The Acquisition of Embedded Subject Pronouns in European Portuguese

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1. Introduction

Children are known to have problems interpreting pronominals in some languages. For instances, in sentences like (1), Chien and Wexler (1990) have found that children, unlike adults, assign a co-referent interpretation to the pronoun *her*:

(1) Mama Bear washes her.

At the time, this finding raised several questions regarding the nature of this difficulty in interpretation. Several options emerged:

a) Does this behavior reflect a late acquisition of binding principles, in particular a late maturation of principle B?

b) Is it the case that binding is acquired, and the difficulties have to do with a late acquisition of pragmatic principles ruling the interpretation of pronouns (Chien and Wexler 1990, Grodzinsky and Reinhart 1993)?

c) Is the assignment of co-referential interpretations to pronouns a universal problem or is it specific to some pronominal forms in some languages (McKee 1992)?

d) Is the difficulty in the interpretation of pronouns a linguistic problem or a processing problem imposed by working memory limitations at the interface (Reinhart 2006, Grolla 2004)?

The goal of this paper is twofold: first, we intend to contribute to clarify the debate regarding the nature of the difficulties in the interpretation of pronouns by showing that some crosslinguistic asymmetries found can be replicated language-internally, which shows that the nature of the asymmetries is not linked to the language type. Second, we show that the crucial distinguishing feature for determining whether children have troubles interpreting pronouns is the clitic/non-clitic status of the pronominal form.

The paper is organized as follows: in section 2, we review some of the major results of the literature regarding the interpretation of pronouns, emphasizing those results that are crucial for the present discussion, namely the status of crosslinguistic differences, and the burden put on linguistic or on pragmatic factors as the key for explaining children's difficulties. In section 3, we show why testing strong pronouns in a language with clitics and strong pronouns is relevant. In section 4, we present an experiment on the interpretation of null and overt subject pronouns in European Portuguese, and finally, in section 5, we present the main conclusions of the paper.

2. Acquisition of co-reference: language vs. pragmatics

As mentioned in the introduction, Chien and Wexler (1990) found that 3 to 5 years-old English speaking children assign reflexive interpretations to pronouns in sentences like (2):

(2) John washes him.

Children's performance is chance-level, which indicates that they do not know how to interpret the pronoun, that is, they are not assigning it a wrong interpretation. Instad, they are hesitant about how to interpret it.

Interestingly, Chien and Wexler (1990), and also Grodzinsky and Reinhart (1993), found that this behavior cannot be attributed to a late acquisition of binding principles. First, because in the interpretation of anaphors, children were found to behave adult-like. In other words, they never assigned disjoint referent interpretations to anaphors. Second, when the antecedent of the pronouns is a quantified phrase, as in (3), children were found to behave adult-like:

(3) Every bear washes him.

These cases are relevant, since, when the antecedent of the pronouns is a quantifier phrase, only binding can be involved, no other mechanism for establishing co-reference can be evoked. This becomes evident in the following examples:

(4) a. $John_i$ entered the room. He_i was tired.
     b.   Every boy_i entered the room. He_{*i} was tired.

In (4a), it is shown that a co-reference relation can be established between a pronoun and a DP across a sentence boundary in the absence of c-command, that is, in a context in which binding plays no role. As for QPs, the same relation cannot be established, which shows that for a co-reference relation between a QP and a pronoun to hold, binding must be involved. Crucially, the relation between a QP and a pronoun may be co-referential, provided there is binding, as in (5):

(5) Every boy_i said that he_i was tired.

The observation that there is no problem with the acquisition of binding principles per se forces one to find a different explanation for the lack of success in the interpretation of sentences like (3). Chien and Wexler (1990) and Grodzinsky and Reinhart (1993) hypothesize that, if the problem is not syntactic in nature, it is due to a late acquisition of the pragmatic principle ruling the interpretation of pronouns. Put differently, at the relevant ages, children know the principles of Binding Theory, but they do not know that binding takes precedence over other discourse ways for establishing co-reference relations. Under this view, only when these pragmatic principles undergo maturation can children assign the correct interpretation to pronominal forms.

