference-set computation is required and showed that in that case, children behaved at chance.[9] She argued that reference-set computation requires greater load on working memory than local computation and proposed that whenever reference-set computation is involved, there should be some evidence of processing complexity. Her hypothesis is that if reference-set computation exceeds children's processing ability, one should expect to find a guess pattern in areas where we assume this computation is involved. Reinhart claimed that, although children know what they have to do in these computations, their working memory is not big enough to hold the materials needed to complete the task. The computation required is beyond young children's abilities, which makes them give up and guess, leading to the 50% pattern of response.

In the cases under scrutiny here, the computation required to exclude a derivation with a pronoun involves the following steps. While holding the sentence under processing in memory, the child has to build a set with two possible derivations, one involving movement, the other containing a pronoun. Then the child has to compare these derivations to check which one is more economical. The hypothesis entertained here is that children cannot perform all these steps.

It is important to note that this analysis does not raise learnability problems. The claim that children's working memory is more limited than adults' has been demonstrated in various studies (see, for example, Gathercole & Baddeley 1993). As children grow older, their working memory develops, which explains how children reach the adult state. That is, children will not have processing problems anymore when their working memory is fully developed.

This proposal, though clearly inspired by Grodzinsky and Reinhart's (1993) analysis for children's problems with coreference, differs from that theory in crucial respects. Grodzinsky and Reinhart (1993) claim that children's processing problem in sentences involving local coreference arises when they have to compare the bound and coreferential *interpretations* of a pronoun. My claim is that the problem is in comparing syntactic derivations and deciding which one is more economical. The two analyses make different predictions for RPs, where the *interpretations* for a derivation with a gap and a pronoun are the same and children still behave at chance.

Summarizing, adopting the proposal discussed in Reinhart (1999) regarding young children's processing limitations, the hypotheses considered here are that (a) constructions involving pronouns in extractable positions require reference-set computation to be excluded and (b) children are not capable of handling this kind of computation. The predictions we make are the following. First, children should perform around chance level (that is, around 50% correct responses) when pronouns are placed in extractable positions. In these cases, both the derivation with a pronoun and the one without it converge, requiring reference-set computation. Second, children should perform like adults (that is, close to 100% correct responses) when pronouns are inserted in non-extractable positions. In these cases, the derivation without the pronoun does not converge. If so, no computation is needed: the derivation with the pronoun is the only one in the reference-set. If no reference-set computation is needed, children should not have processing problems. And third, given that the same kind of computation is required in tests with both A- and A'-bound pronouns, children who have chance performance on the test with locally A-bound pronouns should also have chance performance on the test with RPs in extractable positions.[10]

Before moving on to the experimental section, I would like to discuss the difference between clitics and full pronouns. Hornstein's theory of bound pronouns is centered on data from English, which does not display clitics, and in his (2001) book there is not a discussion about these elements. The most straightforward analysis for them would be to assume that they are also elsewhere elements, requiring reference-set computation. However, as mentioned in Section 2 above, children acquiring languages such as French and Spanish do not exhibit chance level performance when locally A-bound clitics are tested. This fact from language acquisition requires us to analyze object clitics in a manner distinct from full pronouns in adult languages. Given that children do not over-accept locally A-bound clitics, it must be the case that these elements do not require reference-set computation to be excluded. A detailed analysis of these elements is beyond the scope of this study. What is relevant for our purposes is that in the case of BP, since the sentences presented to children displayed full object

pronouns, and not clitics, children should have processing problems in these cases and resort to guessing.[11]

In order to test the predictions above, I interviewed the same children on tests with A- and A'-bound pronouns. As far as I know, this kind of data has never been collected. In the next section, I turn to these experiments.

4.1 Method

Subjects. I tested 40 children acquiring BP as their native language. They ranged in age from 3;4 to 6;6 (mean age = 4;7). The children came from a daycare center in Franca, a town in the state of São Paulo.

