

Pronouns as Elsewhere Elements: Implications for Language Acquisition

Elaine Grolla, Ph.D.

University of Connecticut, 2005

This dissertation investigates the acquisition of A- and A'-bound pronouns in Brazilian Portuguese and English. Previous studies on the acquisition of pronouns have found that children behave at chance level when pronouns with local antecedents in A and A' positions are tested.

The hypothesis under investigation here is that children performed poorly in tests with locally A- and A'-bound pronouns because the source of the problem is the same. There are several reasons to pursue a unifying approach. First, both constructions involve pronouns. Second, results of studies in several languages indicate that children perform similarly on both tests, incorrectly accepting these cases at chance level. 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.

Following Hornstein (2001), I assume that (A- and A'-) bound pronouns are elsewhere elements, that can only be inserted in a derivation *if needed for convergence*. Adopting Grodzinsky and Reinhart's (1993) hypothesis, I claim that such a condition is too demanding for young children, as their limited working memory cannot handle complex computations, such as those required in order to assess if bound pronouns are licit in a derivation.

Using the grammaticality judgment task, the same Brazilian Portuguese- and English-speaking children were interviewed on two experiments, one involving A-bound pronouns and another involving A'-bound pronouns. The data revealed that the majority of the children performed at chance level (50% correct responses) when A'-bound pronouns placed in extractable positions were tested (**the frog that **he** is skating is happy*). Children also behaved at chance level when pronouns locally A-bound by both referential and quantified antecedents were tested (**the dog_i/every dog_i is scratching **him_i***). Importantly, children did not behave at chance in control cases where the kind of computation mentioned above is not necessary. In these cases, children behaved at ceiling. These results support the hypothesis under investigation here, indicating that children's problems with pronouns is related to processing problems rather than to the lack of some linguistic knowledge.

Pronouns as Elsewhere Elements:
Implications for Language Acquisition

Elaine Grolla

B.A., Universidade Estadual de Campinas, 1997

M.A., Universidade Estadual de Campinas, 2000

M.A., University of Connecticut, 2003

A Dissertation

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

at the

University of Connecticut

2005

UMI Number: 3187726

Copyright 2005 by
Grolla, Elaine

All rights reserved.

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

UMI[®]

UMI Microform 3187726

Copyright 2006 by ProQuest Information and Learning Company.

All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

Copyright by

Elaine Grolla

2005

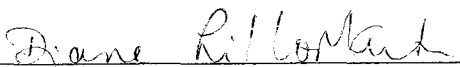
APPROVAL PAGE

Doctor of Philosophy Dissertation

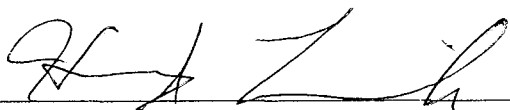
Pronouns as Elsewhere Elements: Implications for Language Acquisition

Presented by

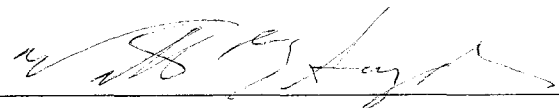
Elaine Grolla, B.A., M.A.

Major Advisor 

Diane Lillo-Martin

Associate Advisor 

Howard Lasnik

Associate Advisor 

William Snyder

University of Connecticut

2005

Acknowledgments

Working with the members of my advisory committee was an extremely rewarding experience. I wish to thank Diane Lillo-Martin for the dedication and interest with which she discussed my ideas with me. My meetings with her were always very productive as she always provided me with interesting feedback. I have learned a lot from her, both academically and professionally. I am truly indebted to her for all the dedication and friendship. I am also very thankful to Howard Lasnik, whose careful reading of my dissertation gave me a lot more understanding of my own ideas. Numerous students before me have commented on Howard's wonderful skills as a teacher, and it is hard to say something new about it. He is truly a gifted and inspiring person. As he says, you can always be better in what you do. I believe this is an important aspect of his brilliance as a linguist and this is a lesson I will carry with me forever. I also wish to thank William Snyder, for his attention and interest in my work. He raised interesting questions and gave me important feedback on several issues in this dissertation.

This research would not have been possible without the children who participated in the studies. It is to them that I express my utmost gratitude. Thanks to the children and teachers from the 'Toulouse Lautrec' school in Brazil and the children and teachers from the 'Mansfield Discovery Depot' in Connecticut.

I would also like to thank the other members of the faculty, for their support and friendship. Thanks to Željko Bošković, Yael Sharvit, Sigrid Beck, Eva Bar-Shalom, Jonathan Bobaljik, Susi Wurmbrand, Andrea Calabrese, Harry van der Hulst and Mona Anderson. Judy Marcus, our department secretary, also deserves my gratitude.

It is fair to say that without Jairo Nunes' help and encouragement I would not have come to the United States. Not only that, he was also the person who introduced me to formal syntax and gave me great support in my academic life. Needless to say, I am indebted to him for all that. Jairo is above all a friend and I treasure his friendship.

For discussing the ideas presented in this dissertation with me, I would like to thank Cedric Boeckx, Željko Bošković, Andrea Gualmini, Norbert Hornstein and Jairo Nunes.

The students in the department of linguistics at UConn have provided a friendly atmosphere in which to work. Thanks to Klaus Abels, Masahiko Aihara, Duk-Ho An, Inkie Chung, Sarah Felber, Natasha Fitzgibbons, Carlos Buesa García, Simona Herdan, Takako Iseda, Bosook Kang, Pei-Jung Kuo, Luisa Martí, Fumi Niinuma, Masashi Nomura, Karen O'Brien, Toshiko Oda, Sei-Rang Oh, Bum-sik Park, Jong-Un Park, Deborah Pichler, Natasha Rakhlin, Lara Reglero, Miguel Rodríguez-Mondoñedo, Tsuyoshi Sawada, Serkan and Nilüfer Sener, Koji Sugisake, Shigeki Taguchi, Takuro Tanaka, Oksana Tarasenkova and Sandy Wood.

My stay in the United States was made more enjoyable thanks to the Brazilian people living in Storrs and in Cambridge. At UConn, thanks to Ana Cláudia Bastos and Cynthia Zocca. At MIT, thanks to Cristina, Ana, and Alexandre Ximenes, and Andres, Amélia, Rafael and Tomás Salanova.

I would like to thank CAPES - Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (grant 1740/99-7), for the research funding.

Back in Brazil, I want to thank my parents-in-law, Vera Lúcia and José Olindo and my brother-in-law, Daniel, for the delicious churrascos, caipirinhas, all the laughs and fun! I also wish to thank my brothers, Júnior and Waner, and my sisters-in-law, Ana Cláudia and Vanda. Thanks also to my precious nephew and niece, Vítor and Vivian. My parents, Vilson and Sueli, were always incredibly supportive. Obrigada pelo carinho, pela atenção, pelos longos telefonemas. Saber que eles estavam sempre ao meu lado me deu forças pra continuar.

Finally, I wish to thank my husband Marcelo, for his unconditional support, both personally and academically. I will always cherish his friendship, complicity and love. From the bottom of my heart, I dedicate this dissertation to him.

Table of Contents

Chapter I – Introduction	1
1.1 Introduction	1
1.1.1 Language Acquisition and the Theory of Principles and Parameters	1
1.1.2 A-Bound Pronouns in Adult Languages	3
1.1.3 A'-Bound Pronouns in Adult Languages	5
1.2 The Acquisition of Pronouns	7
1.2.1 The Acquisition of A-Bound Pronouns	7
1.2.2 The Acquisition of A'-Bound Pronouns	10
1.2.3 Proposal	11
 Chapter II – Previous Studies	 22
2.1 Studies on the Acquisition of A-Bound Pronouns	23
2.1.1 Chien and Wexler (1990)	25
2.1.2 Thornton and Wexler (1999)	33
2.1.3 Grodzinsky and Reinhart (1993)	42
2.1.4 Conclusion	47
2.2 Studies on the Acquisition of A'-Bound Pronouns	47
2.2.1 Labelle (1988, 1990)	54
2.2.2 Pérez-Leroux (1995)	57
2.2.3 McKee and McDaniel (2001)	63
2.2.4 Conclusion	68
2.3 Conclusion to Chapter 2	69
 Chapter III – The Acquisition of A- and A'-Bound Pronouns	 70
3.1 Introduction	70
3.2 Pronouns as Elsewhere Elements	72
3.2.1 Pronouns in Brazilian Portuguese	81
3.2.2 Technical Implementations	84
3.2.2.1 <i>The Insertion of 'Self'</i>	84
3.2.2.2 <i>The Insertion of Pronouns</i>	87
3.2.2.3 <i>Coreferential Pronouns</i>	90

3.2.3	Reference-Set Computation	94
3.3	Reference-Set Computation and Working Memory	96
3.3.1	Reference-Set Computation and Language Processing	97
3.3.2	Working Memory Capacity in Children and Adults	101
3.4	Proposal and Predictions	104
Chapter IV	– Experimental Results	110
4.1	Introduction	110
4.2	Experiments	112
4.2.1	Experiment I: English	112
4.2.2	Experiment II: Brazilian Portuguese	125
4.3	General Discussion	130
4.3.1	Chance Level Performance	130
4.3.2	Reaching the Steady State	133
4.3.3	Avrutin and Wexler (1992) on the Acquisition of Russian	135
4.4	Quantified Antecedents	138
4.4.1	“DP – him” vs. “QP – him” Acceptance Rates	139
4.4.2	Chien and Wexler (1990)	141
4.4.2.1	<i>Experiment III: The Saliency Test</i>	148
4.4.3	Thornton and Wexler (1999)	154
4.4.4	Conclusion	157
4.5	Conclusion to Chapter 4	158
Chapter V	– Final Remarks	160
5.1	Introduction	160
5.2	The Acquisition of Bound Pronouns	160
5.3	The Elimination of Principle B from the Theory of Grammar	165
5.4	Implications for Future Research	172
Appendix I	– Sentences Used in Experiment I (English)	180
Appendix II	– Sentences Used in Experiment II (Brazilian Portuguese)	181
Appendix III	– Sentences Used in Experiment III (Saliency Test)	183
References		184

Chapter I - Introduction

1.1 Introduction

1.1.1 Language Acquisition and the Theory of Principles and Parameters

This study is couched within the generative theory of Universal Grammar (Chomsky (1975, 1981, 1986)). According to this theory, human beings are born with a system of richly structured linguistic knowledge wired in the mind/brain. This hypothesis about an innately endowed linguistic knowledge is based on the observation that speakers know fairly abstract properties of their languages, which could not be brought about only from the evidence available to children acquiring language.

The evidence on which children rely when acquiring language is comprised of sentences uttered around them. Adults' corrections, informing the child of what is *not* possible in the language s/he is acquiring, are generally assumed not to play a role in language acquisition. This is so due to the fact that this kind of evidence (the so-called *negative evidence*) is not available to all children on all occasions. Also, it has been observed that this kind of evidence is generally noisy and not sufficient (see Bowerman (1988); Brown and Hanlon (1970); Marcus (1993); and Morgan and Travis (1989)).

Therefore, if children do not make use of negative evidence when acquiring a language, the most straightforward way to explain how the process of language acquisition takes place is to assume that there is some kind of knowledge already in place informing the child of what is not possible in the language s/he is acquiring.

Universal Grammar (UG) corresponds to this innate linguistic knowledge claimed to be present in human beings' mind/brain. UG consists of a set of constraints that hold universally and that cannot be violated. In this theory, there are two types of constraints: the principles, which are invariant properties of languages, and the parameters, which encode properties varying from language to language. Parameters can be thought of as switches that are turned on or off during the process of language acquisition. Children's task in this process is to set the parameters based on their experience. Therefore, in the hypothesis being assumed here, UG defines the range of possible variations among languages, and guides language acquisition.

Making use of this theoretical framework, the present study is concerned with the acquisition of pronominal elements appearing in two distinct environments, namely, pronouns with local subjects as their antecedents, as in (1), and pronouns appearing in the relativized position of relative clauses, as in (2):

- (1) * *Donald* likes *him*.
- (2) * This is the boy that *he* likes ice cream.

These sentences are not possible in adult English. In (1), the pronoun is A-bound, as its antecedent (the local subject) is in an A-position. In (2), the pronoun is A'-bound, as its antecedent (the relative operator) is in an A'-position. While A-bound pronouns are generally analyzed as being regulated by a UG principle known as Binding Principle B,

A'-bound pronouns appearing inside relative clauses are usually assumed to be constrained by language-specific rules. In what follows, I discuss the adult distribution of A-bound pronouns in section 1.1.2 and of A'-bound pronouns in section 1.1.3.

1.1.2 A-Bound Pronouns in Adult Languages

In this section, I discuss how UG handles the distribution of A-bound pronouns in natural languages. The principle responsible for this distribution is called Binding Principle B, and it is part of a more general module called "Binding Theory." There are three principles altogether: Binding Principles A, B and C. Binding Principle A handles the distribution of anaphors and Principle C deals with R-expressions. In what follows, I will discuss only Principles A and B, as there is a close relation between the distribution of anaphors and pronouns. I will not comment on the distribution of R-expressions. Below, I provide a version of Principle A as stated in Chomsky and Lasnik (1993):

- (3) An anaphor must be bound in a local domain.

This principle requires anaphors to have an antecedent that is 'close' to it. 'Local domain' is approximately the minimal clause containing the anaphor. In order to be bound by an antecedent, the anaphor must be c-commanded by and coindexed with it. Finally, although this is not mentioned in this version of the principle, the antecedent for the anaphor must be in an A-position. In order to observe how this principle works, consider the sentences below:

- (4) a. Minnie Mouse_i is scratching herself_i.
b. *Minnie Mouse_i is scratching herself_k.
c. *Minnie Mouse_i saw that Goldilocks_k scratched herself_i.

Sentence (4)a is fine. It has the anaphor c-commanded by and coindexed with a local antecedent, as required by Principle A. However, in (4)b the anaphor is not coindexed with an antecedent, which results in ungrammaticality. In (4)c ungrammaticality also arises, as the anaphor and its antecedent are not in the same clause.

Turning now to Principle B, below I provide Chomsky and Lasnik's (1993) formulation of it:

(5) A pronoun must be free in a local domain.

'Free' means 'not bound.' So, the requirement for a pronoun is that it must not be c-commanded by and coindexed with an element in its clause. Some versions of this principle state that pronouns must be A-free in a local domain, that is, a pronoun must not have a local antecedent in an A-position. Consider the sentences below:

- (6) a. * Wonder Woman_i likes her_i.
b. Wonder Woman_i likes her_k.
c. Wonder Woman_i thinks that Lois Lane_k likes her_i.

In (6)a, as coindexation indicates, Wonder Woman is the antecedent for the pronoun. Given that they are in the same clause, the sentence is ruled out. Sentence (6)b is fine because the pronoun does not have an intra-sentential antecedent. Although Wonder Woman is in the same clause as the pronoun, it is not the antecedent for it, as their indexes are distinct. Finally, in (6)c the pronoun and its antecedent are in different clauses and the sentence is good.

Comparing the sentences in (4) and (6), we can see that when the anaphor is possible, the pronoun is not. Conversely, when the pronoun is possible, the anaphor is not. This complementarity between pronouns and anaphors is captured in Binding Theory

by positing opposite requirements for pronouns and anaphors. Given that both Principles A and B make use of the same notion of local domain, the complementarity is guaranteed.¹

1.1.3 A'-Bound Pronouns in Adult Languages

The class of A'-bound pronouns that will be of concern here relates to pronouns appearing in the relativized positions of relative clauses. These elements are called 'resumptive pronouns' (RPs).² A RP is bound by the relative operator, which is sitting in an A'-position. When these pronouns are sitting in extractable positions, we can say that they are locally A'-bound by their antecedents.

The distribution of these elements in English is very restricted. For example, RPs are not possible in extractable positions, such as subject, direct object, and oblique, as shown below respectively:

- (7) a. * The smurf that **he** likes ice cream is dancing.
b. * The troll that Mary kissed **him** is happy.

¹ It is not the case that anaphors and pronouns are always in complementary distribution. As the examples in (i) and (ii) illustrate, there are some environments where both pronouns and anaphors are possible. Observe also that in some cases the anaphor can be non-locally bound by its antecedent, as in (iii) and (iv). Finally, in (v) it is shown that in some cases both the anaphor and the pronoun are impossible:

- (i) John pulled the blanket over him/himself.
(ii) They saw their/each other's friends.
(iii) Bill remembered that the *Times* had printed a picture of himself in the Sunday edition.
(iv) Max boasted that the queen invited Lucie and himself for a drink.
(v) We like (*me)/(*myself).

I will not discuss these cases in the text. For a discussion of the cases in (i) and (ii), see Lees and Klima (1963), Lakoff (1968), Chomsky (1981), Kuno (1987), among others. For a discussion of picture phrases, as in (iii), see Pollard and Sag (1994). For the case in (iv) where the anaphor is free in its local domain, see Ross (1970), and Kuno (1987), among many others. For a discussion of (v), see Lasnik (1981). For a general discussion of these cases, see Reuland and Everaert (2001).

² Sells (1984) makes a distinction between 'resumptive pronouns' and 'intrusive pronouns.' This distinction will not be relevant to the discussion above. Thus, I will use the term 'resumptive pronoun' as indicated in the text, that is, as referring to pronouns present in relativized positions inside relative clauses. The term 'intrusive pronouns' will not be used in the text.

- c. * The troll that Mary talked about **him** is ugly.

These sentences become acceptable if the RPs are replaced with gaps:

- (8) a. The smurf that ___ likes ice cream is dancing.
 b. The troll that Mary kissed ___ is happy.
 c. The troll that Mary talked about ___ is ugly.

RPs seems to be more acceptable in sentences where the relativized position is inside islands, that is, in unextractable positions:³

- (9) a. This is the pirate that Mama Bear laughed [when **he** arrived].
 b. This is the pirate that Goldilocks knows [the girl who likes **him**].

In these cases, a gap is not possible:

- (10) a. * This is the pirate that Mama Bear laughed [when ___ arrived].
 b. * This is the pirate that Goldilocks knows [the girl who likes ___].

The data above shows us that there is a complementarity in the distribution of RPs. When gaps are possible, RPs aren't. Conversely, when RPs are allowed, gaps aren't.

The distribution of RPs varies from language to language. While in English the use of these elements is very restricted, in languages like Palestinian Arabic they are very productive. For example, in this language RPs *must* be present not only inside islands but also in direct object and oblique positions, as shown below (data from Shlonsky (1992), page 445):⁴

- (11) a. l-bint ʔilli šufti-*(ha)
 the-girl that (you.F) saw-(her)
 'the girl that you saw'

³ Note that, even in these cases, some native speakers of English do not consider RPs to be fully grammatical. Some speakers consider sentences with RPs inside islands to be 'tolerable,' to use William Snyder's terms (p.c.).

⁴ The star outside the brackets indicates that the RP is obligatory.

- b. l-bint ʔilli fakkarti fii-*(ha)
 the-girl that (you.F) thought on-(her)
 ‘the girl that you thought about’

Given this cross-linguistic variation, it is usually assumed that the distribution of RPs is regulated by language-specific rules. In subsection 1.2.3, an analysis for the distribution of RPs in English will be presented. But first, I discuss what has been already discovered about children’s acquisition of pronouns in A and A’ environments.

1.2 The Acquisition of Pronouns

1.2.1 The Acquisition of A-Bound Pronouns

As discussed above, Binding Principle B rules out sentences with pronouns locally A-bound. Therefore, in the sentence below, the pronoun cannot be interpreted as bound by Goofy:

- (12) Goofy is washing him.

Interestingly, children apparently allow an interpretation for this sentence in which ‘him’ is referentially dependent upon Goofy (that is, the pronoun can take Goofy as its antecedent), giving rise to an interpretation where Goofy is washing himself. This is not possible in adult English, where the pronoun can only have as its antecedent some other individual salient in the context. Children allow both the adult interpretation for the pronoun as well as the non-adult coreferential interpretation. Thus, children display an over-acceptance problem in the case of locally A-bound pronouns.

It is interesting to note that, although children allow a non-adult interpretation for the pronoun in the sentence above, they do not allow non-adult interpretations for anaphors. Consider the sentences below:

- (13) a. Pluto is scratching himself.
b. Pluto thinks that Mickey is scratching himself.

In (13)a, ‘himself’ must take Pluto as its antecedent. The anaphor cannot take some other relevant individual from the context as its antecedent. Children show such knowledge from an early age. Children also show knowledge that in (13)b, the anaphor has to take ‘Mickey,’ and not ‘Pluto,’ as its antecedent. So, children’s problem of over-acceptance is confined to the case of locally A-bound pronouns only. This indicates that children’s problem is related to the acquisition of Principle B. Given that children do not have over-acceptance problems with anaphors, their difficulty is not associated with Principle A of the Binding Theory.

Children’s acquisition of pronouns has been widely investigated in the last 20 years. The vast literature on this topic has consistently found that children acquiring languages such as Dutch, English, Icelandic and Russian sometimes accept sentences in which a pronoun has a local antecedent. Interestingly enough however, children acquiring Romance languages such as Catalan, French, Italian and Spanish are adult-like with respect to Principle B. 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 strong pronoun and children correctly rejected the sentences involving locally A-bound clitics. So, children’s problems with Principle B are confined to the cases with strong pronouns.

One of the main studies on the acquisition of Principle B is Chien and Wexler (1990). These authors interviewed 177 children acquiring English in the age range of 2

years; 6 months to 7 years. The experiment consisted of showing the children pictures of cartoon characters and then asking them yes/no questions about those pictures. In one of the trials, the picture depicted Mama Bear touching herself, and Goldilocks watching the scene. The experimenter showed children the picture and then asked:

(14) 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 in half of the trials children allowed the pronoun to have a local antecedent, in violation of Principle B of the Binding Theory. This 50% rate of acceptance is due to the fact that individual children sometimes answered the question affirmatively and sometimes negatively. Given that children appeared to be guessing randomly with a 50% probability of responding ‘yes,’ children were said to be behaving at chance level.

Since Chien and Wexler’s experiment, other researchers have replicated these results generally using the same methodology (see Avrutin (1999); Avrutin and Thornton (1994); Avrutin and Wexler (1992); Grimshaw and Rosen (1990); Jakubowicz (1984); McDaniel, Cairns and Hsu (1990); McDaniel and Maxfield (1992); Philip and Coopmans (1996); Sigurjónsdóttir and Hyams (1992); Thornton (1991); Thornton and Wexler (1999); Wexler and Chien (1985); among others).

Although researchers have found that children allow local coreference when the antecedent for the pronoun is a referential DP like ‘Mama Bear,’ the same over-acceptance problem does not emerge when the pronoun’s antecedent is a quantified expression, as in “Every bear is touching her.” Chien and Wexler (1990) tested this kind

of sentence using the same methodology described above and reported that children displayed adult behavior in these cases. That is, children rejected this kind of sentence at a high rate (84% of correct responses for 5 year-olds).

The fact that children correctly reject cases of pronouns locally A-bound by QPs has been taken as an indication that children are constrained by Principle B. The over-acceptance detected in cases of referential DPs is analyzed as being due to children's lack of some extra-linguistic knowledge. The particular proposals vary and some of them will be discussed in detail in chapter 2. I turn now to the acquisition of A'-bound pronouns.