Summarizing so far, we have two main findings: first, children fail to interpret pronominal forms, assigning co-referential interpretations to pronouns – this effect is often referred to in the literature as "Delay of Principle B effect" (DPBE); second, the failure in interpretation is restricted to pronouns when the antecedent is a DP, which indicates that there is no generalized problem with the acquisition of binding principles or any problem with the acquisition of binding.

A third relevant finding is due to McKee (1992), who found that the results obtained for English speaking children were not replicated in Italian. Unlike the English participants, children acquiring Italian perform in an adult-like manner in all conditions, assigning co-referential interpretations to anaphors and disjoint interpretations to pronouns. This finding is an important one, since it casts doubt on any general maturational account to this phenomenon. Whatever general pragmatic principle on the interpretation of pronouns that is operative in English - and must be subject to maturation - has to be subject to maturation in Italian too. Yet, there is no clear reason why it should maturate earlier in Italian than in English.

This English – Italian asymmetry led to a great body of crosslinguistic research on this matter, and by now it is clear that languages split in whether children display problems interpreting pronouns (in the sense that they assign co-referential interpretations to pronouns when they have a local DP antecedent in an apparent violation of Principle B) or not. In the following table, we summarize the findings for some languages. The methods used were comparable to those of Chien and Wexler (1990):

Languages with "DPBE"	Languages without "DPBE"
English (Chien & Wexler 1990)	Italian (McKee 1992)
Dutch (Philip and Coopmans 1996)	French (Hamman et al. 1997)
Icelandic (Sigurjónsdóttir 1992)	Spanish (Baauw et al. 1997)
Brazilian Portuguese (Grolla 2004)	European Portuguese (Cristóvão (2006)

T1. Summary of results of experiments testing acquisition of comprehension of binding

Several authors raise the hypothesis that the key difference between the two groups of languages is the status of the pronominal form involved. Accordingly, those languages in which children have difficulties interpreting pronouns have full pronouns (in the sense of Cardinalletti and Starke 1999), whereas those in which children behave adult-like have clitics. In fact, if we replicate the table above and reorganize the languages according to the type of pronoun used in the experiments we see that no difference obtains: a perfect match emerges between the languages with "DPBE" and full pronouns and the languages without "DPBE" and clitics.

Languages with full pronouns	Languages with clitics
English (Chien & Wexler 1990)	Italian (McKee 1992)
Dutch (Philip and Coopmans 1996)	French (Hamman et al. 1997)
Icelandic (Sigurjónsdóttir 1992)	Spanish (Baauw et al. 1997)
Brazilian Portuguese (Grolla 2004)	European Portuguese (Cristóvão (2006)

T2. Correlation between results on binding experiments and type of pronominal forms used in experiments.

According to this observation, the problem in the interpretation mostly depends on the specificities of the pronominal form, and not so much on pragmatic principles. Note that the contrast between Brazilian and European Portuguese is quite an interesting one. These are variants of the same language, and the sole distinguishing factor in the experiments conducted was the fact that a clitic was used in the Portuguese version of the Brazilian experiment, in which a full pronoun was used.

If indeed the status of the pronoun is relevant, one must establish why pronouns are hard to interpret. Grolla (2004) makes a proposal trying to answer this question, based on Reinhart's conjectures on children's abilities to deal with competing computations at the interface. Grolla (2004)

follows Hornstein's (2001) idea that pronouns are elsewhere elements. This means that pronouns are only inserted whenever needed for convergence, after syntax, and only if a gap is not enough to attain a convergent derivation. This has a computational consequence. For one to know whether a pronoun is a legitimate object, one must bear two derivations in mind: one with a gap and one with a pronoun. Only after comparing the two and checking that the one with the gap is not good enough can one discard it, and use the derivation with the pronoun.

Reinhart (2006) claims that operations at the interface are problematic for children for processing reasons: whenever children have to bear two derivations at the same time in memory and make explicit comparisons between them, a burden is put on their working memory. They must keep the two derivations in memory in order to compare them. This is difficult for them, because their working memory does not allow it, which is reflected by their chance level performances.