Procedure. The experiment was a grammaticality judgment task (Hiramatsu & Lillo-Martin 1998 and McDaniel et al. 1990). Children were introduced to a puppet which came from the moon and spoke moon-talk. The puppet was presented as a creature that was willing to learn BP, but got confused sometimes. The child was then invited to help the puppet to learn BP. In this task, only one experimenter was present. The experimenter showed to the child and the puppet pictures of cartoon characters. After a brief presentation of the character(s) in the picture, the experimenter manipulated the puppet, uttering the target sentence. Children had to say whether the sentence uttered by the puppet was right or wrong.[12]

The whole study was comprised of 4 sessions. The first session was devoted to teaching children the task and to applying a pretest in order to check if children had learned it. In the training part of this first session, children were given feedback on their answers.[13] When children started to give only correct responses, the pretest was applied. Only children who answered 5 out of 6 sentences correctly were included in the study. The subsequent sessions, done at least two days apart from each other, tested the target sentences.

In testing sentences with RPs, the pictures depicted two identical animals engaged in different activities, and then a short story was told. For example, in one of the trials, the picture depicted two frogs; one was skating and smiling, and the other had his skating shoes on, but was being carried by a swan. A short story along the following lines was then told to the child:

(18)   In this picture, we have two frogs. This one is very happy skating! This other one was skating too, but he fell! When the frog fell, the swan laughed, but then he was sorry and went to help the poor frog.

After the experimenter told the story, she pointed to the frog being carried by the swan and asked the puppet who was that frog. The target sentence in this case was "this is the frog that the swan laughed when he fell."

When locally A-bound pronouns were tested, there was no need to tell a story. The experimenter simply introduced the character in the picture and the verb that was going to be used in the target sentence. In one of the trials, the picture showed a female

spider inside a bathtub soaping up its body. The experimenter presented the picture in the following way:

(19)   In this picture we have a spider and she is soaping.

The target sentence could be one of the following: "the spider is soaping her," "the spider is soaping herself."

A clarification is in order here regarding the choice of the methodology. Usually, studies investigating Principle B have made use of the truth-value judgment task to elicit children's responses.[14] In studies on RPs, the grammaticality judgment task is more frequently used. In the present study, it was desirable to gather data from the same children using the same type of methodology. This is the reason why a grammaticality judgment task was used in both cases.

Materials. There were six conditions investigated with four items for each type, giving a total of 24 sentences tested. The types of sentences were: (a) simple sentences with DP and QP antecedents locally binding pronouns and anaphors and (b) relative clauses with RPs in the highest subject position and inside islands. Examples of target sentences are presented below:

(20)   A-bound (pronouns and anaphors):
    a.   DP – him: *A   aranha está ensaboando ela.
                   The spider is   soaping   her
    b.   QP – him: *Todo urso está escovando ele.
                   Every bear is   brushing   him
    c.   DP – self: O   elefante está se   ensaboando.
                    The elephant is   himself soaping.
    d.   QP – self: Todo bichinho está se   vestindo.
                    Every animal   is   himself dressing.
(21)   A'-bound (RPs in subject and island positions)
    a.   Subject: *O   sapo que ele está esquiando está contente.
                    The frog that he is   skating   is   happy.
    b.   Island: Esse é o sapo que o cisne riu   quando ele caiu
                    This is the frog that the swan laughed when   he fell.

In addition to these target sentences, 8 filler sentences were included. These were simple sentences that could be grammatical or ungrammatical, depending on the pattern of the child's responses.

4.2   Results

Children had a high rate of acceptance of the grammatical cases, namely, sentences involving anaphors (20c/d) and sentences with RPs in island contexts (21b). The rate of acceptance of these structures, as shown in the table below, is 95%. Children judged

Table 1. Frequencies of acceptance of A- and A'-bound pronouns

Structure	Percentage of acceptance
DP – him	71/160 (44.4%)
QP – him	79/160 (49.3%)
DP – self	152/160 (95%)
QP – self	152/160 (95%)
Subject	93/160 (58.1%)
Island	152/160 (95%)

sentences with RPs in the highest subject position (21a) acceptable 58% of the time. Sentences with pronouns locally A-bound by DP antecedents, such as (20a), were judged acceptable 44% of the time. 49% of the pronouns locally A-bound by QP antecedents (20b) were judged acceptable.