1.2.2 The Acquisition of A'-Bound Pronouns

As was the case with A-bound pronouns, in tests investigating the acquisition of RPs, children also show an over-acceptance behavior. They accept RPs in extractable positions at a much higher rate than adults do. In order to illustrate children's behavior, I will mention the study conducted by McKee and McDaniel (2001). Using a grammaticality judgment task, these authors interviewed 38 English-speaking children between the ages of 3;5 to 5;11 and 34 adults. In their experiment, the experimenter acted out short stories in front of the child in order to provide a context for the target sentences. Following the story, the experimenter uttered the target sentence and asked the child if the sentence was 'the right way' or the 'wrong way' to say what happened in the story. In this test, all the sentences are true in the context. So, children do not answer 'yes' or 'no' based on the truth-value of the sentence, but on its acceptability.

McKee and McDaniel tested a large number of sentence types. Below I will mention just two of them, as a detailed discussion of their study is left to chapter 2. In (15)a, the RP is in the highest subject position and in (15)b it is inside an island:

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

Children accepted sentence (15)a 47% of the time, in contrast to adult speakers, who accepted this sentence only 2% of the time. Similarly to what happened in Chien and Wexler's study, children's rate of acceptance in this case can be considered chance performance, as they revolve around 50%. In unextractable contexts, as in (15)b, children's answers were similar to adults'. Children and adults accepted these sentences at a high rate, 78% for children and 80% for adults.

Comparing children's rates of acceptance in (15)a-b (47% versus 78%), we see that they make a distinction between RPs in extractable versus unextractable positions. However, the over-acceptance in extractable position indicates that they have not yet acquired the full distribution of these elements in English.

1.2.3 Proposal

Putting together the observations made in sections 1.2.1 and 1.2.2 (and leaving aside for a while the case of pronouns with quantified antecedents), we arrive at the following description of children's non-adult behavior. Children behaved at chance level performance (that is, around 50% correct responses) in tests with sentences containing pronouns locally A-bound and in sentences with RPs in extractable positions.

The aim of this dissertation is to provide a unifying explanation for this chance level performance. The proposal put forth here will explore the fact that the constructions that children over-accept (as in (16)a and (17)a below) have fully acceptable counterparts that do not contain pronouns. Observe the contrasts below:

- (16) a. * Mama Bear_i is touching her_i.
b. Mama Bear_i is touching herself_i.
- (17) a. * This is the duck that he loves Minnie Mouse.
b. This is the duck that __ loves Minnie Mouse.

That is, the sentences containing pronouns in (16)a and (17)a are not acceptable, but if we replace the pronoun by an anaphor or a gap, as in (16)b and (17)b respectively, the sentences become acceptable. Interestingly, in the case where children display adult behavior, the structure with the pronoun is acceptable and its counterpart without it isn't:

- (18) a. This is the troll that Ariel doesn't know what he's eating.
b. * This is the troll that Ariel doesn't know what __'s eating.

This contrast shows that the sentence with the RP is possible only when its counterpart with the gap is not. Intuitively, it seems that there is some kind of competition between the structures in (16)-(18): the structures containing pronouns are possible only when alternatives (such as the gap or the anaphor) are impossible.

The discussion so far has shown that the two cases where children have over-acceptance problems have various points in common. First, both structures involve bound pronouns (in one case, it is an A-bound pronoun and in the other it is an A'-bound pronoun). Second, both constructions involve some type of competition, as described

above. Third, the same 50% chance behavior is found in both cases. Finally, the age when these problems appear is the same in both cases, that is, around 4 and 5 years.

With all these points in common, the straightforward question that comes to mind is this, is there a commonality in the problems children face in the case of RPs and in the case of locally A-bound pronouns? This dissertation has this inquiry as its research question. Given the various similarities enumerated above, the experimental hypothesis is that the reason for the over-acceptance behavior in both cases has one underlying cause. If so, we expect children to exhibit chance level performance in tests with pronouns locally A- and A'-bound. The null hypothesis is that there will be no such association.

Turning now to the facts observed above relating to the 'competition' between structures with and without pronouns, these data have a natural explanation in adult language if we analyze pronouns as 'elsewhere' elements. That is, they are used only when alternatives are not possible. This proposal has recently been put forth by Hornstein (2001). In his theory, (A- and A'-) bound pronouns are analyzed as elsewhere elements that can only be used to save derivations that would be bad otherwise. This theory tries to eliminate Principle B from the theory of grammar by allowing movement to occur more freely and by analyzing pronouns as elsewhere elements.

As observed above, the cases where children have over-acceptance problems involve comparison between two derivations. That is, when one hears a sentence with an A-bound pronoun, one must compare it to its counterpart with an anaphor. If the latter is well formed, the former is not. In the case of A'-bound pronouns, they are allowed only when a gap is not. Here again one compares two structures, the one with the pronoun and the one with a gap. If the latter is fine, the former is discarded.

The proposal to be developed in chapter 3 is that children know this elsewhere character of pronouns, but that they cannot perform the required comparison between derivations with and without the pronouns. This hypothesis is motivated by the ideas developed in Grodzinsky and Reinhart (1993). These authors claim that children's working memory capacity is more limited than adults' and that children are not able to perform computations similar to ones discussed above. I assume that children's more limited working memory makes it impossible for them to hold two syntactic representations simultaneously and compare them, a necessary step in assessing sentences with bound pronouns. Being unable to perform the task, children guess randomly, giving rise to the chance level performance reported above.

This proposal differs in some important respects from Grodzinsky and Reinhart's analysis. These authors claim that the comparison with which children have problems is related to the coreferential readings of pronouns. As an illustration, consider the sentence below:

(19) John likes him.

This sentence has three potential interpretations. The first interpretation, which is not relevant here, has the pronoun referring to an individual other than John who is salient in the context. In the second interpretation, the pronoun is bound by John, giving rise to a reading like the following: John λx (x likes x). This reading is banned by Principle B, and Grodzinsky and Reinhart claim that children do not have problems with it. However, in the third interpretation for that sentence, the pronoun is coreferent to John, giving rise to the reading: John likes him (where *him* = *John*). Grodzinsky and Reinhart claim that this interpretation is not ruled out by Principle B, but by a coreference rule called Rule I. Rule

I allows coreference only when the bound interpretation and the coreferential interpretation of the sentence are distinct. That is, Rule I requires comparison between interpretations and Grodzinsky and Reinhart claim that children cannot handle the computations necessary in these cases. (Their analysis will be discussed in more detail in chapter 2).

Like Grodzinsky and Reinhart, I claim that children's problem is related to their more limited working memory, but the difficulty is not in comparing the possible interpretations for the sentence, but in comparing syntactic derivations with and without pronouns. The two analyses make different predictions for RPs, as in this case the pronoun and its antecedent (a relative operator) cannot be coreferent. In this case, the interpretations for a derivation with a gap and with a pronoun are the same and children still have problems.

An interesting consequence of my proposal is that, if for some independent reason, the competing representation cannot be derived, no comparison will take place and children should not have problems in performing the task. A relevant example is found in the case of RPs. When RPs are placed in unextractable positions, the gap is not possible, due to the impossibility of movement out of islands. So, the derivation involving movement crashes without converging (to use the terminology in Chomsky (1995)). Therefore, no structure with a gap is derivable and the derivation with the pronoun wins without comparison between derivations. With no comparison necessary, children are predicted to behave like adults. As the results of McKee and McDaniel's study with sentences like (15)b above indicate, this prediction seems to be borne out.

Summing up, the hypothesis being considered here takes pronouns to be elsewhere elements only used when necessary. In some cases, in order to decide whether a pronoun is allowed in a structure or not, hearers have to perform some computations that I claim children cannot handle, due to their limited working memory. When this happens, children are predicted to guess randomly, with a 50% probability of responding ‘yes.’ In other words, children are predicted to behave at chance level. When such computations are not required, as in the case of pronouns inside islands, children are predicted not to have processing problems and to behave like adults.

In order to test the experimental hypothesis, I conducted two experiments with forty Brazilian Portuguese-speaking children between the ages of 3;4 and 6;6 and twenty-three English-speaking children, between the ages of 3;7 and 5;11. Note that Brazilian Portuguese is a Romance language. As mentioned in section 1.2.1, children acquiring Romance languages do not over-accept sentences with locally A-bound clitics. Brazilian Portuguese has a mixed pronominal system with clitic anaphors and strong pronouns in object position. The test sentences presented to children in this case contained strong pronouns, and not clitics. Therefore, the expectation was that Brazilian Portuguese-speaking children should behave in a similar way to English-speaking children rather than French or Italian-speaking children.

In the experiments carried out in my study, A and A'-bound pronouns were tested, which yielded results for the same children in both domains. The methodology used was a grammaticality judgment task. The results of my experiments, to be fully described and discussed in the fourth chapter, show that the majority of the children indeed behaved at chance level on the two tests.

These results are accounted for by claiming that children's problem in both cases has one underlying cause, and is related to children's difficulty in performing the computations mentioned above. It is important to note that, despite the similarities mentioned above, previous studies on the acquisition of RPs and on the acquisition of Principle B have never explored the possibility that children's over-acceptance problems are correlated and thus never investigated both constructions with the same children. The chance level performance encountered in both domains in those studies was found for different children. Therefore, the results of the present study are enlightening, as they suggest that, no matter what type of analysis we propose, the range of data to be accounted for is broader than what was thought before.

We are left with one important issue to discuss, which relates to pronouns locally A-bound by quantified antecedents. In Chien and Wexler's experiment, although children had chance level performance when the antecedent for the pronoun was a referential DP like 'Mama Bear,' children were more adult-like when the potential antecedent for the pronoun was a QP like 'every bear.' These results go against the predictions of the present study. Given that there is competition between 'every bear is touching herself' and 'every bear is touching her,' we expect children to behave at chance in these cases too. In the grammaticality judgment task I conducted with Brazilian Portuguese-speaking children and English-speaking children, they indeed behaved at chance in these cases, supporting the present research hypothesis. We need then an explanation for such different results in these experiments.

I claim that the discrepancy between the results of my study and Chien and Wexler's study is due to a difference in the methodologies employed. As will be fully

discussed in chapter 4, I detected a confounding factor in Chien and Wexler's experiments and I claim that this factor is likely to be the reason for children's behavior.

Consider how Chien and Wexler's experiment was carried out. Children were shown a picture depicting, say, Goldilocks and three female bears. The bears were touching themselves and Goldilocks was watching them. The experimenter then said to the child: "these are the bears and this is Goldilocks. Is every bear touching her?" Chien and Wexler's hypothesis was that, if children knew Principle B, then they would not pick 'every bear' as the antecedent for the pronoun, given that this would violate Principle B. If they knew Principle B, they should pick Goldilocks as the pronoun antecedent. Given that the bears were not touching Goldilocks in the picture, they should answer 'no' to the question. Children acted as predicted and answered 'no' at a high rate, suggesting that they know Principle B.

I argue that there is another possible alternative to explain why children picked Goldilocks as the antecedent for the pronoun. Children might have picked her not because of Principle B, but because Goldilocks was highly salient in the context provided. In the picture shown in Chien and Wexler's paper, Goldilocks was much bigger than each bear. In addition, the three bears were identical looking and Goldilocks was physically different from them. These facts made her highly salient. This saliency drew children's attention to her, making her the most natural antecedent for the pronoun.

This claim is corroborated by experimental results. Besides the experiments using the grammaticality judgment task cited above, I carried out a second experiment with the English-speaking children. I used the same methodology used by Chien and Wexler. The experiment involved not only sentences where the pronouns were locally A-bound by

QPs, but also sentences where the pronouns were not locally A-bound by QPs, as in: “these are the dogs and this is Mama Bear. Is every dog touching her hat?” The picture accompanying this question depicted three small female dogs and Mama Bear, which was much bigger than the dogs, as in Chien and Wexler’s experiment pictures. The dogs were wearing hats and touching them. Mama Bear was also wearing a hat, but she was not touching it. Given that Principle B does not block the QP to be the antecedent for the pronoun in this case and that the dogs were indeed touching their hats, ‘yes’ was a possible answer. However, if the saliency of Mama Bear drew children’s attention in the same way I claim they did in Chien and Wexler’s study, then children should answer ‘no’ most of the time. As predicted, children in my study answered ‘no’ to this question at a high rate.

These facts and observations suggest that children’s answers in Chien and Wexler’s study might have been due to the saliency of the DP antecedent and not due to Principle B. In chapter 4, these issues will be discussed in great detail. In that chapter I will discuss how Thornton and Wexler’s (1999) methodology, although different from Chien and Wexler’s, also exhibits the same confounding factors. There will also be a discussion of how this confounding factor does not arise when the antecedent for the pronoun is a referring DP or when a different methodology (such as the grammaticality judgment task) is used.

To conclude, let me describe how this dissertation is divided. In chapter 2, I review and discuss previous proposals for the acquisition of RPs and Principle B. The number of theories that have been proposed in the literature in order to account for children’s problems in these two domains is enormous. I will discuss only some of them,

as it is impossible to do justice to all of the studies that were conducted in these two fields. The central objective of this chapter is to show how none of the proposals available in the literature can account for the full range of facts that are being considered in this dissertation.

In chapter 3, I present an analysis of bound pronouns, considering them to be ‘elsewhere’ elements. This is Hornstein’s (2001) theory of pronouns, which tries to eliminate Principle B from the theory of grammar by allowing movement to occur more freely and by analyzing (A- and A’-) bound pronouns as parasitic on movement. That is, bound pronouns are possible only if movement isn’t. In this chapter I also discuss Grodzinsky and Reinhart’s (1993) proposal concerning young children’s limited working memory. A brief review of some psychology studies on working memory capacity is presented, and it is discussed how some of them have investigated children’s working memory capacity and found it to be more limited than adults’.

Next, I claim that children’s problems in both A and A’ domains are due to processing reasons. Taking Hornstein’s theory of pronouns and Grodzinsky and Reinhart’s proposal on children’s limited working memory, we are led to the hypothesis that children should behave at chance level in sentences involving locally A-bound pronouns and RPs in extractable positions.

In chapter 4, I describe the experiments that were conducted in order to test this hypothesis. The children that participated in the study were acquiring Brazilian Portuguese and English as their native languages. The results obtained for both languages are reported and discussed, showing that the hypothesis entertained here is on the right track.

Finally, chapter 5 is the conclusion, where a summary of the study is provided. In this chapter I also discuss Safir's (2004) theory, which, similarly to Hornstein's theory, tries to eliminate Principle B from the theory of grammar. A comparison of these two theories is offered, where I evaluate which theory fares better in its predictions for language acquisition. I conclude that Hornstein's theory is more successful with the acquisition data and that, although Safir's theory is able to account for children's over-acceptance problems with locally A-bound pronouns, his theory does not predict the correlation we found in A and A' domains. As a final point, consequences of the present research to future studies are discussed.

Chapter II – Previous Studies

In this chapter I will review and discuss previous studies which investigated the acquisition of pronouns. Section 2.1 will be devoted to a discussion of studies on the acquisition of locally A-bound pronouns and section 2.2 will deal with studies on the acquisition of A'-bound pronouns. As the literature on these topics is very extensive, I will confine myself to the studies that were most influential in the field and to the ones that are most relevant to the theory advocated in this dissertation.

The main objectives of this chapter are first to report previous findings on the topics of interest here, providing an idea of the type of behavior children are claimed to have. Second, I intend to discuss both the experimental methods used in some of those studies as well as their theories, highlighting the problems I believe they have. Finally, I hope this discussion will show that the theories proposed in these studies cannot account for the full range of data to be presented and discussed in chapter 4.

2.1 Studies on the Acquisition of A-Bound Pronouns

The literature on the acquisition of binding theory is quite vast. Research on this topic has been conducted not only for English, but for other languages as well, such as Catalan, Dutch, French, German, Icelandic, Italian, Portuguese, Russian, Spanish, among others (see Avrutin (1999); Avrutin and Thornton (1994); Avrutin and Wexler (1992); Baauw, Escobar and Philip (1997); Boster (1994); Cairns, McDaniel, Hsu and Konstantyn (1995); Cardinaletti and Starke (1995); Chien and Wexler (1990); Deutsch, Koster and Koster (1986); Escobar and Gavarró (1999); Grimshaw and Rosen (1990); Grodzinsky and Kave (1993); Grodzinsky and Reinhart (1993); Hamann (2002); Hamann, Kowalsky and Philip (1997); Jakubowicz (1984); Jakubowicz, Müller, Kang, Riemer and Rigaut (1996); Kaufman (1988); Lasnik and Crain (1985); Lust, Loveland and Kornet (1980); McDaniel, Cairns and Hsu (1990); McDaniel and Maxfield (1992); McKee (1988); McKee (1992); McKee, Nicol and McDaniel (1993); Philip and Coopmans (1996); Sigurjónsdóttir and Coopmans (1996); Sigurjónsdóttir and Hyams (1992); Silva (1989); Solan (1983); Thornton (1991); Thornton and Wexler (1999); Varela (1988); Wexler and Chien (1985), among others).

The general picture that emerges from these studies is that in languages such as English and Dutch, children show knowledge of Principle A of Binding Theory before they show knowledge of Principle B.¹ That is, children correctly accept sentences containing locally A-bound reflexives most of the time and also reject sentences containing anaphors that are not locally A-bound, but incorrectly accept sentences

¹ For a different point of view, see Grimshaw and Rosen (1990) and Kaufman (1988). For a critique of Grimshaw and Rosen's analysis with respect to Principle A, see Grodzinsky and Kave (1993); with respect to Principle B, see Grodzinsky and Reinhart (1993) and Thornton and Wexler (1999).

containing locally A-bound pronouns around 50% of the time. In order to explain this behavior, the various researchers working on this phenomenon have come up with widely divergent analyses. Most of them have one point in common though: most of them assume that children know Principle B. Given that children display knowledge of Principle A and given that the same notions are involved in both binding principles (such as *c-command*, *coindexation* and *local domain*), then the most natural assumption is that children know Principle B, but perform poorly on the experimental tests due to some problem outside the grammar. That is where the points of variation among these theories reside: in what makes children accept illicit coreference of the pronoun with a referential antecedent. Grimshaw and Rosen (1990), for example, claimed that children's non-adult behavior is due to an artifact of the experimental design. That is, both children's syntactic as well as pragmatic knowledge is in place, but the experiments conducted by other researchers had flaws, which made children disobey Principle B. McDaniel and Maxfield (1992) proposed that children's behavior is due to a perceptual problem. They tested children on both Principle B and sensitivity to stress and found the following correlation. The children who displayed knowledge of Principle B were sensitive to stress, but the children who had a non-adult behavior with respect to Principle B were insensitive to stress. These authors claim that insensitivity to stress was the reason why children allowed the pronoun to corefer with a local antecedent. Avrutin (1999) claimed that children's over-acceptance of locally A-bound pronouns arises because they have difficulty in interpreting the intentions of other speakers.

It is important to note that, although children *accept* sentences with locally A-bound pronouns, they do not *produce* them. Bloom, Barss, Nicol and Conway (1994)

studied the spontaneous speech of three children acquiring English as their native language (from approximately 2;0 to 5;0 years of age) and discovered that they virtually always used pronouns in accord with the adult grammar. Also, in an elicited production task, de Villiers and Cahillane (2004) found that children's production of A-bound pronouns was virtually perfect.

Explanations for children's over-acceptance of Principle B violations are greatly varied. As mentioned before, I will not discuss here all of the proposals available in the literature, but will limit the discussion to the ones that are most relevant to the theory to be developed in chapter 3. In section 2.1.1, I will discuss Chien and Wexler's (1990) study. In section 2.1.2, I will present Thornton and Wexler's (1999) work. Section 2.1.3 is devoted to Grodzinsky and Reinhart's (1993) proposal. Finally, section 2.1.4 is the conclusion of this first part of the chapter.

2.1.1 Chien and Wexler (1990)

Chien and Wexler (1990) is a very important study as it influenced most of the subsequent work on the acquisition of Principle B. These authors interviewed 177 children on the age range of 2 years; 6 months to 7 years. They showed children pictures of cartoon characters, such as Mama Bear and Goldilocks, with one of them 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:

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

Children answered ‘yes,’ allowing the pronoun to corefer with the local antecedent, Mama Bear, around 50% of the time. Adults, on the other hand, never allowed such local coreference. An intriguing result emerged when Chien and Wexler tested sentences involving quantified antecedents. Test sentences were like the following:

(2) 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 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. Chien and Wexler’s results are that, contrary to what happened in the case of (1), children did not allow the pronoun to be locally A-bound, behaving like adults. That is, they correctly answered question (2) negatively most of the time.

If we observe the results obtained in Chien and Wexler’s study by age group, the facts are not so straightforward. The sentences below are some of the conditions they had in their experiments, and Table 1 provides their rates of correct responses for each of these conditions (in the matching cases, the correct response was ‘yes,’ and in the mismatching cases, it was ‘no’):

(3) **Match cases** (the picture matches the sentence. Correct response: Yes)

- a. Is Mama Bear touching her? (Picture: MB touching Goldilocks)
- b. Is every bear touching herself? (Picture: bears touching themselves)

- c. Is every bear touching her? (Picture: bears touching Goldilocks)
- (4) **Mismatch cases** (the picture does not match the sentence. Correct response: No)
- d. Is Mama Bear touching her? (Picture: MB touching MB)
- e. Is every bear touching herself? (Picture: bears touching Goldilocks)
- f. Is every bear touching her? (Picture: bears touching themselves)

<i>Age Groups</i>	<i>Match Cases</i>			<i>Mismatch Cases</i>		
	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>	<i>f.</i>
Under 4	91.67	77.43	88.54	30.90	29.51	46.88
4 – 5	88.52	76.67	94.44	39.26	40.74	60
5 – 6	90.15	89.39	97.93	49.24	82.95	83.71
6 – 7	94.58	94.17	98.75	76.67	84.58	86.67

Table 1 Percentage of correct responses (Chien and Wexler (1990))

The results show that children did not have problems in the matching cases. Even the children under 4 years of age accepted these cases at a high rate. This is true even for the questions containing QPs, as in (3)b/c. Turning now to the mismatching cases, we see that children had a much lower percentage of correct responses. The case that interests us here is the question in (4)f. In this case, a ‘yes’ response indicates that presumably the QP was taken as the antecedent for the pronoun, constituting a Principle B violation. The table shows that only the groups of 5-6 and 6-7 year-olds correctly rejected these sentences at a higher rate. Younger children accepted these cases around 50% of the time. Chien and Wexler claim that the problem with the younger children is not with Principle B but with the quantified phrases. In their control conditions, they had questions involving quantifiers and names, like the following:

- (5) These are the bears; this is Goldilocks. Is every bear touching Goldilocks?

In the matching picture, all the bears were touching Goldilocks and children gave correct responses more than 90% of the time for all age groups. However, in the mismatch

picture (where only two out of the three bears were touching Goldilocks), children's percentage of correct responses was very low, revolving around 30% for children under 4. Children in the 4 – 5 age range gave correct responses 71.48% of the time. The group of children between 5 – 6 years of age rejected these cases 93.94% of the time and the older group (6 – 7 years old) rejected these cases 97.29% of the time.