Cristóvão (2006) notes that Grolla's explanation, based on Reinhart's proposal, accounts for the fact that pronouns are difficult to interpret, but fails to explain the crosslinguistic difference between clitic languages and pronoun languages. Clitics, in the relevant languages, behave like pronouns for binding purposes, so they might behave like pronouns in the pronoun languages for reference set computation purposes. However, as mentioned above, this is not the case. Cristóvão suggests that this asymmetry between clitics and non-clitics can be explained under Hornstein's approach to pronouns, followed by Grolla (2004). Recall that, under this proposal, pronouns are elsewhere elements inserted post-syntactically. This approach cannot be extended to clitics. As it is well-known since Kayne (1975, 1991), clitics are defective syntactic elements, that must undergo movement in syntax in order to be licensed. Typically, they can only be licensed after being displaced to the functional domain. Taking into consideration these properties of clitics, it becomes evident that one cannot assume that these objects are inserted late in the derivation. If they would be inserted postsyntactically, they could not be moved, because the domain in which movement would be taking place would already be "closed" for movement operations, since it would constitute a complete phase (Chomsky 2001). As such, clitics must be inserted in the course of the syntactic derivation. This has an immediate consequence for their interpretation: they will not be competing with null forms. There will be no alternative to the structure with a clitic, and no reference set computation problem will arise. Consequently, it is predicted that children will have no problems interpreting clitics, but only strong pronouns.

The combination of Grolla's proposal with Cristóvão's idea on the reason why clitics are not problematic makes one interesting prediction. If children's difficulties depend on the type of pronominal forms, it is expected that the relevant asymmetries do not hinge on language types, but rather on the type of pronouns used in the experiments. In other words, it is expected that the asymmetries found crosslinguistically are replicated language-internally if the clitics and strong pronouns are tested within the same language.

3. Research question: strong pronouns in a clitic language

As discussed in the previous questions, the results of the research on the comprehension of pronominal forms by children lead to the prediction that the relevant difference for understanding why, in some languages, children have difficulties interpreting pronouns whereas they do not in others has to do with the status of the pronouns, and not with some general macro-typological difference between the languages. Furthermore, it was shown that, since the crucial difference is the type of pronoun, it is expected that the relevant asymmetries can be found language internally. Varlokosta (2000) tried to test this prediction for Greek, a language with clitics and strong pronouns, and found an asymmetry, since children had more troubles interpreting strong pronouns. However, the strong pronouns used in the experiment were demonstrative pronouns. This introduces an extra variable, since it must be established that children deal with deixis and the demonstrative nature of these pronouns in order to be able to use them. That is, they do not make a minimal pair with the clitics used in the experiments for testing binding.

Our goal in this paper is to test the relevance of the clitic-strong pronoun asymmetry language internally, with forms that can form a minimal pair. We formulate our hypothesis in the following terms:

✓ If the difficulties in comprehending pronominal forms depend on the status of the pronominal form, it is expected that children exhibit difficulties interpreting strong pronouns even in a language in which they fare well in the interpretation of clitic pronouns.

We will assume, following Cardinalletti and Starke (1999), that null pronouns group with clitics in the set of deficient pronominal forms. As such, the predictions regarding interpretation now become clear. As summarized in (6), the prediction made is that children should not have problems interpreting clitics or null pronous, but they should have problems interpreting strong pronouns:

(6) a.   DP….. clitic $\Longrightarrow$ Unproblematic
     b.   DP….. Ø $\Longrightarrow$ Unproblematic
     c.   DP…. Strong pronoun $\Longrightarrow$ Problematic

European Portuguese is a good language to test these predictions, since the three pronominal forms are available. In the following examples, we illustrate binding relations being established between a DP antecedent and each of the possible pronominal forms:

(7) *Binding relation between a DP and a clitic:*
     a. O Pedro$_i$ disse que a Maria o$_i$ conhece.
         the Pedro said that the Maria him knows
         "Pedro said that Maria knows him."
     b. O Pedro$_i$ conhece-o$_{*i}$.
         the Pedro knows him
         "Pedro knows him."