No child was adult-like (i.e., rejecting all of the ungrammatical cases) in all tests and no child accepted all of the sentences. That is, chance performance is observed for children individually, in both domains. Thus, in analyzing individual children, the majority of them had chance performance on both A- and A'-bound pronouns in extractable positions.[15]

The results of these experiments show that the majority of children displayed chance level performance with A- and A'-bound pronouns in extractable positions. Also relevant is that these children did not exhibit problems with A'-bound pronouns in unextractable positions. This last fact is critical, as it shows that it is not the case that children have problems with RPs generally. It is only when they are inserted in extractable positions that their performance gets poor.

The fact that the majority of children had problems in both domains (that is, A- and A'-bound pronouns placed in extractable positions) can be either taken as a coincidence or analyzed as one sole problem. In this paper, I claim that the latter holds. That is, the fact that the same children had problems in both cases is taken as evidence that the problems they face have the same source. As mentioned earlier, I propose that children's problems reside in performing the reference-set computations that are needed to exclude pronouns placed in extractable positions, whether it is in A or A' environments.

A final issue to be discussed regards pronouns A-bound by Quantified antecedents. This is done in the next section.

5. Discussion

As the results in Table 1 show, children acquiring BP accepted pronouns locally bound by QP antecedents at a considerable rate. This contrasts with the results in Chien and Wexler (1990) and Thornton and Wexler (1999), which showed a clear difference in the acceptance rate of pronouns locally bound by DP and QP antecedents. In Chien

and Wexler's study, children accepted pronouns A-bound by DPs around 50% of the time and pronouns locally bound by QPs around 16% of the time. In Thornton and Wexler's study, the difference is even more significant: pronouns bound by DPs were accepted 58% of the time and pronouns bound by QPs were accepted 8% of the time, for the simple sentences.[16]

This pattern of behavior is not the one we expect in the framework adopted here. In order to see this, consider the sentences below:

(22) a. *Every elephant* is washing *him*.
     b. *Every elephant* is washing *himself*.

Given that the derivation with the anaphor is possible, the insertion of the pronoun is banned. This shows that sentences like (22a) require reference-set computation to be excluded. If so, we expect children to behave at chance in these cases. The results of my experiment, unlike those of Chien and Wexler (1990) and Thornton and Wexler (1999), conform to this prediction.

I believe that the difference between my results and the results obtained in Chien and Wexler's and Thornton and Wexler's studies for QP antecedents has a principled explanation, which is related to the methodology employed in the studies. I will start commenting first on Chien and Wexler's experiments. In these cases, children saw a picture with three identical characters performing a reflexive action and a fourth distinct character, which was only watching the scene. Children then were asked the question: "*these are the bears, this is Goldilocks. Is every bear touching her?*" As discussed in example (4) above, 5-year-olds answered this question negatively 84% of the time. In this case, they probably were picking Goldilocks as the antecedent for the pronoun. Chien and Wexler claimed that *because Principle B blocks an interpretation where 'her' has 'every bear' as antecedent, children picked Goldilocks as the antecedent for the pronoun.*

The observation I want to make here is that Chien and Wexler did not consider another possibility in interpreting children's answers. Children could have taken Goldilocks as the antecedent for the pronoun not because of Principle B, but because Goldilocks was highly salient in the context. That is, if children's attention was drawn to Goldilocks in the picture because of her saliency, then their answers do not bear on their knowledge of Principle B.