Given the poor performance of the two younger groups, Chien and Wexler reason that it might be the case that children under 5 years of age might have had poor performance in condition (4)f due to their problems with QPs. On the other hand, the children older than 5 years showed good performance in the QP-name condition, indicating they know the concepts of quantified NPs. They also behaved better in condition (4)f, which Chien and Wexler argue is an indication that they know Principle B.

The difference in behavior observed for children older than 5 years when QP and DP antecedents were tested (as shown in columns (d) and (f) of Table 1) received an ingenious explanation in Chien and Wexler's study. In order to discuss their proposal, let us first consider the sentence below:

(6) Minnie Mouse likes her.

This sentence potentially has two interpretations, one in which the pronoun refers to a salient individual in the context and another in which it refers to Minnie Mouse. These interpretations are illustrated below by means of indexing:

- (7) a. Minnie Mouse_i likes her_k.
 b. *Minnie Mouse_i likes her_i.

The structure where Minnie Mouse and ‘her’ are coindexed is excluded by Principle B but the structure where they are not coindexed is allowed. However, the noncoindexation in (7)a does not necessarily mean disjoint reference. That is, Chien and Wexler assume that two coindexed NPs must corefer, but two noncoindexed NPs are free in reference; they may or may not corefer. So, the noncoindexed structure can mean: Minnie Mouse likes her (& her = Minnie Mouse).

Following Reinhart (1983a, b), Chien and Wexler claim that a pragmatic principle, which they call Principle P, constrains the choice of reference in sentences like (7)a, so that the indexes *i* and *k* are not coreferential in cases like this.² In the case of quantified antecedents, such noncoindexation strategy is not available and the only possible interpretation has the pronoun not bound by the QP:

(8) Every dog likes her.

(9) a. * Every dog_i likes her_i.

b. Every dog_i likes her_k.

Sentence (9)a is excluded by Principle B and sentence (9)b has only the interpretation where every dog *x* likes her. Here, ‘her’ cannot corefer with ‘every dog,’ as QPs do not refer to anything. Therefore, the availability of coreference in noncoindexation cases is not possible with QPs.

Chien and Wexler proposed that children know Principle B, explicating why they are adult-like in sentences involving QPs. The reason why children are not adult-like in cases involving DPs is due to the fact that they do not know pragmatic Principle P. So, in

² In some cases where the context is appropriate, Principle P allows coreference, such as:

(i) That must be John. At least, *he* looks like *him*.

(ii) He’s wearing John’s coat. Therefore, *he* must be *John*.

These cases will be further discussed in sections 2.1.2 and 2.1.3 below.

a sentence such as (6), children might assign it the indexing shown in (7)a, but might give it a coreferential interpretation. This kind of non-coindexing is constrained by Principle P, but, as children do not know it yet, they allow coreference between a pronoun and a local DP antecedent in this case.

Although this proposal has been very influential and has been extremely important to the research on the acquisition of Principle B, it makes a strong prediction concerning Principle C, which does not seem to be confirmed by experimental data. Principle C states that R-expressions, such as Pluto in the sentence below, must be free. That is, R-expressions cannot be coindexed with and c-commanded by an antecedent. Consider the sentence below and its possible indexing options:

(10) He loves Pluto.

(11) a. * He_i loves Pluto_i.

b. He_i loves Pluto_k.

In the sentence above, Pluto cannot be coindexed with 'he,' as this violates Principle C. The indexation in (11)b is allowed. As was the case with pronouns, pragmatic Principle P may allow coreference in the case of noncoindexation, if the context supports it (cf. footnote 2). So, the noncoindexation in (11)b, under special context situations, may receive an interpretation where Pluto loves himself.

If children do not know Principle P, as Chien and Wexler claim, the straightforward prediction we make is that children will not show knowledge of Principle C in sentences like the one above. Children should behave similarly in tests with sentences like (6) and (10), as both cases are regulated by the same pragmatic rule, which children are claimed not to know. However, McDaniel et al. (1990) tested children on the

acquisition of the three principles of Binding Theory and reported that the children in their study showed knowledge of Principles A and C but not of Principle B. Thornton and Wexler (1999) also reported that children in their experiment were better on Principle C tests than on Principle B ones.³

Besides this kind of evidence that obviously weakened Chien and Wexler's proposal, I believe there is a learnability problem in their study as well. The problem lies in explaining how this pragmatic principle is going to be acquired. Usually, it is assumed that a grammatical constraint like Principle B cannot be learned based solely on evidence available in the input. This is so because it would require negative evidence indicating to the child what is *not* possible in her language. The same should be true of a pragmatic principle. As McKee (1992), following Lasnik's observations, points out, "whether Condition B is a pragmatic or a syntactic principle, it is a constraint and therefore unlearnable under the poverty of the stimulus assumption. The proposal that children learn a pragmatic Condition B is therefore as implausible as the idea that they learn a grammatical Condition B" (p. 46).

The last point I shall discuss is related to their experiment with quantified antecedents for the pronouns. In this chapter, I will only mention the problem and in chapter 4 this issue will be fully developed. As described above, in the experiments with potential QP antecedents, children saw a picture with, say, three identical bears touching themselves and a fourth distinct character (Goldilocks), which was only watching the scene. Children then were asked: "*is every bear touching her?*" A 'yes' response would indicate that children were taking the QP as the pronoun antecedent, violating Principle

³ For a more detailed discussion on the acquisition of Principle C, see chapter 5, section 5.3.

B. A 'no' answer would indicate that children were probably taking Goldilocks as the pronoun antecedent. Given that children answered 'no' most of the time, Chien and Wexler claimed that this was so because they were constrained by Principle B.

However, there is another possibility in interpreting children's answers that Chien and Wexler did not consider in their paper. 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. This possibility is highly likely, and a complete discussion about this is presented in chapter 4. I will claim that the experiment pictures in Chien and Wexler's study were flawed, as they had the extra sentential character (i.e., Goldilocks) stand out. This saliency made Goldilocks the most natural alternative as the antecedent for the pronoun. 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. In chapter 4, I discuss not only the reasons that led me to suspect that the saliency of Goldilocks in their pictures could have interfered with the results, but also provide experimental data corroborating this claim.

I finish this section observing that, although Chien and Wexler's study was a great contribution to the field due to its ingenious analysis of children's data, it makes some predictions concerning Principle C that does not seem to be confirmed. Also, as just mentioned, its experiments had some critical confounds, which ultimately brought results that are unreliable. Subsequent studies that based their analysis on these data also need to be revised as they make predictions that might not be confirmed by new experiments without these confounding factors.

2.1.2 Thornton and Wexler (1999)

Thornton and Wexler (1999) investigated children's knowledge of Principle B in simple sentences and in sentences involving VP ellipsis. In order to entertain their study with VP ellipsis in more detail, let us first consider simple sentences involving a pronoun and a DP antecedent, as in (12) below. In these cases the pronoun has three potential interpretations, as shown in (13):

(12) Mickey loves his dog.

(13) (a) Bound: Mickey (λx (x loves x's dog))

(b) Coreferential: Mickey (λx (x loves his dog) & his = Mickey's)

(c) Deictic, where 'his' = 'Goofy': Mickey (λx (x loves Goofy's dog))

In ellipsis constructions, the pronouns in the antecedent VP and in the elided VP also have these interpretations. Sentence (14)a is represented in (14)b with its elided material in angled brackets:

(14) a. Mickey loves his dog and Donald does too.

b. Mickey loves his dog and Donald does <loves his dog> too.

Again, we have three interpretations for the pronouns. However, if the pronoun in the antecedent VP is coreferential, then the pronoun in the elided VP must be coreferential also. This option gives us the reading where Mickey loves his own dog and Donald loves Mickey's dog too. Conversely, if the pronoun is bound in the first VP, it must be bound in the second also. The reading we get is: Mickey loves his own dog and Donald loves his own dog too. Finally, if the first pronoun refers to a salient individual in the context, the pronoun in the elided VP must refer to that individual also. The reading we get in this case is for example: Mickey loves Goofy's dog and Donald loves Goofy's dog too.

Thornton and Wexler, following Fiengo and May (1994) and Fox (1998), claim that these properties of VP ellipsis constructions are due to the parallelism constraint, as stated below (page 117 of Thornton and Wexler's book):

(15) *Parallelism Constraint*

NPs in the elided and antecedent VP must

(a) both be bound variables or both be referential pronouns (structural parallelism)

(b) if the pronouns are referential pronouns, they must have the same referent (referential parallelism).

In sentences involving QP antecedents, the context can make the options for the interpretations of pronouns unambiguous. Consider the sentence below:

(16) Mickey walked his dog and every duck did <walk his dog> too.

In a context where every duck walked his own dog, the pronoun in the elided VP has a bound interpretation; it cannot have a coreferential interpretation because QPs do not refer. Thus, according to the parallelism constraint, the pronoun in the antecedent VP must be bound also; it cannot be coreferential to Mickey, but must be bound by Mickey. Therefore, this kind of sentence is useful in tests on the acquisition of Principle B as it can make just the bound reading available and we can then observe children's behavior in this case. The deictic reading for the pronoun is made unavailable in the experiments, which guarantees that only the bound interpretation for the pronoun is possible.

This example demonstrates how helpful VP ellipsis constructions are. They can show us whether or not children behave differently in cases like the one above where just the bound reading for the pronoun is available and in cases where the coreference reading is also possible. Besides structures involving VP ellipsis, Thornton and Wexler also

tested simple sentences with locally A-bound pronouns and locally A-bound R-expressions. In what follows, I discuss their proposal and their experimental methods.

Following Heim (1998), Thornton and Wexler observe that in adult English local coreference interpretations for pronouns are possible in very specific contexts. The first one is what they call ‘identity debate’ cases, as shown in the dialogue below. The context for this dialogue is the following: there is a speaker on stage delivering a speech and person A, watching such speech, asks person B:

(17) A: Is this speaker Zelda?

B: How can you doubt it? She is praising her to the sky. No competing candidate would do that.

In person’s B second sentence, ‘she’ refers to Zelda, and so does ‘her.’ In such contexts, ‘she’ is a local antecedent for ‘her,’ but the sentence is acceptable. Heim claims that in this case of local coreference, two guises of the same individual are under consideration: the guise of Zelda on the stage at the time the conversation takes place and the guise of Zelda in the memories of persons A and B. A second context where Principle B is apparently violated is called ‘structured meaning.’ These involve sentences such as:

(18) You know what Mary, Sue and John have in common? MARY admires John, SUE admires him, and JOHN admires him too.

In the last clause of this sentence, John is a local antecedent for the pronoun. Stress on the name facilitates intended coreference. It is not possible to change the stress pattern above by focusing on the pronoun in object position. Variations of the sentence above are possible, in which Principle C is at stake:

- (19) You know what Mary, Sue and John have in common? MARY admires John,
SUE admires John, and ...
- a. HE admires John too.
 - b. HE admires him too.

Thornton and Wexler conjecture that sentences like (19)a and (19)b express the proposition that John's admiration of himself is unexpected or atypical in some way. They claim that stress on the pronoun in these sentences has the effect of presenting John in a different guise, in virtue of his surprising property of self-admiration. Thus, there is no Principle B or C violation in these cases. Although Heim (1998) does not analyze these cases of structured meaning as involving different guises of the same individual, Thornton and Wexler believe that such an approach is worth pursuing.

The third case considered by Thornton and Wexler involves run-of-the-mill examples with a stressed pronoun. These constructions allow local coreference and are more salient if accompanied by deixis:

- (20) Mama Bear washed HER.

According to Thornton and Wexler, when the pronoun is stressed, what is communicated is not just the idea that Mama Bear washed herself. It is the idea that Mama Bear is not washing someone else, as one might expect, but is washing herself instead, something that one might not have expected. Stress on the pronoun indicates that the individual being referred to is engaging in atypical behavior.⁴ In this case, no violation of Principle B seems to occur. According to Thornton and Wexler, here again we have two guises of

⁴ As pointed out to me by Diane Lillo-Martin (p.c.), in order to have coreference in (20), some speakers of English consider that it is more important to have the pointing than this 'expectedness' factor. That is, the pointing is a crucial factor in these cases and could alone be responsible for the possibility of coreference.

Mama Bear (page 95): “one guise is the character present in the visual scene (in the current example, Mama Bear). The second guise, introduced by the pronoun, is the same character – but a time-slice of that character that is engaged in unexpected behavior, (in the current example, behavior that is not usually associated with the Mama Bear in the visual scene, perhaps because the behavior is not expected of bears generally).”

Summarizing, all possible cases of local coreference considered above for adult English are analyzed by Thornton and Wexler as involving different guises of the same individual. In such cases, Principle B does not seem to be operative.

Thornton and Wexler account for children’s over-acceptance of locally A-bound pronouns by claiming that children’s knowledge of pragmatics is incomplete. So, children may give sentences interpretations that normally require special contextual support to be felicitous for adults. This means that children can assign different guises to the same individual, promoting the local coreference interpretation, even in run-of-the-mill contexts. According to Thornton and Wexler, what children are missing is real-world knowledge about the contexts that license local coreference interpretations. They must also learn how speakers alert hearers to the fact that local coreference is intended, by use of pronominal stress.

I believe that Thornton and Wexler’s proposal faces some significant difficulties.

The first problem lies in their claim quoted below (p. 98):

“For adults, the local coreference interpretation is permitted only if the event being described is unexpected [...]. No doubt, most adults have formed opinions about what is typical behavior (in and out of experimental settings) for bears in general, and for mother bears in particular. It may not strike adults as unexpected that a mother bear should decide to wash herself. Consequently, *Mama Bear washed her* does not evoke a local coreference interpretation. Children’s knowledge about the characteristic behavior of different creatures is far less complete than adults’. In the absence of firm opinions about the behavioral repertoire of bears (in and out of experiments), children are open to

construe the event of Mama Bear washing herself as the climax of the story. Not knowing whether or not this is typical or atypical behavior for Mama Bear, or for bears generally, children accept the local coreference interpretation of *Mama Bear washed her*.”

The problem with this claim is the following. In the story told to children in the experimental setting, and described below, Mama Bear is presented as a mother, feeding her baby, cleaning up the mess the baby did, etc. This is typical behavior of mothers in general, and children are familiar with the behavior of mothers. Also, children usually watch cartoons and read books, where animals are frequently doing what humans do. So, although children may not know what is typical behavior for bears in the real world, they do know that in fantasy world, where the story is being told, it is normal for bears to act like humans, feeding their babies, cleaning up, showering, etc... Therefore, it is not at all clear that children might have the kind of problem the authors suggest. In addition, as Maratsos (2002) points out, Thornton and Wexler did not investigate their pragmatic explanation directly. They could have provided evidence, for example, that children think that mother bears do not typically wash themselves. Or, they could have shown that, in situations where children are consistently not surprised at someone doing something to himself, children’s competence was perfect, following Principle B.

Another problematic claim made by these authors is the following (pages 98, 99):

“Children operate on the assumption that speakers are speaking truthfully, being relevant, and so on. [...] children’s adherence to the principle of cooperation encourages acceptance of the local coreference reading of sentences like *Mama Bear washed her*. To maintain the view that the speaker is being cooperative and is therefore saying something true, children search for the aspect of the context that matches a reading that makes the sentence true. That is, they search the experimental context to see if there is any way in which the sentence *Mama Bear washed her* could be a true description of the story. This search leads them to the final event, in which Mama Bear washed herself. In the absence of a firm conviction that this is typical behavior for bears, children are led to a different conclusion: that the speaker intends to point out that it is uncharacteristic behavior.” (My underlining).

In the experiment carried out by Thornton and Wexler, the puppet is presented as a creature that is not reliable: sometimes he does not pay attention to stories and says “the wrong thing,” other times he pays attention and says “the right thing.” Therefore, it is likely that the child would not assume that the puppet is being truthful. In fact, this is exactly what the child is evaluating and s/he would not reach conclusions based on what a non-reliable speaker like the puppet said.

These facts lead me to believe that Thornton and Wexler’s proposal, namely, that the cause of children’s apparent Principle B errors comes from their lack of knowledge about real-world conditions, cannot be on the right track. Besides the difficulties pointed out above, there is another problem with it concerning learnability issues. Thornton and Wexler claim that children learn from experience that contextual cues accompany the local coreference interpretation, such as the factor of “surprise.” Once children have witnessed a sufficient number of examples of the local coreference interpretation in contexts that contain the relevant contextual cues, they will then stop assigning this interpretation in the absence of these special markers. According to the authors, “the problem of learnability is circumvented by the accrual of real world knowledge in combination with innate pragmatic principles that govern the assignment of interpretation to sentences in conversational contexts” (page 105).

As pointed out by Atkinson (2002), the claim above is not sufficient to guarantee that children will arrive at the final state. To see this, consider the sentence “*Mama Bear washed HER.*” Suppose that this sentence was used by an adult in a context where it is clear to the child that two guises of Mama Bear are under consideration. What this situation tells the child is that pronominal stress is *compatible* with reference to a guise,

but crucially, it does not tell the child that lack of stress is *incompatible* with such reference. But we know that, in order for the child to arrive at the final state, s/he must be informed that pronominal stress is required in cases of multiple guises, not only compatible with it. It seems that, in Thornton and Wexler's theory, children need negative evidence in order to arrive at the adult state.

Turning now to Thornton and Wexler's experiment, these authors interviewed 19 children from 4;0 to 5;1 years of age. They also tested 6 adults. The experiment was a truth-value judgment task. Children watched short stories acted-out in front of them and a puppet tried to describe what happened in those stories. Children had to say whether what the puppet said was true or not. The main results of their study are the following.

Children showed knowledge of Principle C, as they accepted the sentence below in the context where the skeleton dusted himself only 8% of the time:

(21) He dusted the skeleton.

As expected, children over-accepted simple sentences with the pronoun having a local DP as its antecedent. That is, children accepted the sentence below 58% of the time in a reading where Bert brushed himself:

(22) Bert brushed him.

Children did not over-accept sentences when the local binder for the pronoun was a QP. The rate of acceptance for sentences like the one shown below was only 8%:

(23) Every reindeer brushed him.

The same pattern emerged in ellipsis contexts. Children behaved at chance when the pronoun had a coreferential reading, but rejected most of the sentences in which the pronoun had a bound reading. Consider the sentences below:

- (24) a. Bert lassoed him and the Tin Man did too.
b. Batman cleaned him and every turtle did too.

In the context leading up to sentence (24)a, Bert lassoed himself and the Tin Man lassoed Bert. In this case, the pronoun in both VPs is coreferential to Bert. Thornton and Wexler claim that this is the kind of structure with which children have problems. Adults did not accept this sentence, but children accepted it 43% of the time. In the context for (24)b, Batman cleaned himself and every turtle cleaned himself. Given that the pronoun in the elided VP is bound, the pronoun in the non-elided VP must be bound too, as required by the parallelism constraint. Children showed knowledge of Principle B in these cases and accepted this sentence 14% of the time.

Thornton and Wexler claim that in the case of sentences (23) and (24)b, children had a low acceptance rate because they were constrained by Principle B. However, as was the case with the experiments in Chien and Wexler's study, I believe that Thornton and Wexler's experiment has a confounding factor in cases involving possible QP antecedents. The problem, similar to the one mentioned above for Chien and Wexler's study, refers to the fact that the stories told to children always involved three identical characters and a fourth character that was always more salient. I will argue in chapter 4 that the saliency of this fourth character cannot be excluded as being the reason why children took him as the antecedent for the pronoun. If this is so, children's behavior in those tests might be telling us nothing about their knowledge of Principle B.

Summing up, Thornton and Wexler's study on children's knowledge of Principle B has, besides the methodological problem to be further discussed in chapter 4, some theoretical problems as well. We saw that the most challenging problem for Thornton and

Wexler's proposal relates to learnability issues. In order to account for how children reach the final state, their theory seems to require negative evidence, something undesirable.

2.1.3 Grodzinsky and Reinhart (1993)

The two studies mentioned in the sections above tried to account for children's non-adult behavior with respect to Principle B by proposing that children lack some kind of pragmatic knowledge or rule. Grodzinsky and Reinhart (1993), on the other hand, offered a processing account for children's problems. In order to appreciate their proposal, let us observe the sentences below:

- (25) a. Lucie adores her friends.
b. Every actress adores her friends.

Similarly to the studies discussed above, Grodzinsky and Reinhart follow Reinhart (1983a) in assuming that it is necessary to differentiate coreference readings from bound readings for pronouns. Leaving the deictic interpretation aside, in (25)a, we have two possible interpretations for the pronoun: (a) the coreferential reading: Lucie λx (x adores her friends) & her = Lucie and (b) the bound reading: Lucie λx (x adores x 's friends). In (25)b, on the other hand, we have just the bound interpretation for the pronoun: every actress λx (x adores x 's friends). The reason (25)b does not have a coreferential reading is due to the nature of the antecedent for the pronoun. In this case, the antecedent is a quantificational phrase, which does not refer to anything. If so, the QP cannot be coreferential to the pronoun.

Grodzinsky and Reinhart (1993) claim that only bound readings are constrained by Principle B. The authors state that coreference “is the assignment of identical values to NPs with distinct syntactic indices, regardless of whether the two NPs occur in the same sentence or not” (page 77). When coreference is involved, violations of Principles B and C seem to be possible in some cases, as shown in the examples below:⁵

- (26) a. Who is this man over there? *He* is *Colonel Weisskopf*.
 b. I dreamt that I was Brigitte Bardot and *I* kissed *me*.
 c. Only *Churchill* remembers *Churchill* giving the speech about blood, sweat, toil, and tears.

Coreferential readings are not constrained by binding Principles B and C. Following Reinhart (1983a), the authors claim that the constraint on intrasentential coreference is not syntactic, but instead is related to “an inference based on knowledge of grammar, meaning, and appropriateness to context” (page 79). The constraint is stated below:

(27) *Rule I: Intrasentential Coreference*

NP A cannot corefer with NP B if replacing A with C, C a variable A-bound by B, yields an indistinguishable interpretation.

The idea is that, if the structure allows the bound reading for a pronoun, then the coreferential reading is possible only if it gives rise to an interpretation that is somehow different from the bound interpretation.⁶ For example, coreference in the case of (26)a is

⁵ The examples in (26) are all taken from Grodzinsky and Reinhart’s paper, pages 78-79. Example (26)b is due to George Lakoff, discussed in Heim (1991). Example (26)c is attributed to Fodor (1975), page 134.

⁶ Lasnik (1991) identifies a problem in Reinhart’s (1986) Rule I. In order to see it, consider the sentence below (from Reinhart (1986), example (8) – example (i), footnote 1 in Lasnik’s paper):

(i) Charlie Brown talks to his dog and my neighbor Max does too.

In the phrase ‘his dog,’ the pronoun can be either bound or coreferential. If it is bound, we get the reading where Charlie talks to Charlie’s dog and Max talks to Max’s dog. If it is coreferential to Charlie, we have the reading where Charlie talks to Charlie’s dog and Max talks to Charlie’s dog.

possible because the bound interpretation is a tautology ($\text{He } (\lambda x (x \text{ is } x))$), which is clearly different from the coreference reading.