As shown in (7), a clitic can be bound by a DP antecedent as long as they are not in the same local domain. Within the same domain, they must have a disjoint reference, otherwise an ungrammatical interpretation comes up, as in (7b).

(8) *Binding relation between a DP and a null pronoun:*
     O Pedro$_i$ disse que pro$_i$ conhece a Maria.
     the Pedro said that pro knows the Maria
     "Pedro said that he knows Maria."

The example in (8) illustrates a case in which the DP binds a small pro, and as illustrated in (7a) for the clitic, binding is legitimate, because the antecedent and the pronominal form are not within the same local domain. For this context, we do not create a context in which the DP binds a null form locally in object position, since it is not entirely clear that a perfect parallel would be established. According to Raposo (1986), the null object that can be found in a simple clause in a sentence like (9) is a variable and not a pronoun:

(9) (talking about a specific dog)
     Vou levar Ø ao veterinário.
     Go-1st take to the vet.
     "I'm taking it to the vet".

Note, nevertheless, that there is some evidence showing that Portuguese speaking children treat null objects like pronouns, which explains their misuse and misinterpretation of null objects (Silva 2008, Costa and Lobo 2009a, 2009b). For the purpose of the current explanation, it is irrelevant to consider null objects, since we would not be able to control their status as variables.

Consider now the case of a relation between a DP and strong pronoun, as in (10):

(10) *Binding relation between a DP and a strong pronoun:*
  O Pedro$_i$ disse que ele*$_i$ conhece a Maria.
  the Pedro said that he knows the Maria
  "Pedro said that he knows Maria."

As shown in the example, a strong pronoun, unlike a null pronoun (cf. 8) or a clitic (cf. 7a) does not establish a good binding relation with a DP antecedent in a matrix clause.

Bearing these distinctions in mind, we have the necessary ingredients to test the following hypotheses:

1. If children's co-reference problems bear on the clitic-full pronoun asymmetry, it is predicted that children acquiring European Portuguese will <u>correctly</u> reject co-referential interpretations for clitics in simple declarative sentences.

2. If children's co-reference problems bear on the clitic-full pronoun asymmetry, it is predicted that children acquiring European Portuguese will <u>incorrectly</u> allow for co-referential interpretations between matrix subjects and embedded full pronouns.

Hypothesis 1 was tested in Cristóvão (2006). This author replicated Chien and Wexler's experiment and found that children acquiring European Portuguese had no problems interpreting clitic pronouns in local domains.

Cristóvão ran a truth-value judgment task on 38 children aged from 3 to 5 years old. In the task, children watched a picture with two characters. In the picture, one of the characters could be doing something to himself or performing an action to the other character. For instances, the picture could depict a grandmother and a girl, and the grandmother might be combing herself or, in a different picture, the grandmother might be combing the girl. A puppet made comments on the pictures, using anaphors or pronouns (clitics in both cases), and the child's tasks was to tell whether the puppet was telling the truth, rewarding or punishing the puppet according to whether he told the truth or lied, respectively.

In the next tables, we present a summary of Cristóvão's results. The results are divided in two tables, because the experiment was run with two elicitation procedures. The pictures were described using a verbal form in the present (with a simple verb), which is a rather unnatural use of the present in Portuguese, and using a progressive (with an auxiliary verb), which is the most natural way to describe a picture. This difference had no impact on the results. The tables also present the results for referential and quantified antecedents apart for the reasons outlined in section 2, and the cases in which the target response was a no-answer, to set aside the natural tendency of children to say "yes" in experiments of this type (Crain and Thornton 1998):

Pronouns		Referential subject	Quantified subject
Simple verb	Yes	86,8%	88,6%
	No	70,2%	70,2%
	Total	78,5%	79,4%

T3. Cristóvão's (2006) results on the comprehension of pronous with simple verbs.