I believe this possibility is highly likely, as the following factors indicate. First, in the picture shown in Chien and Wexler's paper, Goldilocks was much bigger than each of the three bears, which obviously made her stand out. Second, all three bears were identical and Goldilocks was physically different from them. We know from studies on the acquisition of universal quantifiers like '*every*' that children tend to concentrate their attention in the different character present in the pictures in those experiments (see Crain et al. 1996; Drozd & van Loosbroek 1998; Philip 1995; Sugisaki & Isobe 2001; among others). For example, in Philip's (1995) study, children were shown a picture with four elephants – three of them were being ridden by a boy and the fourth one was not. When asked the question *Is every boy riding an elephant?*, 97 out of

216 preschoolers responded 'no,' pointing to the elephant that was not being ridden. The same phenomenon could have happened in Chien and Wexler's experiment, as their pictures were similar to the ones in Philip's experiment, in that they also had three identical characters and a fourth individual which was somehow different and more salient.

Besides these problems, Boster (1994) discusses the possibility that children in Chien and Wexler's study might have had difficulty in recognizing the bears as female, as the experimenter did not identify them as such or name them. The picture of the bears did not make their gender clear also; the only hint about it was the bows in the bears' heads. So, although the bears might or might not be female, Goldilocks was clearly a girl and so doubtlessly an appropriate antecedent for the pronoun.

Boster (1994), taking this gender issue under consideration, tested 24 children acquiring English (ages 3;3 to 6;2). She used a yes/no question task, modeled after Chien and Wexler's experiment. Boster's trials were of three types. The first two types were similar to Chien and Wexler's, where sentences with DP and QP antecedents were tested. In the case of DPs, children accepted local coreference around 37% of the time. In the case of QPs, children accepted local coreference around 34% of the time. One difference between Boster's and Chien and Wexler's experiment in these cases is that Boster made the gender of the animals clear to children. Also, the fourth character in the QP case was roughly of the same size as the other animals. The third type of pictures depicted three identical animals performing a reflexive action and two other animals of a different type watching the scene. For example, one of the trials had three monkeys patting themselves and two zebras watching them. All animals were of the same size. Because the pictures had 3 animals of one type and 2 of another type, there was no character more prominent than the others. The sentences in these cases were like the following:

(23)   Is every monkey patting them?

Children accepted local coreference in this case around 42% of the time. Boster reports that there was no real difference between children's rates of acceptance of Principle B violations in sentences such as *Every bear is washing her* and in sentences such as *Mama Bear is washing her*. This contrasts with Chien and Wexler's results where children accepted the former 16% of the time and the later 50% of the time.

The increase in acceptance rate observed in the case of (23) has different possible explanations. One possibility, entertained by Boster, is that children analyze QPs of the type 'every NP' as binding plural pronouns. If so, children might reject sentences where the QP binds a singular pronoun and accept it more often when the QP binds a plural one. Another possibility, mentioned above, is that the saliency of the character outside the sentence in Chien and Wexler's study drew children's attention, which made them pick that character as the antecedent for the pronoun more often. Given that in the case of (23) there was not a more salient character to be considered, children picked the sentence internal QP as its antecedent more often.

This discussion entertains the possibility that children chose Goldilocks as the antecedent for the pronoun in sentences involving QPs not because of Principle B, but because the experiment pictures were flawed, as they had the extra sentential character stand out. If this was the case, then Chien and Wexler's experiments had a confounding factor, and the authors' conclusion about children's knowledge of Principle B does not necessarily go through. Note that these problems do not arise in the pictures showing only Mama Bear and Goldilocks, for sentences of the type "*Is Mama Bear is touching her?*". In these cases, the pictures displayed two equal sized characters, which were clearly identified as female. The context did not make one character more salient than the other. Therefore, there is no clear salient antecedent for the pronoun in this case. Thus, in sentences involving a possible DP antecedent for the pronoun, the confounding factors mentioned above did not arise and children's answers could not have been guided by the saliency of one of the characters.