So, in Grodzinsky and Reinhart's system, a sentence involving a pronoun and local DP antecedent is constrained by the interaction of Principle B and Rule I. Similarly to Chien and Wexler's claim, Grodzinsky and Reinhart propose that the results of previous studies on the acquisition of Principle B demonstrate that children know Principle B but have problems with Rule I. As reported in section 2.1.1 above, in Chien and Wexler's (1990) study children performed well in sentences involving a pronoun and a QP (that is, they rejected the bound reading at a high rate). Grodzinsky and Reinhart take those results as evidence that children know Principle B. On the other hand, children's performance in sentences involving a pronoun and a referring DP (acceptance of illicit coreference of around 50%) is taken as an indication that children have problems with Rule I.

The problem, Grodzinsky and Reinhart (1993) claim, is that Rule I involves some computations that are too hard for children to process. Consider the sentence below:

(28) Oscar touches him.

According to Rule I, the coreferential reading will only be possible if there is reason to use it, that is, if it is different from the bound reading. In the case above, if the speaker wants the elided VP to mean that Max talks to Charlie's dog, then the coreferential reading will be allowed for the antecedent VP. However, a problem emerges in the following scenario:

(ii) Speaker 1: Charlie Brown talks to his dog.

Speaker 2: My neighbor Max does too.

Exactly like the case in (i), the elided pronoun in (ii) can be bound or coreferential. But Reinhart's theory does not allow the coreferential reading to be available in this case. As Lasnik points out, by hypothesis, Speaker 1 gave the pronoun a bound reading, as there was no reason for him to give it a coreferential reading. Speaker 2 had no reason to assume that Speaker 1 had a reason for avoiding the bound reading. Therefore, Speaker's 2 utterance can only have a bound pronoun, and his utterance can only mean that Max talks to Max's dog. But this is clearly the wrong result, as the fact of the matter is that the coreferential reading *is* available in this case.

In chapter 3, I will discuss a new version of Reinhart's Rule, which does not present this problem identified by Lasnik.

In order to decide if the coreference reading for the pronoun is possible or not, children should perform several steps. First, it must be determined if the pronoun can receive a bound interpretation. If it could not, then the task would be over, and coreference would be allowed. But in the sentence above, it is possible for the pronoun to have a bound interpretation (Oscar λx (x touches x)). So, according to Grodzinsky and Reinhart, children must proceed as follows, “while still holding the sentence under processing in memory, they must construct two representations, one for the binding option, and another for the alternative coreference reading. Next they must compare the two representations, relative to their context, in order to decide whether they are distinguishable. If they are, coreference is allowed; if they are not, it is ruled out” (page 88).

The authors assume that children can perform all of these steps, that is, they are able for example to determine the bound and coreferential interpretations for the pronoun and to distinguish between them. The problem is that children’s working memory is more limited than adults’ and so they cannot hold and compare two representations, as this is beyond their processing capability. Thus, although children know what are the steps that they should perform, they have difficulties in making these computations. The result is that children cannot perform all of these computations and therefore guess when pressured to give an answer in the experimental situation. The 50% pattern of response in these cases receives a natural explanation: given that children are guessing, sometimes they answer ‘yes’ and other times they answer ‘no.’

This theory has some advantages over the two previously mentioned proposals. First, it does not pose a learnability problem to the acquisition of Rule I. According to Grodzinsky and Reinhart, Principle B and Rule I are both innate. Children’s problems

reside in holding and comparing interpretations in the relevant types of sentence, as their working memory cannot deal with the amount of computation required. It is known that children's working memory is more limited than adults', as experiments on working memory have shown. It is also known that it develops with age. So, when children's working memory gets bigger, they will be able to make the necessary computations. Thus, this theory presents no learnability issues.

Another advantage of this theory is that the 50% pattern of response is accounted for. That is, there is a reason why children display chance performance in these tests: because they are guessing. Chien and Wexler (1990) and Thornton and Wexler (1999) could not satisfactorily explain why the lack of a pragmatic principle always gives rise to this chance performance.

Although Grodzinsky and Reinhart's theory is, in my view, superior to the other theories discussed here, it faces one of the problems that those theories also encountered, which relates to the data that this theory is set to explain. The authors did not provide new data on the acquisition of A-bound pronouns, but based their theory on the results of Chien and Wexler (1990), reviewed above, and Grimshaw and Rosen (1990), which was not reviewed above, but obtained similar results. If the concerns I discussed in the previous sections regarding the confounding factors existing in those studies are taken into consideration, then children's behavior on sentences involving pronouns bound by QPs was not properly portrayed. As we will see in the fourth chapter, children do behave at chance in these cases when a methodology without that confounding factor is employed. This means that children accept locally A-bound pronouns not only in cases where Rule I is claimed to be operative, but also in the cases where Principle B is claimed

to hold. Therefore, although the idea that children's problems are not related to the lack of pragmatic knowledge, but is instead related to processing problems, is worth pursuing, Grodzinsky and Reinhart's theory makes the wrong predictions concerning children's behavior on sentences with QP antecedents.

2.1.4 Conclusion

In this section I reviewed several studies on the acquisition of A-bound pronouns. I claimed that some of the most influential studies in this area faced methodological problems as their experiments contained confounding factors that could have ultimately driven children's answers. If this is so, then their results cannot be taken as evidence bearing on children's knowledge of Principle B. On the theoretical side, I conjectured that if the facts they are set to explain were not portrayed correctly, then their theories could be incorrect also. All of these difficulties lead us to the conclusion that children's behavior on this issue is yet to be not only correctly described but also explained. In the next section, we will turn to studies on the acquisition of A'-bound pronouns.

2.2 Studies on the Acquisition of A'-Bound Pronouns

In this section, I will discuss studies on the acquisition of A'-bound pronouns. More specifically, I will be concerned with the acquisition of resumptive pronouns, that is, pronouns appearing in relativized positions inside relative clauses, as the example below from Brazilian Portuguese illustrates:

- (29) Esse é o menino que a Carmen conversou com **ele**.
This is the boy that the Carmen talked with him
'This is the boy that Carmen talked to.'

Most of the research to be reported in this section studied the acquisition of resumptive pronouns (henceforth RPs) only indirectly, as their prime interest was in investigating whether or not children's relative clauses involve movement. There are two approaches to this debate, the "non-movement approach" and the "movement approach." The non-movement approach argues that the presence of RPs in all sites of relativization as opposed to their lack in wh-questions indicates that relative clause formation differs from wh-question formation in child language. The latter but not the former involves movement. Another argument for the lack of movement in early relatives comes from the fact that children's relatives do not involve overt relative operators such as *who* or *which* but are formed with the complementizer *that*. Also, some relative clauses that in adult languages obligatorily involve pied-piping are formed without it in child language.

These arguments are challenged by the movement approach. Proponents of this line of research claim that the presence of RPs in child language does not necessarily mean lack of movement, as there is a complex typology of RPs, some of them being analyzed as spell out of traces, for example. Another argument comes from the fact that movement is available in children's grammars, as witnessed in wh-question formation. If so, the claim that children display movement in one construction but lack it in another seems paradoxical. Another point relates to the absence of relatives with overt wh-operators. Some researchers report that in elicited production tasks, even adults prefer *that* relatives over overt operator relatives. Finally, the proponents of the movement approach claim that the non-movement approach faces a learnability problem. The move from non-movement to movement relatives requires negative evidence, as children would

need to be informed that the non-movement strategy is not possible in the languages they are acquiring.

So, the production of RPs plays an important role in the debate concerning relative clause formation in children's grammar. For some researchers but not for others, it means that children's relatives never involve movement, even when the relative clause contains a gap. For other researchers, gap relatives involve movement and RP relatives don't. In this case, it is assumed that children have movement relatives in their grammars, and they only differ from adult grammars in that they allow RPs in syntactic positions that adults don't. These two positions will be further discussed below when studies on the acquisition of relative clauses in various languages are presented.

In what follows, I will first briefly review some studies on the acquisition of relative clauses, focusing on their results on the production of RPs by children or on the grammaticality judgments that children provided. This review will give an idea of children's behavior. Then I will address three studies in more detail, describing their methods and theories more deeply.

Research on the acquisition of RPs show that children acquiring languages such as English, French, Spanish, Serbo-Croatian, Hebrew, Brazilian Portuguese and Russian produce and/or judge grammatical relative clauses containing RPs in various syntactic positions, sometimes clearly violating the constraints found in their target languages.

Varlokosta and Armon-Lotem (1998) investigated the production of RPs in relative clauses in children acquiring Modern Greek and Hebrew. The experiment was a 'toy elicitation task.' In this type of experiment, two identical toys are presented to the child. The experimenter acts out short stories with these toys and at the end of each story

asks the child something about one of the toys. Children have to answer the question to a blindfolded puppet. Given that the puppet cannot see the toys, the only way children can describe them is by using a relative clause.

The authors tested 13 Greek-speaking children between the ages of 3 to 5;6 and 24 Hebrew-speaking children from 2;8 to 5;5 years of age. Greek-speaking children produced relative clauses containing RPs in direct and indirect object position and as complement of preposition. All these constructions were licit in the adult language. However, for the Hebrew data, these authors show that 24% of the subject relatives contained a RP. This contrasts with the adult language, where RPs are not allowed in this position. For all the other syntactic positions tested, adult Hebrew allows RPs and children had a high percentage of RP production in these positions. The positions are: direct object (93% of RPs), indirect object (100%), and oblique (83%).

Another language tested on this issue is Serbo-Croatian. Goodluck and Stojanovic (1996) tested 42 Serbo-Croatian-speaking children from 4;0 to 6;0 years of age. The experiment consisted of a picture-cued relative elicitation task, where pictures of characters were presented to the child. The child was supposed to put a colored sticker on one of the characters in the picture and then tell the experimenter on which character s/he had put it. The picture was placed in such a way that it could not be seen from the experimenter's perspective. Since the experimenter could not see the picture, the best way for the child to describe it was using a relative clause to identify the character with the sticker.

Although these authors did not give the percentage rate for the production of relatives with RPs, their chart shows that children produced direct object relatives,

indirect object relatives and oblique relatives with RPs. Many of these forms are not licit in the adult language.

Bar-Shalom and Vinnitskaya (2004) tested 33 children from 4;0 to 6;10 years of age acquiring Russian. They report that children produced relatives with RPs mostly in direct object position, although the adult language does not allow RPs in this position.

In a 2004 study, I conducted an experiment with 11 children acquiring Brazilian Portuguese (BP) as their native language on the age range of 3;0 to 5;5 years. The experiment was a grammaticality judgment task.⁷ In this experiment, two experimenters were present. One experimenter manipulated a puppet and the other acted out short stories. The experimenter introduced the puppet to the child as a creature that came from the moon and speaks moon-talk. The puppet is learning BP, but gets confused sometimes. The child is told that her job is to help the puppet to learn BP. If the puppet says something the wrong way, the child should give the puppet a fruit for him to get smarter. If he says it the right way, the child should give the puppet a donut, as a reward. Twelve relative sentences were tested. Four targeted the subject position, four targeted the direct object position and four targeted the oblique position. The results of the study, summarized in the chart below, show that children accepted RPs in subject position at a high rate, as opposed to adults, who accepted it only 10% of the time. For the oblique

⁷ The reason why a grammaticality judgment task was chosen over an elicitation production task is the following. RPs are licit in adult BP but are not obligatory in all syntactic positions. Therefore, if children, by any chance, never produced a RP in the elicitation production task, no conclusion could be drawn. On the other hand, if they **accepted** a construction with a RP, this would be evidence that that construction was possible for the child.

position, where RPs are required in adult BP, children's and adults' acceptance rates were identical: 90%.⁸

The table below provides an overview of the array of some of the data mentioned above and some of the data that will be discussed in the following subsections. The superscripts inside the cells indicate the study from which these figures were taken: ^aPérez-Leroux (1995); ^bLabelle (1990); ^cVarlokosta and Armon-Lotem (1998); ^dGrolla (2004); ^eMcKee and McDaniel (2001):⁹

<i>Position</i>	<i>Production</i>				<i>Grammaticality Judgment</i>	
	<i>English^a</i>	<i>Spanish^a</i>	<i>French^b</i>	<i>Hebrew^c</i>	<i>BP^d</i>	<i>English^e</i>
Subject	-	-	*26,9%	*24%	*63%	*47%
DO	*25%	*36,2%	*25%	93%	%/*72%	*70%
Oblique	*26,9%	*60%	*28%	83%	90%	*68%

Table 2 Rates of children's production and acceptance of RPs

The first interesting fact shown in the table above is that children are not adult-like in their production of RPs and in their judgments. This behavior emerges in various languages, be it languages where RPs are more constrained, like English, or languages where these elements are more productive, such as Hebrew and BP. Particularly, children accept RPs in subject position, something not possible in any of the adult languages tested. We could describe children's behavior with respect to RPs as being a case of over-generation and over-acceptance, that is, they accept and produce RPs in positions that adult speakers don't.

⁸ For the direct object position, the results are difficult to assess. There seems to be a dialectal difference among the adult speakers tested. Some of them consistently rejected RPs in this position, while others accepted them frequently. For this reason, children's answers in this case were harder to evaluate and I leave a more complete discussion of this issue to chapter 4.

⁹ The star in front of a percentage indicates that the presence of a RP in that position in that adult language is not licit. A percentage sign (%) indicates that there is dialectal difference in the adult language, with some speakers always accepting the construction and others always rejecting them.

The second interesting fact to observe in the chart above is that, for English, there is an asymmetry on the rates of acceptance and production of RPs. Children judge a sentence containing a RP acceptable more often than they produce sentences with RPs. I believe that this asymmetry between the elicited production task and the grammaticality judgment task is not surprising. Even in languages where RPs are more productive, it is not the case that these elements are obligatory in all positions. The use of RPs is optional in some syntactic positions, and children might omit them from a relative clause for the same reason that adult speakers of Brazilian Portuguese or Hebrew do not produce RPs all the time. On the other hand, with the grammaticality judgment task, children have to say whether or not a construction with a RP is acceptable. Thus, every time a sentence with a RP is presented to them, children have the chance to say ‘yes,’ accepting the construction with the pronoun.

It should be noted that it is not the case that all of the studies on production of RPs obtained results similar to those reported above. In Grolla (2000), I study the spontaneous speech of a child acquiring Brazilian Portuguese as her native language from 2 to 4 years of age. I found that her production of RPs was adult-like. Also, in McKee and McDaniel (2001), besides the grammaticality judgment task whose results are reported above, they conducted an elicited production task as well, and children’s production of RPs in extractable positions was similar to adults’, as we will see in detail in section 2.2.3 below.

Thus, it seems that children’s over-acceptance of RPs in extractable positions is more frequent than their production of these elements. As mentioned above, several studies have addressed children’s interesting behavior and in what follows I will discuss only some of them. I will review in the next sections the studies that were most

influential in this area of research. Section 2.2.1 is devoted to a discussion on Labelle's (1988, 1990) ideas. Section 2.2.2 discusses Pérez-Leroux's (1995) study. Section 2.2.3 reviews McKee and McDaniel's (2001) work. Finally, section 2.2.4 is the conclusion to this part of the chapter.

2.2.1 Labelle (1988, 1990)

Labelle (1988) reports that, in an experiment with 108 French-speaking children from 3;0 to 6;0 years of age, children produced relative clauses containing RPs in the following syntactic positions: subject, direct and indirect object, locatives and genitives. All these constructions are not licit in adult French. Labelle used the picture-cued relative elicitation task, mentioned above.

The percentages of children's productions of RPs are provided below for all syntactic positions tested (taken from Labelle (1990), page 99):

<i>Syntactic position</i>	<i>% Resumptive Pronouns</i>
Subject	26.9%
Direct Object	25%
Indirect Object	28%
Locative	37%
Genitive	43%

Table 3 Percentage of production of RPs in child French

Labelle proposes that children's initial relatives in French do not involve movement. One of the arguments that she uses to defend this claim is the fact that child relatives do not involve pied-piping. Compare (30) below (a relative clause in adult French where pied-piping is obligatory) to children's (31), where pied-piping was not employed:

- (30) Celle-là à qui le papa montre un dessin
'That one to whom the father shows a drawing'

- (31) Celle-là que le papa lui montre un dessin
 ‘That one that the father to-her shows a drawing’

Another type of relative produced by children is shown below. Labelle calls these structures “such that” relatives:

- (32) La maison que la maman dort
 ‘The house that the mother is-sleeping’

The absence of pied-piping, the presence of RPs, and the existence of these “such that” type relatives in the production data of children acquiring French constitute evidence for Labelle that children’s relatives are derived without movement of an operator. Labelle claims that children’s relatives involve a lambda operator binding either a variable, as shown in (33)a, or a RP, as in (33)b, or even the whole clause, as is the case in (33)c:

- (33) a. La balle_i [λx_i que [le garçon x_i lance]]
 ‘The ball that the boy throws’
 b. La balle_i [λx_i que [le garçon la_i lance]]
 ‘The ball that the boy it throws’
 c. La maison [λ_i que [la maman dort]_i]
 ‘The house that the mother is-sleeping’

Although this is an interesting hypothesis, there are some problems with it. First, as observed by others, it seems unlikely and paradoxical that children have not acquired wh-movement in relatives at a point in their development where it seems obvious that wh-movement in questions and other constructions have been acquired. Labelle (1990) shows that children in fact produce pied-piping in wh-questions, as shown below, a question produced by a 2-year-old child:

- (34) Sur quoi on pèse?
 on what one weighs
 ‘On what do we weigh?’

Also, Labelle proposes that children start with a purely semantic-based grammar of relative clauses (based on lambda abstraction) and shifts to a grammar with syntactic as well as semantic mechanisms (wh-movement and lambda abstraction). This account of children's apparent lack of wh-movement in relative clauses in semantic terms creates a discontinuity problem. She suggested that as children become more productive in their use of relatives, they shift from a semantic strategy to a syntactic strategy. However, it is not clear to me how productivity drives this shift.

Another difficulty for Labelle is that, since she claims that initial relatives do not involve movement, the gaps present in some children's relatives must be analyzed as null RPs instead of traces of movement. The problem is that it seems doubtful that children acquiring languages such as English would display null RPs in the first stages of their development of relative clauses and then these elements would disappear from their grammars.

Finally, Labelle claims that the reason for the appearance of illicit RPs in child language is because children's relatives do not involve movement. If this were correct, the prediction would be that illicit RPs should disappear from their grammars as soon as children acquired movement relatives. However, this prediction is not borne out, as data from the acquisition of Russian indicates. In child Russian it is attested that children go through a stage where overt wh-operators are found (showing that movement took place), but RPs are still used where they are banned in the adult language. Bar-Shalom and Vinnitskaya (2004) report that, in their experiment with children acquiring Russian, there were cases of relative clauses with both "case match" (between the relativized position and the overt wh-operator) and pied-piping, but with the presence of a RP, which is not

allowed in adult Russian. Therefore, the Russian data show us that whether or not children go through a stage where movement relatives are absent, this cannot be the sole reason why they produce RPs as they do. Thus, Labelle's theory does not seem sufficient to account for the range of data discussed.

2.2.2 Pérez-Leroux (1995)

Pérez-Leroux (1995) investigated children's production and comprehension of RPs in English and Spanish. She proposed that children's non-adult behavior with respect to these elements was due to the fact that children's array of empty categories is not completely developed in early stages of language acquisition. Pérez-Leroux assumed the typology of languages as proposed in Sells (1984), which classify languages into two groups with respect to the behavior of pronouns: true resumptive languages, like Palauan, and intrusive pronoun languages, like English. In true resumptive languages, RPs are interpreted as variables, being bound by operators at S-structure. In intrusive pronoun languages, RPs are better analyzed as 'intrusive pronouns,' which are interpreted referentially and are restricted to island contexts.

Pérez-Leroux suggested that this typology of languages can be expressed with respect to a single feature, the $[\pm \text{variable}]$ feature. In order to appreciate her proposal, let us first consider this feature in more detail. The four types of empty categories traditionally considered are PRO, *pro*, wh-trace and NP-trace, which are classified according to the nominal features $[\pm \text{anaphoric}]$ and $[\pm \text{pronominal}]$. Lasnik and Stowell (1991) claim that this array of empty categories needs some refinement. The reason for this comes from the fact observed by these authors that some constructions, like *tough-*

movement, parasitic gap and topicalization constructions, behave differently from other wh-constructions with respect to crossover effects. If these constructions involved wh-movement, then we would expect them to display crossover effects. This is not so, as the grammaticality of the constructions below show (examples from Lasnik and Stowell (1991), page 691):

- (35) a. Who_i t_i will be easy for us [to get [his_i mother] to talk to e_i]
 b. Who_i did you stay with t_i [before his_i wife] had spoken to e_i]
 c. This book_i, I expect [its_i author] to buy e_i

Lasnik and Stowell claim that the trace left in these constructions where the operator is semantically nonquantificational is not a true variable, but another type of empty category, a null R-expression, which exhibits binding properties similar to those of names and epithets and not to those of variables. Lasnik and Stowell suggest a third feature in order to accommodate this newly recognized empty category: [\pm variable].

Incorporating this new feature, Pérez-Leroux (1995) claimed that the parametric distinction between true resumptive languages and intrusive pronoun languages depends on whether syntactic variables can be specified as semantic [+variable] when they are overt. Pérez-Leroux proposed that children's empty category in wh-movement cases is unspecified for the [+ variable] feature. So, initially, empty categories are specified for the features [\pm anaphoric] and [\pm pronominal], but are unspecified for [\pm variable]. This means that children have movement in their grammar, and that the empty category derived by movement has no features that pertain to variables, and may have features similar to those of null epithets.

Pérez-Leroux conjectured that, if children's wh-constructions have null epithets as their empty category, then "this would predict that for children, at least in principle, null elements can alternate with overt elements in their wh-constructions" (page 119). The author showed how in parasitic gap constructions in adult English, gaps and pronouns freely alternate inside an adjunct clause:

- (36) a. Which article_i did you read t_i [before filing e_i]?
 b. Which article_i did you read t_i [before filing it_i]?

These examples, according to the author, have the same interpretation. This demonstrates that in this environment, null epithets alternate with pronouns. So, with the [variable] feature unspecified, children cannot distinguish whether their language is a true resumptive language or not. This analysis predicts that there should be an alternation between empty elements and pronouns and that all children should start with true resumptives when learning English-type languages. Their initial resumptives should appear in both questions and relatives, and their distribution should not be sensitive to extractability.

In order to test her predictions, Pérez-Leroux (1995) conducted an experiment in the same fashion as the one in Labelle (1988). She interviewed 11 children between the ages of 3;5 and 5;5 acquiring English, and 26 children between the ages of 3;5 and 6;8 acquiring Spanish. Pérez-Leroux's study was the first to compare cross-linguistically children's production of RPs. In her findings, Pérez-Leroux reported that the English-speaking children produced relatives containing RPs in direct object and oblique positions. The Spanish-speaking children produced RPs in direct object, locative and oblique positions, as reported above in Table 2 provided in the introduction to section

2.2. These constructions with RPs in all these positions are not allowed in the corresponding adult languages. Comparing her data on English and Spanish to the results for French reported in Labelle's (1990) study, Pérez-Leroux found no cross-linguistic difference in the incidence of RPs.