Pronouns		Referential subject	Quantified subject
Verb + aux	Yes	93,9%	94,7%
	No	84,2%	78,1%
	Total	89,1%	86,4%

T4. Cristóvão's (2006) results on the interpretation of pronouns with progressive.

As shown in the tables above, Portuguese children have very good performances in the interpretation of pronouns. Actually, Cristóvão (2006) reports that the performance in the interpretation of anaphors is comparable to the performance attained in the interpretation of pronouns.

Based on these results, it is legitimate to state that hypothesis 1 is confirmed, that is, like in other clitic languages, children correctly rule out co-referential interpretations for clitics and local antecedents.

In the next section, we present an experiment in which we test hypothesis 2.

4. Experiment on comprehension of strong pronouns in embedded context

In order to test hypothesis 2 and evaluate whether children acquiring European Portuguese have difficulties in the comprehension of strong pronouns, we developed a test for evaluating whether children aged between 3 and 5 know that an overt strong pronoun typically does not have an antecedent in the matrix clause, as shown in (10) above.

4.1. Methodology

The general method used was the following. Children were introduced to two characters who whispered secrets to one of the experimenters. The experimenter said what the character told him and the child's task was to tell who the subject of the action involved was. In (11), we give an example of a test item:

(11) SITUATION: There are two characters involved: Noddy and Shrek. Shrek whispers a secret into the experimenter's ear. The experimenter says:
"O Shrek disse que está cansado. Quem é que está cansado? O Shrek ou o Noddy?"
The Shrek said that Ø is tired. Who is tired? Shrek or Noddy?
Target: Shrek

The two characters were always contextually present, and active in the test, so they would be both potential antecedents. The order of presentation of the characters in the lead-in was randomized so that there was no priming effect on the answer.

The following conditions were tested:

A. Embedded null subject co-referent with matrix subject:

A1:   without an overt internal argument
O Noddy disse que __ tinha fome.
Noddy said that __ was hungry.

A2.   with an overt internal argument
O Noddy disse ao Shrek que __ tinha fome.
Noddy said to Shrek that __ was hungry

B. Embedded null subject not co-referent with matrix subject:
O Noddy pediu ao Shrek que __ fizesse um desenho.
Noddy asked Shrek that __ makes a drawing

C. Embedded overt subject not co-referent with matrix subject:
O Noddy disse que ele tinha fome.
Noddy said that he was hungry

D. Null subject in coordination (obligatorily co-referent):
O Noddy viu o Shrek e sorriu.
Noddy saw Shrek and smiled

E. Overt subject in coordination (obligatorily non co-referent):
O Noddy viu o Shrek e ele sorriu.
Noddy saw Shrek and he smiled

Let us consider the rationale behind each condition. The comparison between conditions A1 and C allows for establishing whether there is an asymmetry between null pronouns and strong pronouns. The comparison between these two conditions is actually the crucial one for testing our hypothesis. However, it is important to discard other hypotheses, which justifies the presence of other conditions. Comparing conditions A1 and A2 permits analyzing whether the presence of an overt antecedent makes the task more difficult or more accessible. Likewise, the comparison between conditions A and B allows for establishing whether there is a general preference for co-reference. Condition B includes a null subject in a context in which co-reference with the matrix subject is ruled out, because of the type of matrix verb and because of the subjunctive in the embedded clause. Finally, the coordination environments are added, because co-reference is obligatory with null subjects and forbidden with overt subjects and not just a preference (as in the contexts of subordination – cf. Montalbetti 1984, Lobo 1994). The inclusion of conditions D and E was, therefore, an attempt to annul some potential difference in results between preferential contexts and categorical contexts for binding. 3 items per conditions were used.

We tested 35 typically developing children, aged from 3 to 6, living in the area of Lisbon. The children were divided in 3 age groups with the following characteristics: 5 children aged from 3;0 to 4;4 (mean age: 3;8), 14 children aged from 4;6 to 5;5 (mean age: 4;11) and 16 children aged from 5;6 to 6;4 (mean age: 5;10).[1] The control group was 15 adults aged between 20 and 32 with university background, and no training in Linguistics.