In the case of Thornton and Wexler's study, similar problems can be detected. Their study was a truth-value judgment task and stories were acted out in front of children using toys and props. Let us take a look at the general guidelines of a story leading up to a sentence with a potential QP antecedent for the pronoun (story taken from Thornton and Wexler's book, page 142):[17]

(24)   "Bert and three reindeer friends have a snowball fight, and they all get covered in snow. When they go inside, Bert is shivering, so he asks the reindeer to brush the snow off him. Two of the reindeer (separately) refuse, saying they have too much snow to deal with, and they brush themselves. The third reindeer helps Bert a little bit, but then brushes the snow off himself. Bert thanks the helpful reindeer for starting to brush him. He says he's sorry he can't reciprocate by helping brush the reindeer; he needs to finish brushing all the snow off himself because he's still very cold.
Puppet: *Every reindeer brushed him.*"

In this story, Bert is more salient than the other characters. This is acknowledged by Thornton and Wexler themselves, when they claim that the background behind this story is that *Bert* has a problem: he wants the reindeer to brush the snow off him. The way the story is told, we have Bert as the protagonist, and three other animals involved in it. The three animals are not as prominent in the story as Bert is. They do not have names (they are referred to as 'the reindeer,' 'the third reindeer,' 'the helpful reindeer'). They do not have the urgency that Bert has, as they do not ask each other to brush the snow off them. Only Bert is depicted as someone having this need. Also, I suspect that the three reindeer are identical looking. Bert, on the other hand, is physically different, which makes him stand out.

So, the fact that Bert is more prominent in the story might be the reason why children took him as the antecedent for the pronoun. One piece of evidence corroborating this possibility comes from a study with adult speakers of English. Morrow (1985) investigated the influence of protagonist status on referent assignment. In his experiment, subjects read a story with a protagonist and a non-protagonist. At the

end of the story, a sentence containing an ambiguous pronoun was presented. Subjects were asked what the 'he' referred to in that last sentence. The results are that subjects are more likely to choose the protagonist when the protagonist was thematically prominent *or* most recently mentioned. Subjects preferred the non-protagonist only when the non-protagonist was thematically prominent *and* most recently mentioned. Oppy and Long (1996) also found that adults are more likely to pick the protagonist of a story as the referent of an ambiguous pronoun.

Therefore, if children are like adults in this matter, they will pick Bert in the story above as the antecedent for the pronoun, given that Bert is more thematically prominent and was most recently mentioned. If this is so, children's behavior in those tests might be telling us nothing about their knowledge of Principle B.[18]

This discussion leads me to conclude that these studies investigating children's knowledge of Principle B ended up having a confounding factor when the possible local antecedent for the pronoun was a QP. In these cases, the character not mentioned in the target sentence (e.g., Goldilocks or Bert) is necessarily made more salient than the characters that make up the QP (e.g., three bears or three reindeer). This might be the reason why children took that DP as the antecedent for the pronoun, and if that is the case, then the results of these experiments do not bear on children's knowledge of Principle B.

In the experiments I conducted with Brazilian Portuguese-speaking children, reported above, the context did not provide other potential antecedents for the pronoun. In this grammaticality judgment task, children were presented with a context (the picture) and were asked to judge if the sentence they heard was acceptable or not for that context. For example, in one of the trials, children saw a picture with three elephants of equal size doing the same action: washing themselves. The puppet then said: *every elephant is washing him*. Here, 'every elephant' was the only possible antecedent for 'him,' as there were no other individuals in the picture.

When the confounding factor pointed out above does not exist, as in my grammaticality judgment task, children behaved differently from the children in Chien and Wexler's and Thornton and Wexler's experiments, accepting pronouns locally bound by QPs and DPs at chance level.

So, the fact that the stories or pictures in these other studies had one of the characters more salient than the others cannot be ignored when we analyze children's answers. If their attention was drawn to that salient character, then their answers cannot be taken as evidence that they were *obeying* Principle B. In this case, their answers only indicate that they are sensitive to the saliency of the characters in a story. This makes the results of these other experiments unreliable.

Therefore, the difference in the results of my experiments on the one hand and in Chien and Wexler's and Thornton and Wexler's studies on the other, can be explained in terms of the experimental differences of these studies, indicating that the methodology employed here has advantages over the methods they used for investigating locally A-bound pronouns.