Pérez-Leroux also conducted a comprehension study with 36 children acquiring English, in the age range of 3;1 to 6;7 years. Twenty-three adults were also interviewed. In her task, participants were read short stories and then asked to respond to a prompt. This was a *wh*-movement construction; either a question or a relative clause inside a "show me" phrase. These prompts contained a pronoun that could be interpreted as a regular pronoun or as a resumptive pronoun. For example, following the story of Mary helping her mother to feed her baby brother, the question was: "*who did Mary help to feed him?*" This question might have two interpretations. In the adult interpretation, with structure shown in (37)a, the *wh*-operator binds the complement of *help*, and the pronoun refers to Mary's brother in the story considered here. In the resumptive interpretation, not possible in adult English, the *wh*-operator binds the pronoun. This is shown in (37)b:

- (37) a. Who_i did Mary help [_{e_i}] [PRO to feed him]?
 b. Who_i did Mary help [PRO to feed him_i]

If children constructed the adult interpretation, then according to the story above, their answer would be "the mother." If children constructed the *wh*-operator as binding the pronoun, then their answer would be "her brother." Therefore, this test was able to check what interpretation the participant children assigned to the question.

Her findings were that children obtained the resumptive interpretation significantly more often than adults did. Also, she found no significant difference in the

number of resumptive interpretations across questions and relative clauses (e.g., “*who did Mary help to find him?*” versus “*Show me who Mary helped to find him*”). Pérez-Leroux claimed that her data show that children acquiring English indistinctively allow pronouns and gaps to be bound by a wh-expression, and that resumptive interpretations were as likely to appear with questions as they were with relatives. These data then indicate that children’s resumptives are different from adults’ in that they follow a true resumptive distribution rather than an intrusive resumptive distribution.

McKee and McDaniel (2001) note that the methods used in Pérez-Leroux’s comprehension study have several difficulties. For example, the prompts used as relative clauses in Pérez-Leroux’s study were not headed relatives, but were more easily interpreted as indirect questions, as they are of the form “show me who ...” If this is so, the comparison she made was probably between direct and indirect questions. This means that the prediction about children’s resumptives appearing in both questions and relatives was not in fact tested.

Another conclusion from this work that has been challenged concerns the effects of extractability. According to Pérez-Leroux’s predictions, there should be no difference in children’s answers to sentences with RPs in extractable positions, such as subject and direct object and in unextractable positions, such as genitive. Pérez-Leroux’s conclusion was that there were no effects of extractability in her data. However, McKee and McDaniel noted that only two of Pérez-Leroux’s experiment’s items targeted relatives with unextractable sites (both genitives), and she reported no data from those items – so the extractability prediction cannot be said to have been confirmed.

Finally, a more compelling criticism to Pérez-Leroux's study comes from Kang (2003). According to Kang, there is a critical flaw in Pérez-Leroux's theoretical assumptions. Pérez-Leroux assumed that in true resumptive languages, resumptives freely alternate with gaps in wh-questions and in relatives. This is based on data from Palauan, as shown below (data from Georgopoulos (1991)):

- (38) ngngera el rum a lulngetmokl er ngii a Willy
 what L room 3-clean P it Willy
 'What room did Willy clean up?'

However, Kang observes that upon close inspection, the sentence above is an example of a clefted question rather than a direct question, as described in Georgopoulos (1991). Kang claims that RPs cannot alternate with gaps in normal, unclefted wh-questions in this language. Other researchers such as Demirdache (1991), Sharvit (1999), and Shlonsky (1992) all argue that in true resumptive languages, RPs cannot appear in wh-questions, when the wh-phrase is a bare element, such as "who." In order for RPs to be possible in wh-questions, the wh-phrase must be complex, such as "which + NP" or "what + NP."

Therefore, the questions involving bare wh-phrases that Pérez-Leroux used in her comprehension task are not possible in true resumptive languages, which means that children's responses to these questions cannot be taken as evidence that they have a true resumptive grammar.

This discussion indicates that, although Pérez-Leroux's work was relevant as it opened up the study of RPs in child language to cross-linguistic scrutiny, it nonetheless faced some critical methodological as well as theoretical problems, which renders her predictions yet to be proven.

2.2.3 McKee and McDaniel (2001)

McKee and McDaniel (2001) investigated English-speaking children's production of RPs as well as their grammaticality judgments on these elements. For the production part, they conducted two tests. In the first one, they interviewed 82 children aged 3;5 to 8;11 and 34 adults. This test targeted subject relative clauses. In the second test, they interviewed 89 children from 3;5 to 8;11 years of age and 20 adults. This test targeted sentences with the following positions relativized: object, object of preposition, genitive subject and genitive object. In both cases, the experiment involved one experimenter acting out stories for the child and for a second experimenter. When the story was over, the second experimenter covered her eyes. The storyteller pointed to one of two identical toys that were introduced in the story, and the child had to describe it to the experimenter with covered eyes. This experimenter then had to pick up that toy. Given that the experimenter could not see the toys, the best way to describe them was by means of a relative clause, as the toys had been identified by events that happened in the story.

For the grammaticality judgment task, McKee and McDaniel interviewed the same 82 children and 34 adults who participated in the first production test. The children ranged in age from 3;5 to 8;11. Before the actual test was carried out, a training session and a pretest were conducted. The experiment involved an experimenter presenting a scenario with toys and then asking whether sentences referring to the scenario sounded right or wrong. They tested a large number of sentences: 2 tokens for each of the 17 conditions. Some of these contained RPs and others were control sentences without them. The sentences in this test had RPs in many syntactic positions, including: subject, object, object of preposition, genitive subject, genitive object, among others involving gaps in

the relativized position. The tables below provide the figures of children's and adults' production and acceptance rate of relative clauses with resumptive pronouns:¹⁰

<i>Syntactic Position</i>	<i>Children</i>	<i>Adults</i>
Subject (pick up the elephant that it is flying on a plane)	2%	0%
Object (pick up the cat that Goofy is petting it)	2%	0%
Object of preposition (pick up the girl that the giraffe is sitting on her)	5%	0%
Genitive subject (pick up the baby that her teddy bear is riding in the wagon)	18%	2%
Genitive object (pick up the robber that Dorothy is swinging his rope)	50%	65%

Table 4 Production of relative clauses with RPs (McKee and McDaniel (2001))

<i>Syntactic Position</i>	<i>Children</i>	<i>Adults</i>
Subject (this is the man that he's swimming)	47%	2%
Object (this is the woman that Bert kissed her)	70%	2%
Object of preposition (this is the baby that Cookie Monster played with her)	68%	2%
Genitive subject (this is the robber that his iron is hot)	50%	25%
Genitive object (this is the pirate that Minnie Mouse buried his treasure)	75%	68%
Unextractable subject (this is the troll that Ariel doesn't know what he's eating)	78%	80%

Table 5 Acceptance rate of relative clauses with RPs (McKee and McDaniel (2001))

The results of their study are that children's and adults' production of RPs were similar. Children did not produce RPs in extractable positions, contrary to what was found in Labelle's and Pérez-Leroux's studies. Their judgments of unextractable resumptives and of control items were also similar to adults' responses. The interesting result appeared in

¹⁰ The percentages presented in the cells are only approximate, as the authors provided those figures in a graph, which signaled numbers in its abscissa at every 20% value.

the judgments of resumptives in extractable positions, as children accepted these elements more often than adults did.

The fact that children did not produce RPs in extractable positions, but judged them grammatical was considered a puzzle by the authors. In their words: “Our data is not conclusive. If we claim – on the basis of the similarity of children’s and adults’ production of resumptives – that their grammars are the same, why do their judgments of some sentences differ? Alternatively, if we claim – on the basis of the difference between children’s and adults’ judgments of some resumptives – that their grammars differ, why are their utterances (and also many of their judgments) the same? Either claim (children’s grammars are on target or their grammars are off target) will run into problems” (page 143).

The solution McKee and McDaniel proposed to explain such puzzle about children’s over-acceptance of RPs involves processing considerations. They follow Dickey (1996), who studies the appearance of RPs in adult languages and shows that the use of these elements can be in part explained if we consider the human sentence processor. In order to appreciate Dickey’s proposal in detail, consider the sentence below:

(39) [S₁ I saw **the boy** [S₂ that you told John [S₃ that Lucy likes **him**]]]

Dickey suggests that the human sentence processor can hold up to two complete sentences in its memory. When the third sentence is introduced, one of the two previous sentences has to be shunted. In our example (39), this means that when S₃ is introduced, either S₁ or S₂ has to be shunted. If the sentence that is shunted is the one containing the head of the relative clause (S₁ in (39)), the head of the relative and, consequently, the features associated with this head (that is, [+masculine]; [+singular] in this case) will be

unavailable for the memory when the relativized position is reached. The insertion of a RP in the relativized position in the third clause makes the sentence more acceptable, since the RP will recover the features of the head that are no longer available in memory. A gap, on the other hand, does not contain the features necessary to recover the features of the head and, if S1 is shunted, processing will become harder with the gap. It is not the case that it will be impossible to process the sentence with a gap, it is just that the sentence will be more difficult to process. If so, the RP will seem more acceptable.

If the sentence that is shunted is S2, then S1 is kept together with the head of the relative. Thus, there is no need to insert a RP, since the features of the head are still available in memory. In this case, a gap should sound better than a RP. This is better illustrated when we have just one embedding, as in (40):

(40) [S₁ I saw **the boy** [S₂ that Lucy likes __/ * **him**]]

In this case, there is no shunting of clauses, since the processor can hold the two sentences in its memory. Therefore, the features of the head are still present when the relativized position in S2 is reached, and there is no need to use a RP for this purpose. Dickey then predicts that in cases like (40) the gap strategy will be more acceptable than the RP strategy.

McKee and McDaniel (2001), adopting Dickey's analysis, suggest that children's sentence processor may shunt a clause when the second clause is introduced, instead of the third. That is, in a sentence like (40) above, a RP may be necessary in order for children to recover the features of the head 'the boy.' If it is indeed the case that children's processor is more limited than the adults' processor in this sense, children will

need RPs more often than adults do. The need for a RP will emerge when processing becomes harder.

Although attractive, there are some problems with this analysis. Besides its vagueness in trying to explain how the sentence processor functions in these cases, there are other problems as well. First, as the authors themselves noted, shunting a clause does not have the effect of making sentences impossible to judge. Also, it does not have the effect of making all sentences with RPs sound good and their trace counterparts sound bad. As the results of McKee and McDaniel's study show, adults and children accepted the trace version of two- and three-clause sentences, and much of the time they rejected the counterparts with resumptives. If their account is correct, it means that clause shunting can (but does not necessarily) affect the process of making a judgment.

Also, the hypothesis that children's parsers keep only one clause in active memory might be problematic because it would become harder to explain how children learn some long-distance relations. For this reason, the authors suggest that children's parsers only *sometimes* shunt on reaching a second clause. This raises questions concerning when and why this would occur. Another problem is related to the difference on children's production of RPs and their acceptance of RPs. If children's limited sentence processor is responsible for their over-acceptance of RPs, why don't we see this effect on the production of these elements as well? McKee and McDaniel do not give a satisfactory answer to this problem. Therefore, McKee and McDaniel's hypothesis about children's sentence processor seems insufficient to explain their findings.

2.2.4 Conclusion

In this section, I reviewed some studies on the acquisition of RPs. The production of RPs by young children was shown to be not adult-like in Pérez-Leroux's and Labelle's studies, as children produced RPs in extractable positions where adults did not produce them. In McKee and McDaniel's study, on the other hand, children did not produce RPs in extractable positions, but accepted them in these positions significantly more often than adults did. I also mentioned two studies I conducted with children acquiring Brazilian Portuguese (BP). In Grolla (2000), the spontaneous speech of one child was investigated and her production of RPs was shown to be adult-like. In Grolla (2004), children's grammaticality judgments on RPs in BP were similar to children's judgments on RPs in English (as reported in McKee and McDaniel's study), with children in these two languages over-accepting RPs in extractable positions.

Thus, although different studies obtained varying results in children's production of RPs (with different rates of production), children's judgments of RPs were found to be more uniform: both in McKee and McDaniel's study and in my 2004 study children accepted RPs at similar rates.

On the theoretical side, we saw that each study tried to account for children's over-generation or over-acceptance of RPs in a different way. In Labelle's and Pérez-Leroux's proposals, children's grammars were claimed to be different from adults'. In McKee and McDaniel's work, it is children's memory capacity that is claimed to differ from adults'. All of them were shown to have problems. This state of affairs leads us to conclude that there is not a consensus as to where children's problems reside.

2.3 Conclusion to Chapter 2

After reviewing and discussing several studies on the acquisition of A- and A'-bound pronouns, the conclusions we reach are the following. First, children exhibit a developmental stage in language acquisition where they (a) over-accept locally A-bound pronouns and (b) over-accept and produce A'-bound pronouns in extractable positions. Second, there are several attempts to explain children's behavior in each domain, but none of them seem completely successful. The sections above discussed the problems that each of these accounts face. Third, no study discussed above had established a connection between children's behavior in A- and A'-bound cases.

The next chapter will address these issues, as I will develop a new theory intended to account for children's over-acceptance behavior in both areas discussed here. The study focuses on children's judgments rather than on children's productions of pronouns for several reasons. For example, as mentioned previously, children's production of pronouns in spontaneous speech has been shown to be adult-like, as found in Bloom et al (1994) for Principle B and in Grolla (2000) for RPs. Some studies in elicited production have also found that children have adult-like production of pronouns, as in de Villiers and Cahillane (2004) for Principle B and McKee and McDaniel (2001) for RPs. Thus, the problem is more frequently found in comprehension than in production. This issue is further explored in the next chapter, where I develop a theory for children's chance level behavior with A- and A'-bound pronouns.

Chapter III – The Acquisition of A- and A'-Bound Pronouns

3.1 Introduction

In the previous chapter, I reviewed some of the most relevant studies on the acquisition of pronouns. It was argued that none of those theories were able to account for the range of data we are interested in here, namely, the acquisition of both A- and A'-bound pronouns. In this chapter, I will discuss how the distribution of bound pronouns can be analyzed as following from economy principles both in English and Brazilian Portuguese. For the case of locally A-bound pronouns, the hypothesis is that Binding Principle B does not exist in the theory of grammar and that its effects can be derived by positing a comparison algorithm that can be expressed as follows: pronouns are excluded when anaphors are possible.¹ There is more than one theory that makes use of this idea. Burzio

¹ There are contexts where this does not hold. For example, in some environments, both anaphors and pronouns are possible, as mentioned in chapter 1 and shown in (i) below; in others, neither is possible:

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

(1991, 1996, 1998), Hornstein (2001, 2004) and Safir (2004a, b) have all proposed that Principle B can be eliminated from the theory of grammar² and that A-bound pronouns can be analyzed as being governed by a comparison algorithm. For the case of A'-bound (resumptive) pronouns, Hornstein (2001) and Shlonsky (1992) have proposed that the distribution of these elements can also be captured by a competition theory: resumptive pronouns are excluded when movement is possible.

This chapter will discuss the predictions that an economy approach to pronouns makes for the acquisition of these elements. I will discuss in this chapter only Hornstein's (2001, 2004) proposal. After presenting the acquisition data in chapter 4, I will discuss the other theories mentioned above in chapter 5, where we will check whether they can also account for the data discussed in chapter 4.

The chapter is divided as follows. In section 3.2, I present Hornstein's (2001, 2004) theory of pronouns. In his system, both A- and A'-bound pronouns are analyzed in a common fashion. Bound pronouns are taken to be 'elsewhere' elements that can only be inserted in a derivation *if needed for convergence*. In section 3.3, we will contend that such a condition can be too demanding for young children. I will discuss the ideas presented in Grodzinsky and Reinhart (1993) and Reinhart (1999a, to appear), where it is argued that children's limited working memory capacity cannot handle more complex

Principle B cannot 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.

² Kayne (2002) also proposes that Binding Principles B and C are not primitives of UG. The effects of both are argued to follow, in a derivational perspective, from basic properties of pronouns and basic properties of movement. In his system, the pronoun is present in the numeration and it derivationally forms a constituent with its antecedent, which moves away from this cluster, giving rise to dependency relations. However, Kayne's system differs from the theories mentioned above, as it assumes the independence of Principle B. That is, he does not analyze its effects as coming from the existence of the corresponding sentences with anaphors. In other words, Kayne does not assume a competition theory in order to explain Principle B effects. Given that the analysis I will propose crucially requires some type of competition to account for the acquisition facts, Kayne's proposal will not be discussed further here.

computations, such as those required in order to assess if pronouns are licit or not in a derivation. Finally, in section 3.4, I will present the predictions of this proposal for language acquisition.

3.2 Pronouns as Elsewhere Elements

Pronouns and local anaphors do not have the same distribution. There is a complementarity between these elements, as the examples below show (the pronouns and anaphors below are intended as bound by their respective antecedents in italics):

- (1) a. *Mickey* admires *himself*.
b. * *Mickey* admires *him*.
- (2) a. * *Mickey* thinks that Mama Bear likes *himself*.
b. *Mickey* thinks that Mama Bear likes *him*.

The contrast in (1) shows that a pronoun cannot appear where an anaphor is possible. In (2), we see that the pronoun is possible where the anaphor isn't. So, considering the contrast above (and disregarding the cases discussed in footnote 1), pronouns can be present if local anaphors can't.

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):

- (3) Principle A: An anaphor is bound in its governing category
Principle B: A pronominal is free in its governing category³

³ 'Free' and 'bound' are defined as follows (Chomsky 1981: 184-5):

- (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.

That is, Principles A and B state opposite requirements: anaphors must be *close* to their antecedents, while pronouns must be *far* from their antecedents. It is by means of these opposite requirements that the complementarity between pronouns and anaphors is captured in Binding Theory.

The existence of Binding 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 also 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. 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 cliticization, Hornstein (2001), Lidz and Idsardi (1997) and Zwart (2002) have suggested 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:

- (4) Bert_i admires [t_i himself].

Leaving the technical implementations of this idea to section 3.2.2.1, let us concentrate on the intuition that anaphors involve movement. If so, then Principle A is not necessary

‘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).

to regulate their distribution. Movement alone is able to account for the locality requirement on anaphors and to guarantee the right antecedent for these elements. The locality requirement follows from the kind of movement involved. In order to see this, consider the sentence below:

- (5) * Bert_i thinks that Mickey₂ admires [t_i himself].

In this sentence, the movement relating the anaphor to its antecedent crossed a potential antecedent for the anaphor, 'Mickey.' This movement violates Relativized Minimality (Rizzi (1990b)). Thus, (5) shows us that this type of movement cannot cross another potential antecedent for the anaphor, which in turn means that the anaphor will always end up close to its antecedent.⁴

This movement analysis can also account for the choice of antecedent for the anaphor. In (4) we see that the antecedent must be the head of the chain formed with the anaphor. The same holds in (5), although here the movement is not licit and so the sentence is not grammatical.

If movement can handle the distribution of anaphors, Principle A of Binding Theory is not needed.⁵ This is a desirable outcome, as it eliminates a stipulation from the theory of grammar. However, Hornstein reasons that if Principle A is eliminated, then

⁴ Cases where the anaphor is close to its antecedent, but which are still illicit, such as (i) will be discussed in (28) below:

(i) * Bill thinks himself is a genius.

⁵ Hornstein notes that the distribution of reciprocals resembles that of anaphors. For example, reciprocals are subject to Principle A, as shown in (i), and have non-local versions, as shown in (ii) (page 186):

(i) a. * The men said that Mary saw each other.

b. * The men said that each other left.

(ii) a. The men_i were angry. Pictures of each other_i in the buff had just been published in the NYT.

b. John_i told Mary_j that rumors about each other_{i+j} were spreading fast.

Hornstein suggests that local reciprocals, like local anaphors, are also formed by movement. For a more detailed discussion, I refer the reader to Hornstein (2001: 187). For the case of non-local reciprocals, Hornstein suggests that they are not formed by movement. Hornstein assumes that both non-local anaphors and reciprocals are emphatic pronouns or logophors (cf. Reinhart and Reuland (1993)).

Principle B has to be eliminated also. Here is his reasoning. If the distribution of anaphors is regulated by movement operations and the distribution of pronouns is regulated by a binding principle, it becomes a mystery why anaphors should block the presence of pronouns, as we saw in (1) above. Thus, it is necessary to find a principled way to derive the complementarity of pronouns and anaphors in a system where Binding Principles are not postulated.

Hornstein's theory derives this complementarity by means of economy conditions. He proposes that bound pronouns are 'elsewhere' elements. These elements are not present in numerations and are inserted into derivations only if needed for convergence. Because they are not in the numeration, their insertion is highly costly. The operation Move is cheaper than the insertion of a pronoun and therefore it is preferred. In other words, pronouns can only be inserted in a derivation if movement is not possible.⁶

Given that anaphors are the residues of movement, derivations containing anaphors are to be preferred over derivations involving the insertion of pronouns. In this system, the availability of movement (and hence, anaphors) and pronoun insertion are related in the following way: pronouns should be blocked where movement can occur. Conversely, where movement is not possible, pronouns should be allowed. In Hornstein's words: "pronouns should be parasitic on the *impossibility* of movement." With these considerations in mind, let us consider the contrast below, intended to have the pronoun and the anaphor locally bound by 'Bert:'

- (6) a. Bert admires *himself*.

⁶ A similar claim was made by Shlonsky (1992), who accounted for the distribution of resumptive pronouns in Northern Palestinian Arabic and Hebrew by assuming that these elements can only be used if movement could not give rise to a good derivation.

- b. * *Bert admires him.*

(6)a is a structure involving movement, while (6)b 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 (6)b 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, (6)b is excluded because it violates economy conditions. Thus, it is possible to derive the complementarity between pronouns and anaphors shown above in a principled way without Binding Theory.

Hornstein points out that the elimination of Principles A and B⁷ from the theory of grammar is a desired outcome, as it is preferable to derive their effects from more general operations like movement that are needed independently. The elimination of Binding Theory is also desirable on grounds of parsimony. The binding domains are defined in terms of ‘government,’ a notion that is not in conformity with minimalist views. Another advantage of this system is that it deals not only with pronouns locally A-bound, as is the case with Principle B, but also with other cases of bound pronouns. In this sense, it can be considered a more general theory of pronouns. In what follows, I discuss cases of (non-locally) A-bound and A’-bound pronouns and deictic pronouns.

⁷ In chapter 5 of Hornstein (2001) there is a discussion about the status of Principle C in his system, but the author does not provide an analysis of how to eliminate this principle from the theory of grammar. Principle C is stated below (Chomsky 1981):

(i) An R-expression must be free.

Hornstein observes that Principle C affects a great variety of relations: variable/variable, pronoun/variable, name/name and DP/bound epithet relations. He points out that this is a quite diverse group of relations and for him it is not entirely clear what, if anything, unifies them. In chapter 3 of Hornstein (2001), the author considers only the first case, which does not concern us here. In section 3.2.2.2 below, I will discuss how some cases traditionally excluded as Principle C violations can be excluded in Hornstein’s system.

Starting with non-locally A-bound pronouns, Hornstein (2001) shows how these elements can also be analyzed as being regulated by economy conditions. Consider the examples below (the pronouns are intended as bound by the antecedents in italics):

- (7) a. *Batman* likes *his* car.
b. *Robin* thinks that *he* is a genius.