Each participant was tested individually in a quiet room. No time limit was imposed during testing, and no response-contingent feedback was given by the experimenter. The sentences of the various types were randomly ordered, with no more than two sentences of the same type appearing consecutively, and the sentence was repeated if the participant asked for it.

4.2. Results

Let us start by considering the results of the control group. In conditions A1, A2 and D, all participants opted for the co-referent interpretation between the null form and the matrix subject. In the conditions in which disjoint reference was expected, this was indeed the emerging pattern, as shown in the following results:

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[1] For further information regarding the participants, see Ambulate (2008).
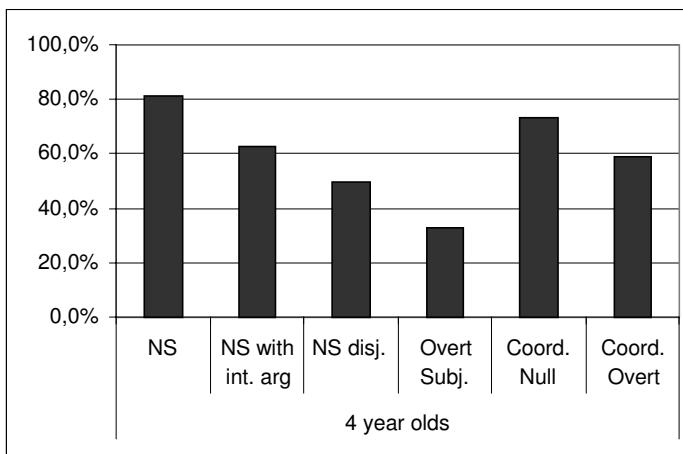
(12) Results – Control group:
  a. Condition A1: co-referent interpretation: 100%
  b. Condition A2: co-referent interpretation: 100%
  c. Condition B: disjoint interpretation: 100%
  d. Condition C: disjoint interpretation: 93,3%
  e. Condition D: co-referent interpretation: 100%
  f. Condition E: disjoint interpretation: 100%

The results of the control group are interesting not only because they confirm the validity of the test, but also because they show that the difference between coordination and subordination – that is, the difference between obligatory and preferential contexts for co-reference – was not a problem for the adult speakers. This difference was irrelevant in the case of null subjects (A vs. D) and almost null in the case of overt subjects (C vs. E).

As for children, the following graphs illustrate their performances in the test according to the target (i.e. the control group):
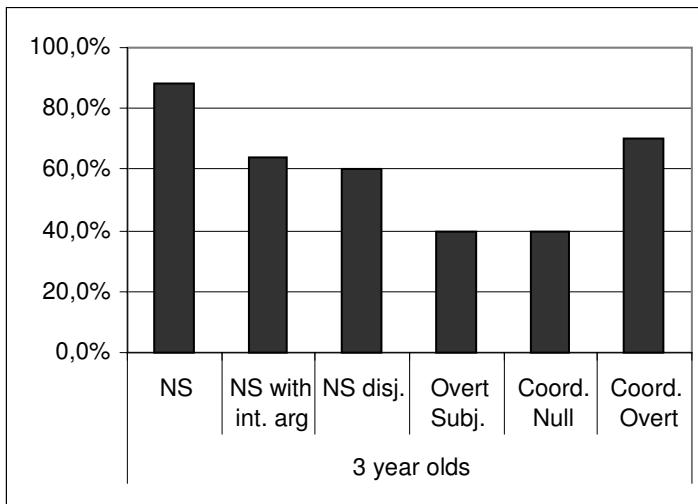
Graph 1: Results – 3 year old group