6.   Conclusion

The results of this study with Brazilian Portuguese-speaking children are relevant in two respects. First, they suggest that the search for a unified way to explain children's problems with A- and A'-bound pronouns in extractable positions is well motivated. This paper showed how such unified explanation can be implemented. Secondly, these results suggest that the theories proposing that bound pronouns are elsewhere elements provide the most straightforward tools to account for children's behavior in both domains. Therefore, our results can be viewed as bringing evidence for such theories.

Notes

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1. McKee and McDaniel (2001) also interviewed 44 English-speaking children between the ages of 6;0 and 8;11. I will not discuss the results for this group here because the children's ages in this group differ from the ages of children in the other studies being reported in the text.

2. 'Free' and 'bound' are defined as follows (Chomsky 1981:184–185):

(i)   α is bound by β iff α and β are coindexed, and β c-commands α.
(ii)   α is free iff it is not bound.

'Governing category' is defined as follows (Chomsky 1981:188):

(iii) β is a governing category for α if and only if β is the minimal category containing α, a governor of α, and a SUBJECT (accessible to α).

'SUBJECT' is defined as follows:

(iv)   The SUBJECT of a category is its most prominent nominal element (including the agreement features on the verb in finite clauses).

3. The technical implementations of this idea are discussed in detail in my (2005) UConn Ph.D. dissertation.

4. Hornstein's system is an attempt to derive the complementarity between pronouns and anaphors by allowing movement to occur more freely. However, there are cases where pronouns and anaphors are not in complementary distribution. For example, in some environments, both anaphors and pronouns are possible, as shown in (i) below; in others, neither is possible, as shown in (ii):

(i)   John pulled the blanket over him/himself.
(ii)   We like (*me)/(*myself).

Neither Hornstein's theory nor Principle B account for these cases. I will abstract away from them in the discussion to follow and will concentrate instead on the cases where complementarity between anaphors and pronouns occur both in BP and in English. For a discussion of cases like (i), see Lees and Klima (1963), Lakoff (1968), Chomsky (1981), among others. For a discussion of cases like (ii), see Lasnik (1981). For an overview on these issues, see Reuland and Everaert (2001).

5. As for the direct object position, since this is an extractable position, RPs should be banned from it. However, there seems to be a dialectal difference in this case, as some BP speakers consistently accept RPs in this position while others don't. In a grammaticality judgment task conducted by me with adult native speakers of BP, I found that relative clauses with a RP in direct object position as shown below are judged grammatical 20% of the time, with a group of the speakers tested always accepting these constructions and the other, more numerous group, always rejecting them:

(i) Esse é o   menino que a   Maria viu *ele*.
     This is the boy   that the Maria saw him
     'This is the boy that Mary saw.'

In order to account for such level of acceptability, we could follow Shlonsky (1992), who reports a similar phenomenon for RPs in object position in Hebrew. Shlonsky's proposal is the following. Hebrew has two homophonous complementizers, one identifies its Spec as an A-position, and the other identifies its Spec as an A'-position. The choice between these complementizers is free. If the A-complementizer is chosen, movement from object position to Spec,CP is blocked, as it crosses the subject position, also an A-position. This constitutes a Relativized Minimality violation. If the A'-complementizer is chosen, movement from object position to Spec,CP can occur. So, Shlonsky proposes that for the case of direct object position in Hebrew relative clauses, movement will be allowed or not depending on the complementizer chosen, hence the alternation gap/RP. The same analysis could be proposed for BP. The speakers who accept RPs in direct object position choose the A-complementizer, while the speakers who reject RPs in this position choose the A'-complementizer.

6. In Grolla (2004), I tested children on constructions like (13a), with RPs in oblique position (among other positions). 11 BP-speaking children between 3;0 and 5;5 years of age were interviewed in a grammaticality judgment task. The results are that children accepted RPs in oblique position 90% of the time. Adult speakers also accepted this construction 90% of the time.