Recall that in Hornstein's system movement into theta-positions is possible.⁸ So, in (7)a, it would be possible, in principle, to move 'Batman' from inside the DP 'Batman's car' to the subject position of 'likes.' However, this movement is not licit as it violates the Left Branch Condition.⁹ Therefore, given that movement is not licit, the insertion of the pronoun inside the DP is obligatory. The derivation of this sentence will involve the insertion of the pronoun inside the DP and the merge of 'Batman' in the subject position of 'likes.'

The same reasoning applies to (7)b. In principle, movement of 'Robin' from the embedded spec,IP to the subject position of 'thinks' is possible, as movement into theta-positions is allowed. However, in this case, this movement 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.¹⁰ So, if 'Robin' checks nominative Case in the embedded spec,IP, it cannot move up to the matrix clause.¹¹ Therefore, the

⁸ Other studies have also assumed movement into-theta positions. See, for example, Boskovic (1994) and Boskovic and Takahashi (1998).

⁹ Following Chomsky (1995), Hornstein assumes that the Left Branch condition is the attempted movement of a non-constituent, which in the derivation of (7)a would block movement.

¹⁰ A more thorough discussion on Case checking is presented below in section 3.2.2.1.

¹¹ A logical alternative to the derivation in (7)b would be to have an anaphor in place of the pronoun, as:

(i) * Robin thinks himself is a genius.

The impossibility of this type of derivation, with an anaphor in subject position, is discussed in (28) below.

alternative is to insert the pronoun in the embedded subject position and merge 'Robin' in the matrix sentence, as in (7)b.

Cases of A'-bound pronouns (henceforth, resumptive pronouns, RPs) are also dealt with in Hornstein's system. Consider the structures below:

- (8) a. The man [that ___ is swimming]
b. * The man [that he is swimming]
- (9) a. * The pirate [that Minnie Mouse laughed [when ___ arrived]]
b. The pirate [that Minnie Mouse laughed [when he arrived]]

The structures above are relative clauses. In (8), the highest subject position is relativized. In (9), the relativized position is also the subject, but it is inside an island.¹² The (a) sentences have gaps in the relativized positions, while in the (b) sentences these positions are filled with RPs. In both cases, the RPs and the gaps are bound by the relative operator, which is sitting in an A'-position. In the example below I provide the structure of the relative clause in more detail:

- (10) [DP the man [CP OP_i [C that] [IP t_i [is swimming]]]]

Returning to the examples in (8) and (9), the contrast in (8) shows that, when a gap is possible, the presence of a pronoun is banned. In (9), 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 (or deleted copy) left by movement, the contrasts above can be restated as follows. When movement is possible, insertion of the pronoun is

¹² The relative clause with a RP inside an island, as in (9)b, is not considered fully acceptable for many speakers of English.

prohibited; when movement is impossible, insertion of the pronoun is obligatory. So, the contrasts above constitute evidence for Hornstein's proposal.

Turning now to the cases of deictic pronouns, these elements are not taken to be elsewhere elements in Hornstein's system. That is, their distribution is not related to the availability of movement. Consider the sentence below:

(11) He left.

In this case, the pronoun refers to a salient individual in the context and it does not have an intra-sentential antecedent. It is then present in the numeration and is not related to availability of movement.

Therefore, deictic pronouns are not the same as bound pronouns. Hornstein argues that this is so because deictic pronouns contribute to the meaning of the sentence in a way that bound pronouns don't. Hornstein's reasoning is the following. Pronouns are bundles of phi-features. When pronouns are bound, their phi-features are not semantically active. This can be seen in the contrast below, taken from Hornstein (2004), page 6:

(12) [Only John]_i thinks that he_i is smart.

This sentence can be contradicted by the sentences below:

- (13) a. Wrong! Mary thinks that she is smart too.
b. Wrong! The boys over there think that they are smart too.
c. Wrong! I think that I am smart and you think that you are.

The sentences in (13) can contradict the one in (12) because the phi-features of 'he' in (12) carry no semantic import. If they did, the values of this bound variable would be restricted by the phi-features of this pronoun, which are singular, third person, male. But the sentences in (13) can contradict (12), and the pronouns present in those sentences

differ from 'he' in phi-features. For example, 'she,' in (13)a differs from 'he' with respect to gender; 'they,' in (13)b, with respect to number; and 'I' and 'you,' in (13)c with respect to person. Now, when we have a deictic pronoun, this is not possible (example from Hornstein (2004), page 7):

(14) This proposal is boring. It/*he/*she/*they/*I/*you/*we is also long.

The pronoun in the second sentence of (14) is not a bound pronoun. It is a deictic pronoun and is coreferential with 'this proposal.' Note that only 'it' can be coreferential with 'this proposal.' Hornstein reasons that in cases of coreference the phi-features of the coreferring expressions must semantically match. This means that the features of the pronoun are interpretable in this case.

This discussion shows us that deictic pronouns are different from bound pronouns because they contribute to the meaning of the sentence in a way that bound pronouns don't. Hornstein proposes that deictic pronouns are present in the numeration and thus are not elsewhere elements, as opposed to bound pronouns. This means that the presence of deictic pronouns is not related to the availability of movement.

Summarizing, in Hornstein's system A- and A'-bound pronouns are analyzed as elsewhere elements that are not present in the numeration. They can be inserted in derivations only if movement has failed to apply. Cases that are ruled out as Principle B violations in other frameworks are ruled out in this theory as economy violations. Deictic pronouns are analyzed differently from bound pronouns, being present in the numeration.

This 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 has one unifying analysis for both A- and A'-bound pronouns. In the next section, we will see that the facts in Brazilian Portuguese are also compatible with this theory.

3.2.1 Pronouns in Brazilian Portuguese

In this section I will discuss data from Brazilian Portuguese (henceforth BP) and show that Hornstein's analysis works in the same way in English and BP. Starting with locally A-bound pronouns, observe in (15)a that the pronoun *ele* 'him' cannot be locally A-bound.¹³ In (15)b we see that the clitic anaphor *se* is the appropriate form:

- (15) 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.'

¹³ An alternative to the derivations shown in (15) 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 (15) above, for example, cannot have a null object, as shown in (iii)a. There seems to be a restriction on the animacy of the object, as also illustrated in (iii)b, which must have an overt object pronoun:

- (iii) a. *O Pedro admira ___ .
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 him.'

Given these complications, which are not relevant to the acquisition study reported in chapter 4, I will not consider cases of null objects in the text. For analyses of these elements in BP, see Cyrino (1997) and Ferreira (2000).

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 (15) are comparable to what happens in English.

Note that the anaphor is a clitic, but that the form ‘*ele*’ is a strong 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).

Turning now to the case of RPs, in the examples below we can see that these elements are not possible in local subject position, but are required inside islands:¹⁴

- (16) 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’

¹⁴ 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 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 pattern of acceptability 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.

In (16)a, 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 (16)b, 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:

- (17) 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 (17)a, or the whole PP is absent, as in (17)b. BP does not exhibit preposition stranding, which means that movement out of PPs is impossible. So, if the PP is present, there must be a RP as the complement of the preposition.

The case in (17)b 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 the oblique position to spec,CP and then deletion of P occurred. As this issue is not relevant for my discussion, I will not pursue it here. For a discussion, see Kato (1993) and Tarallo (1983).

The discussion above shows that Hornstein's theory of A- and A'-bound pronouns can be extended to BP as well. The relevant facts were shown to be similar in

English and BP. This will allow us to investigate the acquisition issues in both languages and compare them.

3.2.2 Technical Implementations

In this section, I will provide some technical details on how to implement Hornstein's theory. In section 3.2.2.1, structures containing anaphors are considered. Section 3.2.2.2 deals with bound pronouns and how they are inserted in structures. Finally, in section 3.2.2.3, I discuss some issues relating to coreferential pronouns.

3.2.2.1 The Insertion of 'Self'

We saw above that pronouns are taken to be elsewhere elements that are inserted in a derivation only if needed. Hornstein proposes that 'self' too is an elsewhere element that is only inserted in a derivation if needed for convergence. 'Self' is inserted in derivations for Case reasons. In order to see why, observe the structure below:¹⁵

(18) * John likes (John).

Assuming that movement into theta-positions is allowed, in this structure 'John' moved from the complement position of 'likes' to the subject position of this verb, and the structure above shows the two copies of 'John.' This structure does not converge for Case reasons. As mentioned before, DPs can check Case only once. So, if 'John' checks the verb's accusative Case, it cannot move further to check nominative Case in spec,IP. Conversely, if it does check nominative Case in spec,IP, the verb's accusative Case is not

¹⁵ In this system, the copy theory of movement (Chomsky (1995)) is adopted. In this theory, moved elements leave behind identical copies rather than traces. In the examples to follow, the bracketed copies indicate the copies that are deleted in PF.

checked. Either way, the derivation crashes. Thus, the anaphor is inserted to check accusative Case, leaving ‘John’ free to check nominative Case.

If the verb does not assign accusative Case, then the anaphor need not be inserted:

- (19) a. John dressed.
b. John [dressed (John)]

Hornstein claims that some verbs assign accusative Case only optionally, and ‘dress’ is one of them. So, sentence (19)a is derived by moving ‘John’ from the complement position of ‘dress’ to subject position of this verb, with no need to insert the anaphor. ‘John’ ends up with two theta-roles: the dresser and the dressee. The meaning that we get is: John λx (x dressed x).¹⁶ Hornstein notes that this meaning is exactly what we are supposed to get if we assume movement from one theta-position into another. Given that there is no accusative Case to be checked, the insertion of ‘self’ is not required.

If the verb above assigned accusative Case, the insertion of the ‘self’ would be necessary and the sentence would be: ‘John dressed himself.’ The details of the derivation where accusative Case needs to be checked are presented below. A sentence like (20)a, has the structure in (20)b:

- (20) a. John likes himself.
b. [IP John I [self [VP John [V likes [DP [John]self]]]]]
 -nom -acc +nom +nom+acc

Going step by step on the derivation above, first we merge ‘John’ (with nominative Case) and ‘self’ (with accusative Case). Then we merge this into the object position of ‘likes.’

¹⁶ Observe that sentences like the one below do not involve movement into theta-positions:

(i) The children already ate.
In this case, the object of ‘eat’ is not ‘the children,’ obviously. This sentence means that the children already ate *something*, and it is left unspecified what they ate. In this case, the complement of the verb is possibly a null element.

This provides ‘John’ with the object theta-role. Next, ‘John’ raises to spec,VP where it gets the subject theta-role of ‘likes.’ Then it raises again to spec,IP where it checks Case and EPP features. At LF, ‘self’ raises to check the accusative Case features of ‘likes.’

In this analysis, ‘self’ is a nominal expression that is inserted into the derivation with Case features and is adjoined to a DP. Just like pronouns, ‘self’ is a grammatical formative, not present in the numeration. The question that straightforwardly comes to mind is, why is it that the form that surfaces is ‘himself’ and not ‘Johnself’? The answer to this question has two parts. First, we need to explain why ‘John’ is deleted and then explain why ‘him’ is inserted in its place.

The answer to the first question is the following. Hornstein assumes the copy theory of movement (Chomsky (1993)). In this framework, movement leaves not a trace, but a copy of the moved element behind. Nunes (1995) claims that deletion of the lower copies of a moved element is required in order for the Linear Correspondence Axiom¹⁷ to successfully apply. That is, if all copies of a moved element are kept, the expressions cannot be linearized consistently. So only one copy must be kept and all the others must be deleted. How do we choose which copy to keep? The copy that has all of its features checked is kept. This is so because if we keep a copy that has not checked its features, the derivation crashes. In (20)b, the copy of ‘John’ in the matrix spec,IP is the only one with Case features checked, so it is kept and the others are deleted.

The answer to the second question is the following. ‘Self’ is a bound morpheme in English. So, it cannot stand alone and needs an element to morphologically support it. If the two lower copies of ‘John’ are deleted, as just discussed, then ‘self’ is left alone,

¹⁷ The Linear Correspondence Axiom (LCA) takes a hierarchical structure and produces a linearization of its constituents. It was first introduced in Kayne (1994).

without any element to support it morphologically. Hornstein proposes that the pronoun is inserted after the copy of ‘John’ is deleted, to serve this function of morphologically supporting the anaphor. The form that is introduced, ‘him,’ agrees in Case with ‘self.’ Thus, the pronoun is inserted in PF, and the derivation that is fed to LF does not contain the pronoun. (20)b above is the LF structure and the structure below is the one fed to PF:

(21) [IP John I [VP (John) [likes [[HIM+self]]]]]

To sum up, in this system it is assumed that DPs can check Case only once. So, in the sentence above, after ‘John’ checks either the nominative Case or the accusative Case, it is frozen in place and cannot move anymore. The insertion of the anaphor is therefore needed for Case reasons. In PF, the copies of ‘John’ with unchecked features must delete for the correct linearization to occur. When this happens, ‘self’ is left without a morphological support. The form ‘him’ is then inserted to support it.

3.2.2.2 *The Insertion of Pronouns*

In this section, I would like to clarify some details of Hornstein’s proposal with respect to the insertion of pronouns. First, let us consider the sentence below, where ‘he’ is bound by ‘Grover’:

(22) *Grover* thinks that *he* deserves a vacation.

In section 3.2, it was claimed that, in structures like the one above, the pronoun is inserted in the embedded subject position and that Grover is inserted in the matrix subject position. The question I would like to address is, how do we know that ‘he’ is bound by ‘Grover’? In other words, couldn’t the pronoun inserted as an elsewhere element be

interpreted as picking another salient individual in the context as its antecedent, being interpreted deictically?

The answer is ‘no.’ Hornstein proposes that sentences like (22) are derived via a “Non-Movement Alternative (NMA) to a derivation D,” stated below. He assumes that NMAs are what license bound pronouns. That is, bound pronouns can be used to generate a sentence S via derivation D’ if and only if D’ is the NMA(D) (read: non-movement alternative to D), D cannot converge and NMA(D) can. This is made more explicit below (taken from Hornstein (2001), page 179):

(23) D’ is the NMA(D) iff_{def} D’ is formed from D as follows:

- (i) D is a phrase marker that does not converge.
- (ii) D’ is obtained from D by demerging an expression E, substituting a pronoun for E and merging E at the relevant point in the derivation.

(23) defines a process that allows one to (a) unmerge a previously merged expression E (b) merge a pronoun into the position E occupied and (c) remerge E into another position that allows the derivation to continue to convergence. Let us see how this works in the case of (22). The numeration for this derivation is shown below:

(24) {Grover, thinks, that, deserves, a, vacation}

The derivation for (22) starts with the merge of ‘a’ and ‘vacation.’ Then, this DP merges with ‘deserves.’ At this point in the derivation, shown below, we have only one alternative: insert ‘Grover.’ Given that this alternative is available, the insertion of the pronoun isn’t:

(25) deserves a vacation

‘Grover’ is inserted in the subject position of ‘deserves’ and the derivation continues with the merge of ‘that,’ ‘thinks,’ until we reach the following point:

(26) [VP thinks [CP that [IP Grover [VP Grover deserves a vacation]]]]

At this point, we cannot move ‘Grover’ from the embedded spec,IP to the subject position of ‘thinks’ due to Case reasons. Given that ‘Grover’ checked nominative Case in the embedded spec,IP, it is frozen in that position. The option we have is to form the NMA to this derivation. In order to do that, we demerge ‘Grover’ from the embedded clause, merge the pronoun into that position and remerge ‘Grover’ in the subject position of ‘thinks.’ This will give rise to the structure we desired.

So, given that the pronoun is merged in the position previously occupied by ‘Grover,’ it is interpreted as bound by ‘Grover.’ So, the pronouns introduced via NMAs are interpreted as bound. One possible question that emerges is, what goes wrong with the sentence below, where the pronoun was inserted in the matrix spec,IP? This sentence is a case of Principle C violation:

(27) * *He* thinks that *Grover* deserves a vacation.

As discussed above, bound pronouns are inserted by means of NMAs. So, if ‘he’ is bound by ‘Grover’ in this sentence, it was inserted by means of an NMA. In order to do this, we would have to merge ‘Grover’ in the matrix spec,IP, then demerge it from there, insert the pronoun in that position and then remerge ‘Grover’ into the embedded spec,IP. This NMA is not licit as it violates the Extension Condition (Chomsky (1993)). Hornstein (2001) assumes that overt instances of Merge and Move adhere to the Extension Condition. This condition requires that grammatical operations extend the tree. In Hornstein’s words, this condition requires “the phrase marker that results from the operation contain as a sub-constituent the phrase marker that was input to the operation” (page 20). However, in the sentence above, when we remerge ‘Grover’ in the embedded

spec,IP, this operation does not extend the phrase marker, as required, and thus, the sentence does not converge. We could think then that cases of Principle C violation like the one above, involving R-expressions and pronouns, are excluded in this system as violations of the Extension Condition.

A final point to address is the following. We saw above in section 3.2.2.1 that ‘self’ is inserted in a derivation for Case reasons. The question then is, why can’t we insert ‘self’ instead of ‘he’ in (22), giving rise to the following sentence?

(28) * Grover thinks that himself deserves a vacation.

The problem with this derivation is that ‘self’ is placed in spec,IP where nominative Case is checked. As discussed in Rizzi (1990a) and Woolford (1999), among others, it is a well known fact that anaphors in English (among other languages, such as Italian and Icelandic) are incompatible with nominative Case. Therefore, this structure is ruled out due to the incompatibility of the Case being checked. Observe that in cases where nominative Case is not assigned, the anaphor is licit:

(29) John considers himself to be a genius.

In this sentence, the anaphor checks the accusative Case assigned by the verb ‘consider,’ and ‘John’ checks the matrix nominative Case.

3.2.2.3 Coreferential Pronouns

Hornstein’s theory deals only with bound pronouns. That is, as we saw above, Hornstein’s system proposes a way of deriving bound pronouns via NMAs and shows how a stipulation like Principle B can be eliminated from the theory of grammar if movement is more freely allowed. Differently from bound pronouns, Hornstein proposes

that deictic pronouns are not elsewhere elements; they are present in numerations and have phi-features that are semantically active, as opposed to bound pronouns, whose phi-features are semantically inert. This theory has nothing to say about coreferential pronouns. In order to make the following discussion more clear, let us make the distinction between bound and coreferential pronouns more explicit. When a pronoun and a DP are *coreferential*, the value of the DP and the value of the pronoun are the same; that is, they pick out the same referent in discourse. When a pronoun is *bound* by an antecedent, the referential value of the pronoun can only be determined as a function of the interpretive content of its antecedent (modified from Safir (2004a)).¹⁸ In the sentence below, we have an example of a coreferential pronoun:

(30) A: Bert doesn't like Cookie Monster, Ernie doesn't like Cookie Monster, only Cookie Monster likes *him*.

B: No! Miss Piggy likes him (= Cookie Monster) too.

In this dialogue, the sentence uttered by speaker A has the pronoun coreferential to 'Cookie Monster' and it is acceptable. However, there are cases of coreferential pronouns that are not acceptable, as shown below:

(31) * Cookie Monster likes him.

This sentence can be excluded in Hornstein's system only when the pronoun is interpreted as bound by 'Cookie Monster.' In this case, the sentence is excluded as an economy violation. However, nothing in his system blocks the derivation where the

¹⁸ Safir (2004a) does not use the term 'bound' in his definitions. In fact, his system does not make use of this notion at all. I adapted his definitions in order to be in accordance with the notions I use in this dissertation.

pronoun is present in the numeration and is interpreted as coreferential with ‘Cookie Monster,’ a case of ‘accidental coreference.’ How should we rule out cases like this?

The analysis I will adopt here is proposed in Reinhart (1983b) and in Grodzinsky and Reinhart (1993). As discussed in chapter 2, Reinhart (1983b) observes that pronouns can have the bound and coreferential interpretations illustrated above and suggests the following. Principle B is responsible for excluding locally A-bound pronouns, and Rule I, stated below, is responsible for excluding pronouns that are coreferent with a local NP:

(32) Rule I: Intrasentential Coreference (from Grodzinsky and Reinhart (1993))

NP A cannot corefer with NP B if replacing A with C, C a variable A-bound by B, yields an indistinguishable interpretation.

The idea behind this rule is that, if the structure allows the bound reading for a pronoun, then the coreferential reading is possible only if it gives rise to an interpretation that is somehow different from the bound interpretation. For example, coreference in the case of (30)A is possible because the bound interpretation is different from the coreference reading. If we had the bound reading in (30)A, the meaning of the sentence would be that only Cookie Monster likes himself as opposed to everybody else, who do not like themselves. This is different from the coreferential reading, where the issue is that nobody else likes Cookie Monster. In other words, in the coreference reading, the issue is not about liking oneself, but about liking ‘Cookie Monster,’ as the reply in (30)B suggests. So, cases of coreferential pronouns are possible, but they need to provide a meaning to the sentence that is different from what we get when the pronoun is bound.

In these cases of coreferential pronouns, like (30), the pronoun is not an elsewhere element, but is present in the numeration. I assume that Rule I, as stated in (32) above,

regulates the distribution of these pronouns. In cases where the bound reading is possible, as in (30), the meaning of the sentence with the coreferential pronoun will be compared to the meaning of a sentence where the pronoun is bound. If they are indistinguishable, the sentence will be ruled out. As extensively discussed above, I do not assume that Principle B is part of the grammar. I assume that, in order to exclude a locally A-bound pronoun, its derivation is going to be compared to its movement counterpart. If the movement counterpart is convergent, it wins the competition and the pronoun is ruled out. Thus, depending on the interpretation of the pronoun, it will be ruled out by economy conditions or by Rule I.

As a final point, let me note that more recently, Reinhart has updated her Rule I, as shown below:

(33) Covaluation Rule I (Reinhart (to appear)):

α and β cannot be covalued if

- a. α is in a configuration to bind β , (namely, α c-commands β) and
- b. α cannot bind β and
- c. The covaluation interpretation is indistinguishable from what would be obtained if α binds β .

Consider the example below in order to see how this rule works:

(34) Despite the big fuss about Felix' candidacy, when we counted the votes, we found out that, in fact, only *Felix* himself voted for *him*. (Reinhart, 1983)

In the last sentence of this example, *Felix* c-commands *him*, so (33)a holds. Hence (33)b needs to be consulted for covaluation. *Felix* cannot bind *him* in that sentence, which means that (33)b also holds. So, we need to check (33)c. Covaluation and binding are distinguishable in this case. So, the third conjunct of (33) does not hold, and (33) does not rule out covaluation.

It seems that both versions of Rule I are interchangeable and it would seem that either version could be adopted here. However, if we observe the covaluation rule in (33) in more detail, we see that condition (33)b makes use of Principle B of Binding Theory. It requires that we check if Principle B is violated or not. This is the reason why I do not adopt this version of the rule in the text. If I am assuming that Principle B is not part of the grammar, the covaluation rule cannot be stated in these terms. For our purposes here Rule I, as stated in (32), is to be preferred.

3.2.3 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 us to *compare* the derivations with pronouns to their counterparts involving movement 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 derivations being compared.

In technical terms, only convergent derivations with identical numerations can be compared. As we saw above, bound pronouns and 'self' are analyzed as grammatical formatives, not present in numerations. This means that derivations involving pronouns and their counterparts involving movement (i.e., anaphors) end up having identical numerations. So, as shown in the numeration in (35)c below, the structures in (35)a and (35)b have identical numerations and therefore can be compared:

- (35) a. *Grover* admires *himself*.
b. *Grover* admires *him*.