Graph 2: Results – 4 year old group
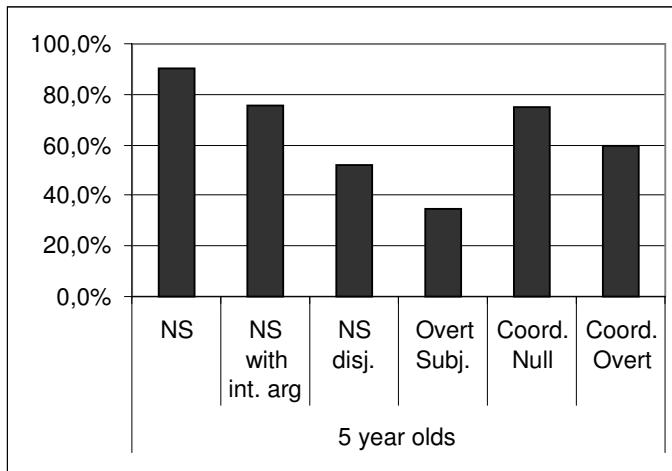
Graph 3: Results – 5 year old group

As can be seen in the graphs above, two major results emerge. First, there is a clear contrast between null and overt subjects in the embedded environments (conditions A1 and C). In all age groups, the overt subject has very low performances and the null subject has a better performance. Second, it is clear that the null subject in coordination environments is different, since the 3 year old group performs very badly in this condition, with a significant improvement in the 4 year old group. Finally, the condition in which disjoint reference is induced (with a subjunctive) creates difficulty in all age groups.

4.3. Discussion

The results presented above reveal that children perform worse in the presence of overt subjects, apparently confirming the hypothesis under discussion in the paper. However, the same results also show that adding an intervening argument and forcing disjoint reference with a null subject makes the interpretation harder. For this reason, it is important to establish whether the difficulty with overt pronouns is due to the presence of overt pronouns or to a generalized difficulty with disjoint reference.

Note that the failure in comprehending structures with overt strong pronouns cannot be attributed to a general problem with disjoint reference. Recall the data from Cristóvão (2006). In her experiment, it was shown that children succeeded in a context of disjoint reference. If there was a generalized problem with disjoint reference, they should fail with clitics as well, contrary to fact. Moreover, the context of obligatory disjoint reference (in coordination environments) is always better than the context of binding into a strong pronoun, which would be unexpected if the issue were disjoint reference, since then children should behave alike in these two conditions. Taking into consideration these aspects, we are thus faced with two independent problems: a preference to assign co-referent interpretations to null forms and a problem interpreting overt strong pronouns. The latter confirms the hypothesis under testing: since children's co-reference problems bear on the clitic-full pronoun asymmetry, it is predicted that children acquiring European Portuguese incorrectly allow for co-referential interpretations between matrix subjects and embedded full pronouns.

A final comment must be made regarding the asymmetry in performance between null subjects in subordinate clauses and in coordinated clauses. The bad performance by 3 year olds on the latter is not surprising, if one assumes, as in Costa & Friedmann (2009), that the null subject in the coordinated clause is not a *pro*, but a gap of a movement dependency. This explains that structures of this type are possible also in language that lack *pro*.

5. Conclusions

In this paper, we arrived at two major descriptive observations:

a) Portuguese speaking children correctly interpret pronominal clitics in simple declarative sentences as disjoint from a local antecedent.

b) Portuguese speaking children incorrectly interpret strong subject pronouns as co-referent with a matrix subject.

From these observations, three major conclusions may be drawn:

a) First, there is no generalized problem in interpreting pronominal forms. In fact, the data shows that children acquiring the same language, at the same age can interpret pronominal forms or not, depending on the syntactic environment or on the type of pronominal form. This strongly militates against any form of maturation of binding principles, since a late acquisition of Principle B would predict that children would fail in any binding task.

b) Second, there is no generalized problem in interpreting co-referential expressions. The data discussed revealed that the establishment of co-reference relations is only problematic in certain environments. If there was a generalized late acquisition of pragmatic principles, one would expect a generalized failure in the establishment of co-reference relations. We can, therefore, conclude that our data provide evidence against the maturation of pragmatic principles as an explanation for problems in the comprehension of pronominal forms.

c) The finding that there is a problem with specific pronominal forms – strong pronouns – favors Grolla's (2006) interpretation of the so-called Delay of Principle B Effect as an interface problem contingent on the syntax of specific pronominal forms.

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