7. An alternative to the derivations shown in (14) would be to have a null element in object position, as these elements are possible in BP, as shown below:

(i) Quando o   João comprou o   livro, ele não mostrou __ pra ninguém.
     When   the João bought the book, he not showed   __ to nobody
     'When John bought the book, he didn't show it to anyone.'

However, as the example below illustrates, null and overt objects are not in competition:

(ii) Quando o   João comprou o   livro, ele não mostrou *ele* pra ninguém.
     When   the João bought the book, he not showed   it to nobody

Although BP displays null objects, it is not the case that these elements are possible everywhere. Example (14) above, for example, cannot have a null object, as shown in (iiia). There seems to be a restriction on the animacy of the object, as also illustrated in (iiib), which must have an overt object pronoun:

(iii) a. *O   Pedro admira   __ .
        The Peter admires __

    b. *Quando a   Maria encontra o   Pedro, ela abraça __ .
        When   the Maria meets   the Peter, she hugs   __
        '* When Mary meets Peter, she hugs.'

Given these complications, which are not relevant to the acquisition study reported below, I will not consider these cases. For analyses of these elements in BP, see Cyrino (1997) and Ferreira (2000).

8. Other examples of structures where reference-set computation is not used are presented in the text, in examples (11), repeated here:

(i)   a. *John* likes *his* mother.
    b. *Peter* thinks that *he* is a genius.

As was discussed in the text, the movement counterparts of these sentences do not converge. So, no reference-set computation is involved in order to check if pronouns are licit in these cases.

9. Reinhart's (1999) paper discussed cases of stress shift, which she claims require reference-set computation.

10. Note that we predict children to behave in such a way in grammaticality judgment tasks, but not in production, especially in spontaneous production. In the GJ task, children are prepared to give a judgment. Therefore, when they hear a sentence with a pronoun, knowing of its elsewhere character, they know that they have to check whether the pronoun is licit or not in the derivation. However, the same should not occur in production, as the pronoun will only be inserted if needed.

11. One possibility is to assume that clitics are agreement markers, rather than pronominal elements. If so, they would not be elsewhere elements requiring reference-set computation. Note that children have not been shown to display chance level performance on tests with anaphors/reflexives in any language tested. In this case, the prediction is the same for languages with non-clitic anaphors, like in English, and for languages with clitic anaphors, like BP and the other Romance languages.

12. Ideally, this experiment would involve two experimenters, one to manipulate the puppet and another to present the pictures to children and to teach them the task. Because I could not find someone able to help me in carrying out the task in Brazil, I developed a way to play both roles. When talking to the child as the experimenter, I used my normal voice and left the puppet sideways, not intervening between the child and me. When pretending to be the puppet, I'd put it in front of my face and spoke with a high-pitched voice. The younger children did not seem to mind that I was the one talking for the puppet. The older children seemed more curious about it, but found it fun to talk to the puppet anyway. So, I do not think that the results of the study were in any way compromised by the presence of just one experimenter.

13. The sentences used in the training session were formulated in such a way as to teach children to pay attention to subtleties on them. For example, the ungrammatical sentences were not 'word salad', but almost grammatical sentences with just one word missing or one word extra.

14. An exception is McDaniel et al. (1990), who have made use of the grammaticality judgment task to test children's knowledge of locally A-bound pronouns. Their results are comparable to what has been reported in other studies using the truth-value judgment task.

15. Five children were not considered in this analysis, as they accepted all the sentences, including fillers. This makes their answers unreliable and this is the reason why they were excluded from the analysis.

16. Thornton and Wexler (1999) tested both simple sentences like the ones in the text and complex sentences involving VP ellipsis.

17. Thornton and Wexler mention that these are just general guidelines of the story told to children. In narrating the stories, the experimenter was careful not to use reflexive pronouns, for example.

18. Note that, exactly like in Chien and Wexler's case, this problem does not arise when the possible antecedent for the pronoun is a DP. In the story with only two characters, both are salient, have names and thus the context does not provide an obvious antecedent for the pronoun, as it did in the case of QPs.

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