- c. {Gover, admires}

As mentioned before, (35)a competes with (35)b. Given that (35)a involves movement, it wins the competition and blocks (35)b. Thus, in order to decide if the pronoun is possible in (35)b, this derivation is compared to its movement counterpart. If the movement counterpart is possible, the insertion of the pronoun is not. The same occurs in the case of RPs, shown below. (36)a and (36)b have the same numeration, as shown in (36)c. In (36)a, we see that the movement counterpart is possible, which renders the insertion of the pronoun illicit:

- (36) a. This is the boy that __ likes candy.
b. * This is the boy that he likes candy.
c. {this, is, the, boy, that, likes, candy}

In the minimalist framework, only convergent derivations can be compared. This is the case in the derivations above. Let us consider the sentences in (35) first. Derivations (35)a and (35)b are both 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 (remember that Principle B is not part of the grammar in this system), which is precisely the issue being evaluated. The same considerations hold for the pair in (36). The derivation in (36)b does not violate any other constraint besides economy. Therefore, both (36)a and (36)b are convergent and are included in the reference-set to be compared.

Things are different when pronouns appear inside islands, as the derivation involving movement does not converge:¹⁹

¹⁹ Hornstein suggests that island conditions “characterize restrictions on the computational system that bar the application of movement for formal reasons” (page 177). Thus, islands effects reflect properties of the computational system, and island conditions are reflections of limitations on the form of computations. He

- (37) a. * This is the boy that Mary left [when __ arrived].
 b. This is the boy that Mary left [when he arrived].

The derivations above have identical numerations. Derivation (37)a involves illicit movement out of an island and is not convergent. Therefore, this derivation is not included in the reference-set. This means that, in order to check if the pronoun is licit in (37)b, the reference-set contains only one derivation. With only one derivation in the reference-set, there is no comparison to be performed in this case.

Thus, in some environments, like the one in (37), reference-set computation is not needed to check if pronouns are licit or not, as the set contains just one member in it.²⁰ In other cases, as in (35) and (36), reference-set computation is required in order to exclude a derivation with a pronoun, as there is more than one derivation in the reference-set.

3.3 Reference-Set Computation and Working Memory

In this section, I discuss Grodzinsky and Reinhart's (1993) and Reinhart's (1999a, to appear) ideas on how reference-set computation is difficult for children due to their more limited working memory capacity. First, I will discuss what exactly is the difficult part in performing reference-set computation and before moving on to section 3.4, I discuss some studies in psychology, which show that Grodzinsky and Reinhart's claim about

assumes that islands are manifestations of the shortest move requirement. Thus, movement is impossible from islands because movement is defined so that 'long' moves are not legitimate operations and that moving out of an island counts as a long move.

²⁰ Other examples of structures where the movement counterpart does not converge were presented in the text, in the examples in (7), repeated here:

- (i) a. *Batman* likes *his* car.
 b. *Robin* thinks that *he* is a genius.

As was discussed in the text, the movement counterpart of (i)a violates the Left Branch condition and the movement counterpart of (i)b is excluded for Case reasons. Therefore, the reference-set for these derivations have just one member each. So, no reference-set computation is involved in order to check if pronouns are licit in these cases.

children's more limited working memory capacity is in fact a consensus in the psychology literature.

3.3.1 Reference-Set Computation and Language Processing

As discussed in chapter 2, Grodzinsky and Reinhart (1993) proposed that children behave at chance level on experiments with sentences like the one below because of their limited working memory capacity:

(38) Mama Bear is washing her.

Ignoring the deictic reading for the pronoun, following Reinhart (1983a, b), Grodzinsky and Reinhart (1993) assume that the sentence above has two potential interpretations, the bound one, shown in (39)a below and the coreferential one, shown in (39)b:

- (39) a. Mama Bear λx (x is washing x)
b. Mama Bear λx (x is washing her) (& her = Mama Bear)

The authors assume that the bound reading is ruled out by Principle B, while the coreferential reading is ruled out by Rule I, stated above in (32). Grodzinsky and Reinhart note that in order to check if the coreference reading is allowed or not by Rule I, a reference-set with two derivations (the bound one and the coreferential one) has to be built. The reference-set for sentence (38) is shown in (39). After these two derivations are built, they must be compared against the context to check if they are distinguishable or not.

Note that the notion of reference-set used here is different from the notion in section 3.2.3. The reference-set built in this case contains the possible *interpretations* for a derivation as its members. These interpretations are compared to check if they are

different from each other. In the cases discussed with respect to Hornstein's theory in section 3.2.3, the reference-sets had derivations in them that were compared to check which one was more economical.

Grodzinsky and Reinhart claim that the computations imposed by Rule I place a great load on children's working memory, which is not capable of handling them. So, 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, explaining the 50% pattern of response. Grodzinsky and Reinhart claim that the most demanding task in this computation is related to the semantic disambiguation that children have to do between the two interpretations. They claim that holding the two derivations in working memory imposes a load too, but it is the semantic disambiguation that is the most demanding part.

In more recent papers however, Reinhart (cf. Reinhart (1999a) and Reinhart (to appear)) has claimed that children's chance performance on sentences like (38) does not reside in performing semantic disambiguation as first proposed. Reinhart (1999a) notes that in tasks of semantic disambiguation, children in fact do not perform like adults. However, the kind of behavior children show in this type of task is not the guess pattern but the default pattern. That is, in semantic disambiguation tasks children choose a default answer and always stick to it. This default answer might differ from adults' answer, but is clearly not one of guessing.

One of the examples of studies on semantic disambiguation tasks cited in Reinhart (1999a) is Crain, Ni and Conway (1994). In this study, Crain et al. interviewed children

and adults on ambiguous sentences like the one below. This sentence has the two interpretations shown in (a) and (b) (bold face indicates main-sentence stress):

(40) The dinosaur is only painting a **house**.

a. The only thing the dinosaur is doing is painting a house.

b. The only thing the dinosaur is painting is a house.

If 'house' is selected as the focus, we get reading (40)b. Conversely, if the VP is selected as the focus, we get the reading in (40)a. There are subset relations between these two readings: (40)a entails (40)b. That is, the situations where (40)a is true are a subset of the situations where (40)b is true. For example, in a context where the dinosaur is painting the house and whistling, (40)a is false, while (40)b is true.

In Crain et al's study, when a context consistent with both readings was presented, adults tended to choose the reading in (40)b as default. That is, adults chose the reading that is consistent with a larger number of contexts. On the other hand, in the same experiment, children chose the other reading as default. That is, children picked the more restricted reading. So, although in this study children's default choice differed from the adults' default pattern of response, it was not a pattern of guess, but a uniform strategy of choosing the more restricted reading. That is, children do not present chance performance in this type of task, by guessing.

Based on this kind of experimental result, Reinhart reasons that children's processing problem in cases with coreferential pronouns is not in performing the semantic disambiguation between the bound reading and the coreferential reading. Reinhart claims, "the disambiguation default pattern is clearly distinguishable from the guess pattern, which I argue is characteristic of reference-set computation" (page 23).

The author goes on and makes the following hypothesis: “if it is independently established that reference-set computation is involved, then there should be a guess pattern in its acquisition” (page 23).

In trying to pinpoint exactly what the problem is that children face when performing reference-set computations, Reinhart (to appear) claims that the first step, which involves constructing the binding representation (to be compared to the coreferential interpretation) is costly. This representation is not available at the input derivation (which is associated with the phonological input received by the parser), since the input derivation does not allow binding. The second step involves semantic computation. Since semantic computation triggers the default pattern of response, as discussed above, Reinhart concludes that “it is only the full complex involved in reference-set computation which leads to a processing crash of the child’s parser. [...] the hypothesis put forth here is that we expect processing failure only when the computation requires also the first step of constructing a derivation not available at the parser’s input” (page 14).

Thornton and Wexler (1999) claim that Grodzinsky and Reinhart’s processing explanation for children’s difficulties with coreferential pronouns is problematic. More specifically, they find worrisome the claim that children’s and adults’ processing capacities are different, because that means that children and adults have different parsers; something undesirable as it raises the question of how children end up with an adult parser. As Reinhart (to appear) clarifies, this is a misunderstanding. Reinhart assumes a universal parser and claims that the only difference between children and adults is in the size of their working memory. She claims “it is commonplace wisdom that

precisely one and the same parser (software), applying in two hardware-systems differing only in the size of their memory, may fail at some tasks in one, but not in the other. A difference in memory-space cannot be described as a different parser, nor precisely as a different processing system” (page 12).

Before moving on to the next section where I use these ideas in my proposal, I would like to discuss a little bit more the notion of ‘working memory’ and the assumption that children’s working memory capacity is more limited than adults’.

3.3.2 Working Memory Capacity in Children and Adults

Researchers in psychology have proposed a division in memory between long-term memory and short-term memory. Long-term memory maintains, for example, large numbers of facts and autobiographical events for up to years, while short-term memory is capable of retaining small amounts of information for very short periods of time (Squire and Zola-Morgan (1991)). Baddeley and Hitch (1974) proposed that the best way to characterize short-term memory is as a ‘working memory’ system. Working memory is conceived of as a short-duration, limited-capacity memory system capable of simultaneously storing and manipulating information in order to accomplish a task. They suggested that working memory plays an important role in the execution of a wide variety of cognitive activities, such as reasoning, language comprehension, long-term learning and mental arithmetic.

Gathercole and Baddeley (1993) pointed out that the processing resources used by working memory to perform various functions are limited in capacity. The efficiency with which working memory fulfils a particular function depends on whether or not other

demands are simultaneously placed on it. The greater the competition for the limited resources of the working memory, the more its efficiency at performing particular activities will be reduced.

Daneman and Carpenter (1980) have argued that language comprehension places demands on resources made available by the working memory system. They proposed that language comprehension involves both *processing* and *storage*. Processing is used in recognizing the lexical items represented in the linguistic structures, accessing their syntactic and semantic characteristics, and interpreting the meaning of the sentences. The intermediate representations that result from these processes need to be stored, as they provide input for further levels of language processing activities. These authors have also proposed that a common pool of limited-capacity resources is used in both storage and processing, so that a tradeoff between these two activities is necessary whenever a language-processing task exceeds the limited resources available.

Psychologists have developed experiments that can measure either an individual's storage capacity or his or her processing capacity. An individual's storage capacity is usually measured in a test where the subject hears a sequence of spoken digits and has to remember these digits in the correct order. The subject's digit span is considered to be the maximum number of digits that s/he can immediately remember and repeat back in the same order. Between childhood and adulthood, there is a significant increase in individuals' ability to retain temporary verbal material such as a list of numbers. Four-year olds have a span of between two and three digits, while adults have a span of about seven digits (Gathercole and Baddeley (1993)). This shows how memory storage capacity increases with age.

A subject's processing capacity can be tested in different ways. Tests measuring such capacity are called tests of *M* space (Case (1972)). In this type of task, subjects have not only to store digits in the correct order, but in addition to it, they have to perform some transformation on the original input before recall. In a study on children's processing capacities, Case, Kurland and Goldberg (1982) used the Counting Span Test. In this test, the operation that is required is counting, and the items that must be stored are the products of a series of counting operations. The subject is presented with a set of white cards, one at a time. On each card, there are a number of colored dots, which the subject is asked to count. After the last card has been counted and removed, the subject is asked to recall the number of dots on each card. The first set contains just one card, so that recall is straightforward. On the following trials, the set size is gradually increased, so that the memory load becomes greater. At some point, the subject reaches a level where s/he can no longer maintain perfect recall. A subject's *M* space is equal to the maximum set size for which s/he can recall all the card totals, on at least two trials out of three.

It has been claimed that not only storage capacity as provided by digit span develops with age, but also *M* space span develops with age. Case et al. observe that five-year-olds have an *M* space of about two units, while ten-year-olds have an *M* space of about four units. Adults have an *M* space of around seven units. Therefore, in psychology, it is common ground that children's working memory capacity is more

limited than adults' and an extensive field of research is devoted to explaining how working memory capacity develops with age.²¹

The particular proposals of how exactly working memory capacity develops with age are not an important issue for us here. What is relevant is that numerous tests on storage as well as on *M* space have provided substantial indication of this difference between children's and adults' working memory capacity. It should be noted, however, that this difference in working memory capacity is not taken to mean that children process language differently from adults. That is, recognizing that children and adults have different capacities for working memory does not mean that their parsers operate differently. Psychology researchers usually assume that language is processed in the same way by both children and adults, although some structures might be harder for children due to their more limited working memory capacity (cf. Gathercole and Baddeley (1993)). This is the assumption that I will make in this dissertation as well.

Having established that it is in fact not only plausible but also natural to assume that children's working memory capacity is more limited than adults', I will now describe the proposal of this dissertation.

3.4 Proposal and Predictions

As discussed in section 3.2, I will assume Hornstein's theory of pronouns, analyzing bound pronouns as elsewhere elements, which are inserted in a derivation only if needed

²¹ Reinhart (1999a) warns us that the working memory system should not be confused with memory resources in general, or long-term memory. She notes that there are no claims that children's general memory resources are limited. This is corroborated by the fact that children manage to learn a large amount of information. She also notes that the precise details of how working memory develops - whether memory capacity itself increases, or only efficiency in allowing more resources to be employed in storage - are subject of debate, as mentioned in the text. However, this does not change the fact that children's working memory was found to be more limited than adults'.

for convergence. In order to decide if a pronoun is licit or not in a derivation, reference-set computation is needed. Pronouns will be allowed if there is no other derivation in the reference-set that is more economical than the derivation with the pronoun. I will also assume Reinhart's proposal on the processing cost associated with reference-set computation, discussed in section 3.3. Given children's more limited working memory capacity, the reference-set computation required in order to check if bound pronouns are licit or not will trigger chance level performance by children.

I assume that children know the elsewhere character of pronouns. So, in experimental settings, when pressured to say if a sentence containing a *bound* pronoun is 'right' or 'wrong,' children know that they have to check if the pronoun is licit or not in the structure, by means of reference-set computation. However, given their limited working memory, they cannot complete the task. Children are then predicted to guess randomly with a 50% probability of responding 'yes.' That is, we predict children to have processing problems and behave at chance level on tests with both A- and A'-bound pronouns.

As discussed in section 3.2.3, in some cases of reference-set computation, the reference-set has two derivations in it, the one with the pronoun and the one with movement. In these cases, comparison is required. Examples of these cases are shown in (41), with their respective reference-sets shown in (42):

- (41) a. *The dog* is scratching *him*.
 b. *Every elephant* is washing *him*.
 c. The frog that *he* is skating is happy.

(42) Reference-sets for the sentences in (41):

- a. *The dog is scratching him. vs. The dog is scratching himself.*
- b. *Every elephant is washing him. vs. Every elephant is washing himself.*
- c. *The frog that he is skating is happy. vs. The frog that t is skating is happy.*

In other cases, the reference-set will have just one derivation in it, as the derivation containing the pronoun converges while the one involving movement crashes:

- (43) a. Reference-set: *Every duck is carrying his guitar.*
Not in reference-set: * *Every duck is carrying t's guitar.*
- b. Reference-set: *This is the frog that the swan laughed when he fell.*
Not in reference-set: * *This is the frog that the swan laughed when t fell.*

We predict children to have processing problems, and therefore, chance level performance, on sentences like (41), but not on sentences like (43). The problem can be thought to reside in constructing the second derivation to be included in the reference-set, which was not in the input, as Reinhart proposes. As the cases in (43) have only one derivation in their reference-sets, no comparison of derivations is performed and children should not have processing problems.

Note that this processing problem is predicted to emerge in comprehension tasks in experimental situations, but not in production. In the grammaticality judgment task, for example, children hear the test sentences and have to say whether they are good or not. So, upon hearing a sentence with an elsewhere element like a bound pronoun, children have to perform the computations described above in order to give a response and this is when they get stuck and cannot complete the task, as just described. However, in production the situation is different. When building the derivation for a relative clause, for example, children will not consider inserting a RP in the relativized position if

movement has succeeded. That is, the insertion of the pronoun is never considered if the need does not arise. In the experimental situation, however, children are forced to do it, as the sentences they heard contained the pronoun.

Summarizing, my proposal is that in sentences involving bound pronouns, reference-set computation is needed in order to check if the pronoun was licitly inserted or not. When the reference-set has more than one derivation in it, children's working memory is not capable of building the second derivation, and comparing them. Not being able to continue the computation, children's way out is to resort to guessing. Thus, the performance we predict children to have is to behave at chance level. In the experimental settings, the two possible answers that children can give are either 'yes' or 'no.' So, chance level performance here corresponds to 50% of correct responses.

As discussed in chapter 2, there is no study on the acquisition of pronouns which has tested the same children on sentences containing both A- and A'-bound pronouns. If the chance level performance observed in those previous studies has one underlying processing cause, as claimed here, we have a clear prediction: children should perform at chance level in tests with A- and A'-bound pronouns.

RPs can only be A'-bound and so, when children hear a relative clause with a RP, as in (41)c, they know that they have to compare it to its movement counterpart by means of reference-set computation. The same happens with pronouns with QP antecedents, as in (41)b. In this case, the pronoun can only have a bound reading. Chance level performance is expected, as children have to compare the derivation with the pronoun against the derivation with the anaphor. The question is not so straightforward in the case of pronouns with DP antecedents in A-positions, as in (41)a. Given that in this case

pronouns can be either bound or coreferential, we need to make it more explicit what happens in these circumstances. There are two possibilities: either (a) the children give the pronoun a coreferential reading, in which case they have to check if this reading is allowed or not by comparing it to the bound reading, as required by Rule I; or (b) the children give the pronoun a bound reading, in which case they have to check if the pronoun was licitly inserted or not by comparing it to its counterpart containing an anaphor.

My hypothesis is that, in the experimental settings, when children see a picture of a reflexive action being performed and hear a pronoun with a local antecedent, like in (41)a, they assign it a bound reading, not a coreferential reading. This hypothesis does not seem to be problematic. There are various proposals in the literature on adult language (see, for example, Büring (2005), Reinhart (1999b) and Safir (2004a, b), among others) claiming that the coreferential reading of a pronoun is possible only if the bound reading is not.²² We could interpret these proposals as meaning that there is a preference in natural language for the bound interpretation of a pronoun, and that the coreference interpretation is not the first interpretation assigned to a pronoun in the parsing of a sentence.²³

As my proposal is clearly inspired by Grodzinsky and Reinhart's (1993) theory, in what follows I would like to clarify how these two proposals differ. Grodzinsky and Reinhart claim that reference-set computation is needed when coreferential readings of the pronouns are at stake. In their system, the bound reading of pronouns does not pose

²² Büring (2005) and Reinhart (1999b) account for this preference for the bound reading over the coreference reading by means of Rule I, which states that coreference is only possible if distinguished from the bound reading. Safir (2004a, b) proposed the "preferred covaluation" principle, which states that dependent identity (or, in our terms, bound reading) is preferred over covaluation.

²³ A more in-depth discussion of coreferential pronouns will be left to chapter 5.

problems for children. These readings are automatically excluded by Principle B of Binding Theory. They claim that children know Principle B and do not have processing problems with it. Thus, the cases where children have processing problems arise when they have to check the availability of coreferential readings for the pronouns. This is where our proposals differ. In the proposal presented here, the chance level performance observed in experimental settings is due to children's problems with bound pronouns, not coreferential ones. In other words, in Grodzinsky and Reinhart's theory, children's problem is in comparing the bound and coreferential *interpretations* of a pronoun. My claim is that the problem is in comparing syntactic derivations with and without bound pronouns. The two analyses differ with respect to predictions for RPs and pronouns with quantified antecedents. In these cases, the interpretations for a derivation with and without the pronoun are the same. Grodzinsky and Reinhart's theory does not predict chance level performance in these cases, but the hypothesis presented here does. As we will see in the next chapter, this prediction is borne out.

A last observation that must be pointed out is related to BP. As mentioned in chapter 2, children acquiring Romance languages, such as French, Spanish, Catalan and Italian, do not display chance level performance on tests with locally A-bound clitics. BP is a Romance language, but, as discussed in section 3.2.1, this language does not exhibit object clitics, but strong pronouns for this position. Therefore, since the sentences presented to children displayed a strong object pronoun, and not a clitic, BP-speaking children should behave similarly to children acquiring languages with object pronouns, like English. Some speculations on the acquisition of clitics are presented in chapter 5.

Chapter IV – Experimental Results

4.1 Introduction

In this chapter I will present the experiments I conducted with children acquiring Brazilian Portuguese and English as their native languages. The experiments were designed to test the predictions formulated in the previous chapter. As discussed there, if bound pronouns are analyzed as elsewhere elements, we need reference-set computation to check if they are licit or not in a sentence. Consider the sentences below:

- (1) a. *The dog* is scratching *him*.
- b. *Every dog* is scratching *him*.
- c. The bear that *he* is smiling is Papa Bear.

In the case of the sentences above, the reference-sets associated with each of these sentences contain two derivations, one involving the insertion of the pronoun and another involving movement. Given that movement is possible in these cases, the sentences above, with pronouns, are excluded. Thus, because the reference-sets have more than one derivation in them, comparison between them is necessary to exclude the derivation with

the pronoun. This is where we claimed that children should have processing problems and resort to guessing, giving rise to chance level performance.

The situation is different in the cases of possessive pronouns, as in (2)a, and RPs in unextractable positions, as in (2)b:

- (2) a. *Every kangaroo* is cleaning *his* glasses.
b. This is the bird that the hippo smiled when *he* got there.

In these cases, the counterparts involving movement do not converge and so are not included in the reference-set. Therefore, the reference-sets for these derivations possess only one member (the derivation with the pronoun) and no comparison is needed. We predicted that children should not have processing problems in these cases. Children should accept these grammatical cases at a high rate.

Thus, the research question of the present study is the following: is there a commonality in the problems children face in the case of RPs in extractable positions and in the case of pronouns locally A-bound? That is, this study investigates children's behavior in these two domains in order to check if we will find a developmental stage in language acquisition where chance level performance is detected for both (a) sentences with RPs in extractable positions and (b) pronouns locally A-bound. The experimental hypothesis is that children should exhibit a 50% chance level performance with respect to both locally A-bound pronouns and RPs. The null hypothesis is that there will be no such correlation.

The chapter is divided as follows. Section 4.2 describes the experiments conducted with English-speaking children (4.2.1) and Brazilian Portuguese-speaking children (4.2.2). Section 4.3 is a general discussion of the findings. Section 4.4 focuses on

the results concerning pronouns locally A-bound by quantified antecedents. In this section, I argue that Chien and Wexler's and Thornton and Wexler's methodologies for testing pronouns bound by QPs are defective. I present a third experiment conducted by me to compare how the same children behave when two different methodologies are employed to test the same type of sentence. Finally, section 4.5 is the conclusion.

4.2 Experiments

4.2.1 Experiment I: English

Subjects. I interviewed twenty-three children acquiring English as their native language.¹ They ranged in age from 3;7 to 5;11 (mean age = 4;7). The children attended the Mansfield Discovery Depot day care in Mansfield, CT. For analysis purposes, the children were divided in three groups by age. There were 4 children from 3;7 to 3;11 years of age, 9 children from 4;0 to 4;11 years of age, and 10 children from 5;0 to 5;11 years of age. Five adult speakers were also tested.

Procedure. The experiment was a grammaticality judgment task (Hiramatsu and Lillo-Martin (1998) and McDaniel, Cairns and Hsu (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 English, but got confused sometimes. The children were then invited to help the puppet to learn English.

¹ The total number of children interviewed, including the ones that had to be excluded from the analysis, is twenty-seven. Three children were excluded because they were too young (under 3;6) and did not seem to understand the task, even after numerous training sentences were presented to them. One child (age 4;4) was excluded because he seemed to have a 'no' bias. He rejected all of the sentences uttered by the puppet in the training sessions, even when I would point out that the sentences were correct. Because I thought his judgments were not reliable, he was removed before the actual target sentences were tested.

In this task, the children were interviewed individually and only one experimenter was present.² The experimenter showed to the child and the puppet bright colored 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 not.

Before proceeding, I would like to make some observations concerning the instructions given to children. When children were first introduced to the puppet, in the training session, the puppet uttered some acceptable sentences and some word salad sentences. This was done with the intent to explain the ‘game’ to them, making explicit the notions of saying the sentences in the ‘right way’ or ‘the wrong way.’ After this initial period, all the other ungrammatical sentences included in the training session were formulated in such a way as to teach children to pay attention to subtleties. They were not as clearly ungrammatical as word salad sentences are, but were sentences with one word extra (for example, *the elephant up woke up*) or one word missing (for example, *the fish sleeping*). The reason for such a strategy is due to the type of sentence that children would have to judge later. For example, a sentence with a RP in an extractable position, like the one below, does not strike one as being strange the way a word salad sentence is:

- (3) The bear that **he** is smiling is Papa Bear.

² 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 people able to help me in carrying out the task in Brazil, I developed a way to play both roles. In order to keep the experiments identical in both languages studied, I used the same technique with English-speaking children as well. The strategy was the following. 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 would put it in front of my face and spoke with a high-pitched voice. The younger children, 3;0 and 4;0 year-olds, 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 anyways. So, I do not think that the results of the study were in any way compromised by the presence of just one experimenter.

This sentence is not good, but it is not completely gibberish also. If the child is really concerned and wants the puppet to learn English, she might consider this sentence as pretty good for someone who is trying hard and had said some really bad sentences in the beginning of the session. She might see it as an improvement and therefore consider it ok.

So, in order to make sure children differentiated at least three levels of acceptability, I introduced the term 'weird,' which was used to describe the sentences that were not completely acceptable, but that were not gibberish (like word salad) also. Children were instructed to feed the puppet: (a) his favorite treat, a toy chocolate donut, when he said something 'the right way,' or (b) a toy apple, for him to get smarter, when he said something 'weird' or something 'the wrong way.' Children did not have problems in understanding these notions. It was often the case that children would not only give the puppet the food he deserved, but would also say what they thought about what the puppet had said. For example, children frequently said: 'that's ok, he deserves the donut,' or 'that's weird, I think he deserves the apple.' In a few occasions, children said: 'that's weird, but I think he deserves the donut.' I interpret this kind of reply as indicating what I have mentioned above, namely, that children detected that the sentence was degraded, but wanted to reward the puppet for his efforts. Therefore, when a child said that a sentence was 'weird,' she was making a relevant distinction: she showed that she knew that the sentence uttered by the puppet was not perfectly acceptable, but was not gibberish also. A sentence judged 'weird' was marked as 'unacceptable' in the answer sheet. In the few occasions where the children gave the donut to the puppet, but said that the sentence was 'weird,' the verbal judgment (in this case 'weird') was considered over what was fed to the puppet.

Returning now to the description of the procedures used, the whole study was comprised of 3 sessions, done on different days. 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. When children started to give only correct responses, the pretest was applied. Following the guidelines in McDaniel and Cairns (1996), the pretest had 3 unacceptable and 3 acceptable sentences. Only children who answered 5 out of 6 sentences correctly were included in the study. The two subsequent sessions, done at least two days apart from each other, tested the target sentences. Children's answers were recorded on audiotape and later transcribed and then coded. This was a simple procedure, as their answers were either 'yes' or 'no.' As mentioned above, when children judged a sentence as 'weird,' this was coded as a 'no.'

In testing sentences with RPs, the picture depicted two identical animals engaged in different actions. 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:

- (4) In this picture, we have two frogs. This one is very happy! He is skating! This other one was skating too, but he fell. When the frog fell, the swan laughed, but then the swan felt 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 and anaphors 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, for example, the picture showed a female spider inside a bathtub soaping up its body. The target sentence for this picture was “the spider is washing herself.” The experimenter presented the picture in the following way:

(5) In this picture we have a spider and she is doing some washing.

A clarification is in order here regarding the choice of the methodology. Usually, studies investigating locally A-bound pronouns, have made use of the truth-value judgment (TVJ) task to elicit children’s responses.³ Thornton and Wexler (1999) employed this method using toys and acting out short stories for children. Chien and Wexler (1990) used a kind of TVJ task, in which children were shown pictures and had to answer yes/no questions about them. On the other hand, in studies on the acquisition of RPs, the grammaticality judgment (GJ) task is more frequently used. McKee and McDaniel (2001), for example, have successfully used this methodology to elicit judgments from English-speaking children.

For the present study, it was desirable to gather data from the same children using the same type of methodology. In having to choose between a GJ task and a TVJ task, it was considered that the former would be more indicated. This is so due to the fact that the sentences with RPs in extractable positions are ungrammatical in both languages to be tested, and cannot be used in a TVJ task. Another reason for such choice will be

³ 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. They tested sentences with the pronoun locally bound by DP and QP antecedents and their results are comparable to what has been reported in other studies using the truth-value judgment task.

discussed in section 4.4, when I discuss the case of pronouns bound by quantified antecedents.

Although I am referring to the methodology used here as a GJ task, this is not completely accurate for the case of A-bound pronouns. In regular GJ tasks, the test sentence has one interpretation and what is judged is its form. This is the case for relatives with RPs, like “*This is the boy that he likes ice cream.*” However, in the case of sentences like “*John is scratching him,*” the grammaticality of the sentence is dependent on its interpretation. The sentence is ok on the interpretation where John is scratching some contextually salient male individual and it is not ok on the interpretation where John is scratching himself. So, the methodology used in the present study was a particular type of GJ task. In judging sentences with a potentially A-bound pronoun, children had to say if they were acceptable or not *for the context associated with them*, which were the pictures. For simplicity, I continue to refer to the methodology employed here as a GJ task, but the reader should keep these observations in mind.

The methodology employed with the adult speakers was similar to the one used with the children. Adult speakers were interviewed individually also, but without the puppet. The experimenter explained the task to them and had a couple of sentences as a warm-up. Then, the experimenter showed the pictures to them and uttered the target sentences. Their answers were taped and coded for posterior analysis.

Materials. There were seven conditions investigated. Some of them had four trials while others had two trials. The total number of sentences tested was 24. The types of sentences were:

- (a) Relative clauses with RPs in the highest subject position and inside islands, and
- (b) Simple sentences with DP and QP antecedents binding pronouns and anaphors.

Examples of target sentences are presented below (the complete list of sentences used is presented in Appendix I):

(6) A-bound (pronouns and anaphors):

DP – self (2 trials): The spider is washing herself.

QP – self (2 trials): Every animal is dressing himself.

DP – him (4 trials): * The little dragon is scratching him.

QP – him (4 trials): * Every elephant is washing him.

Possessives (4 trials): Every duck is carrying his guitar.

(7) A'-bound (RPs in subject and island positions):

RP – extr (4 trials): * The frog that he is skating is happy.

RP – unextr (4 trials): This is the frog that the swan laughed when he fell.

In addition to these target sentences, 6 filler sentences were included. These were simple sentences that could be grammatical or ungrammatical, depending on the pattern of the child's responses. The filler sentences were interspersed at regular intervals (one filler after every three target sentences). Thus, if a child gave three successive 'yes' answers, the fourth sentence was an ungrammatical filler, intended to elicit a 'no.' Besides serving the purpose of breaking a 'yes' or 'no' pattern, these sentences could also indicate if the child was paying attention to the task. It was planned that, if a child gave wrong answers

to the fillers, the session would stop and resume in a different day. If a child continued to answer the filler sentences incorrectly then, s/he would be excluded from the analysis.

Results. Before presenting the results it is worth mentioning that children answered the fillers correctly close to 100% of the time, so no child had to be excluded for this reason. The results are presented in Table 1 below. It provides the acceptance rates for the children and adults tested:

<i>Sentences</i>	<i>Children's Acceptance</i>	<i>Adults' Acceptance</i>
DP – self	93.4%	100%
QP – self	82.6%	100%
DP – him	52.1%	5%
QP – him	44.5%	0%
Possessives	97.8%	100%
RP – extr	48.9%	5%
RP – unextr	88%	90%

Table 1 Acceptance rates (English) (N = 23)

As the table shows, children accepted anaphors locally bound by DP antecedents 93.4% of the time. They accepted anaphors bound by local QP antecedents 82.6% of the time. These sentences were included as controls and these results were expected, as other studies on the acquisition of anaphors, for example, Wexler and Chien (1985) and Chien and Wexler (1990), reported that children correctly accepted locally bound anaphors. This high acceptance of anaphors indicates that children know that anaphors can be

locally bound.⁴ Children also correctly accepted possessive pronouns bound by QP antecedents at a high rate, 97.8% of the time.

Turning now to pronouns locally A-bound, we see that children accepted sentences with a DP antecedent 52.1% of the time. As discussed in chapter 2, this is not unexpected, as other studies on the acquisition of pronouns have also obtained this level of acceptance. The ‘unexpected’ result was found for sentences with pronouns locally bound by QP antecedents. Children accepted these sentences 44.5% of the time. Although this result is consistent with the predictions of chapter 3, it is different from what some other studies have found. I will discuss this issue in great detail in section 4.4 below.

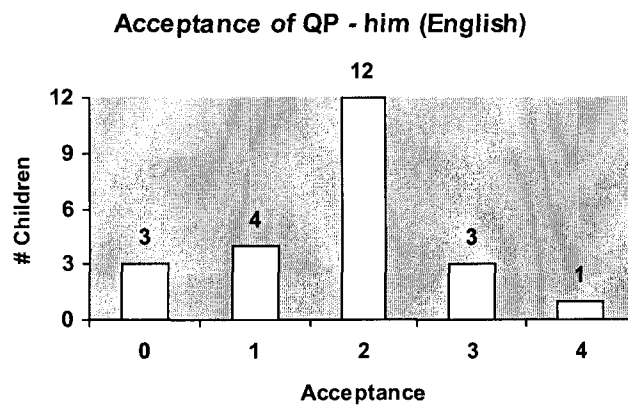
Children accepted RPs in extractable positions 48.9% of the time. This is consistent with the findings of McKee and McDaniel (2001), who, as discussed in chapter 2, also found a similar level of acceptance for English-speaking children in their study. Children correctly accepted RPs in unextractable positions 88% of the time, also in accordance with McKee and McDaniel’s results.

As the group results show, children accepted pronouns locally bound around 50% of the time. I will show next that this 50% of correct responses did not emerge as a result of some children rejecting all of the sentences and some other children accepting all of the sentences. In order to see this in more detail, I provide below the histograms for the relevant sentence types. Histogram 1 provides in the ordinate the number of children and

⁴ The experiments I conducted did not have sentences testing the locality condition on anaphors. However, Chien and Wexler (1990) have tested this condition and children’s answers showed that they knew that an anaphor must be locally bound. In the pretest for my experiments there were two sentences intended to check if children knew that anaphors relate to a reflexive action. In one of the trials, the picture depicted Mama Bird washing Baby Bird. The sentence uttered by the puppet was: “Mama Bird is washing herself.” Children overwhelmingly rejected the anaphor in these trials.

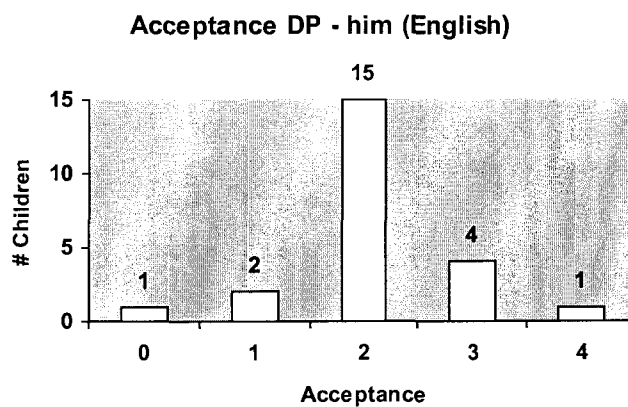
in the abscissa the number of acceptances for sentences with a pronoun locally bound by QP antecedents. For example, there were 3 children who accepted 0 sentences of the type QP – him; 4 children who accepted 1 sentence of this type; 12 children who accepted 2 sentences, and so on.

Histogram 1:



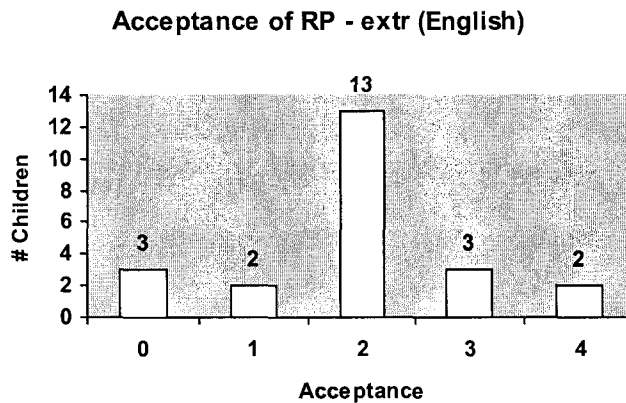
Histogram 2, for sentences with pronouns locally A-bound by DP antecedents, is shown below. As with histogram 1, histogram 2 has in the ordinate the number of children and in the abscissa the number of acceptances for sentences DP – him:

Histogram 2:



Finally, histogram 3 presents the number of children and the number of acceptances for sentences with a RP in the extractable subject position:

Histogram 3:



As histograms 1, 2 and 3 show, for these three types of sentences, most of the children accepted 2 out of the total of 4 sentences presented to them. There were children who accepted none of those sentences and some children who accepted all of them, but they are not the majority.

Thus, the histograms above show that children's 50% pattern of response did not emerge as a consequence of some children consistently answering 'yes' while some others consistently answered 'no.' Another possibility that has to be investigated is that the likelihood of a 'yes' response was in fact higher for certain items than for others. For example, if some specific pictures or verbs had for some reason elicited more of one type of response. In order to evaluate this possibility, we can apply a (separate) 2x4 Chi-square Contingency Test to the responses in each condition. Under the null hypothesis that the likelihood of a 'yes' response was the same for each of the four items in the condition (and for each subject in the study), we can find the likelihood of any observed differences between the items. A significant chi-square test would suggest that the four

items were not in fact equivalent. However, as the following results show, none of the items in the three conditions reached significance.

For the DP – him condition, the observed frequencies are:⁵ (12,11), (10,13), (11,12), (15,8). $\text{Chi-sq.}(3)=2.44$, $p=.486$ (NS). For the QP – him condition, the observed frequencies are: (9,14), (10,13), (12,11), (10,13). $\text{Chi-sq.}(3)=0.84$, $p=.841$ (NS). Finally, for the Subj – extr condition, the observed frequencies are: (13,10), (9,14), (14,9), (9,14). $\text{Chi-sq.}(3)=3.61$, $p=.307$ (NS).⁶ These results indicate that there is no evidence that any particular test item was exceptional.

Discussion. As Table 1 shows, children behaved at chance in three of the seven conditions: pronouns locally A-bound by DPs and QPs and RPs in extractable positions. Children correctly accepted at a high rate the grammatical cases, that is, sentences with possessives and RPs in unextractable positions.

The cases where children behaved at chance are precisely the cases requiring reference-set computation, as discussed in chapter 3. Children did not behave at chance level in sentences where reference-set computation is not necessary. Thus, these results are in conformity with our predictions from chapter 3. I analyze children's chance level performance as being due to their processing problems, that is, children's more limited working memory capacity cannot perform the reference-set computation required in order to exclude locally A- and A'-bound pronouns.

⁵ Observed frequencies are reported as ordered pairs of 'yes' and 'no' responses for each of the four items.

⁶ All p-values are two-tailed. Calculations were performed using the following website:

http://www.physics.csbsju.edu/stats/contingency_NROW_NCOLUMN_form.html.

I thank William Snyder for his help in running these calculations.

As the histograms 1, 2 and 3 demonstrated, it was not the case that all of the children behaved at chance. Although the majority of children did, the histograms show that some children accepted none of those sentences (0/4), some accepted one (1/4), others accepted three (3/4) and even others accepted all four sentences (4/4). It is to these results that I turn now.

Only one child was adult-like, rejecting all of the three types of sentences. He was 5;8, one of the oldest children tested. Another child (aged 5;11) was adult-like with respect to QP – him and RP – extr, but behaved at chance in the case of DP – him.

It is clear that, if a child rejects all of the sentences depicted in histograms 1, 2 and 3, s/he should be considered adult-like, as s/he correctly rejected the unacceptable cases. If a child accepts 2/4 sentences, s/he should be seen as behaving at chance. The less clear cases are those where children accepted 1/4 or 3/4 sentences. It is unclear if children who accepted 1/4 sentences should be grouped with those behaving at chance or with those who accepted 0/4. Similarly, it is unclear if a child who accepted 3/4 trials is to be grouped with the children who behaved at chance or with the children who accepted 4/4 trials.

However, given the clear results shown in the histograms above, it was concluded that a statistical analysis was not needed. Histograms 1, 2, and 3 show that the results obtained are clearly in accordance with the predictions made in chapter 3.

In the next section, I present the results of the experiment conducted with Brazilian Portuguese-speaking children and a more thorough discussion of the results in both languages is left to section 4.3.

4.2.2 Experiment II: Brazilian Portuguese

Subjects. I tested forty children acquiring Brazilian Portuguese (BP) as their native language.⁷ They ranged in age from 3;4 to 6;6 (mean age = 5;0). The children came from the “Toulouse Lautrec” day care center in Franca, a town in the state of São Paulo. For analysis purposes, children were divided in four groups by age. There were 7 children from 3;4 to 3;11 years of age, 13 children from 4;0 to 4;11 years of age, 10 children from 5;0 to 5;11 years and 10 children from 6;0 to 6;6 years. Seven adults were also tested.

Procedure. The exact same procedures described above for the study with English-speaking children were used with the BP-speaking children and the same pictures were also used. The only difference is, of course, the fact that Brazilian children were told that the puppet was learning BP rather than English.

Materials. There were six types of sentences investigated and each type had four trials, giving a total of 24 sentences tested. The same types of sentences tested in English were tested in BP, with the exception of sentences with possessive pronouns, which were not tested.⁸ There were also 6 filler sentences. Examples of target sentences are presented below (a list with all the sentences tested in BP is shown in Appendix II):

(8) A-bound (pronouns and anaphors):

DP – self:	A aranha está se ensaboando.
	The spider is herself soaping
	‘The spider is washing herself.’

⁷ Five other children were excluded from the analysis. They were all between 3;0 and 3;9 years of age and did not seem to understand the task. They were interviewed only for the training session and did not participate in the following two sessions.

⁸ By the time that the experiment with the Brazilian children was conducted, the relevance of the possessive cases had not been considered yet. That is why these cases were not included in the BP experiment.

QP – self: Todo bichinho está se vestindo.
 Every little animal is himself dressing.
 ‘Every little animal is dressing himself.’

DP – him: * O dragão está coçando ele.
 The dragon is scratching him
 ‘The dragon is scratching him.’

QP – him: * Todo elefante está ensaboando ele.
 Every elephant is soaping him
 ‘Every elephant is washing him.’

(9) A'-bound (RPs in subject and island positions):

RP – extr: * O sapo que ele está esquiando está contente.
 The frog that he is skating is happy.

RP – unextr: Esse é o sapo que o cisne riu quando ele caiu
 This is the frog that the swan laughed when he fell.

Results. As was the case with the English-speaking children, in the test with BP-speaking children no child had to be excluded due to lack of attention or answering the filler sentences incorrectly. Table 2 shows the acceptance rates for the children and adults tested:

<i>Sentences</i>	<i>Children's Acceptance</i>	<i>Adults' Acceptance</i>
DP – self	95%	100%
QP – self	95%	100%
DP – him	44.4%	7.1%
QP – him	49.3%	3.5%
RP – extr	58.1%	10.7%
RP – unextr	95%	92.8%

Table 2 Acceptance rates (BP) (N = 40)

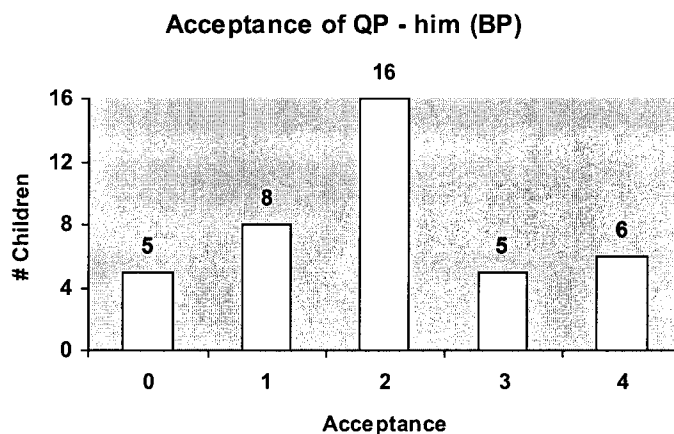
The BP-speaking children had a high rate of acceptance of the grammatical cases, namely, sentences involving anaphors and sentences with RPs in island contexts. The rate of acceptance of these structures, as shown in the table above, is 95%.

Children judged sentences with RPs in the highest subject position grammatical 58.1% of the time. Sentences with pronouns locally A-bound by DP antecedents were judged grammatical 44.4% of the time. 49.3% of the pronouns locally A-bound by QP antecedents were also judged grammatical.

Analyzing individual children, the majority of them had chance performance on both locally A-bound pronouns and A'-bound pronouns in extractable positions, as the histograms below show.

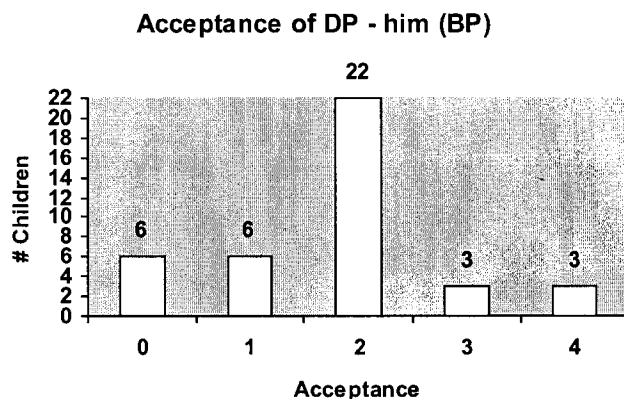
In histogram 4, we see that 6 children accepted all 4 sentences with a pronoun locally A-bound by a QP antecedent. 5 children accepted 3 such sentences and 16 accepted 2 of these sentences. 8 children accepted only 1 and 5 children accepted none of these sentences, behaving like adults.

Histogram 4:



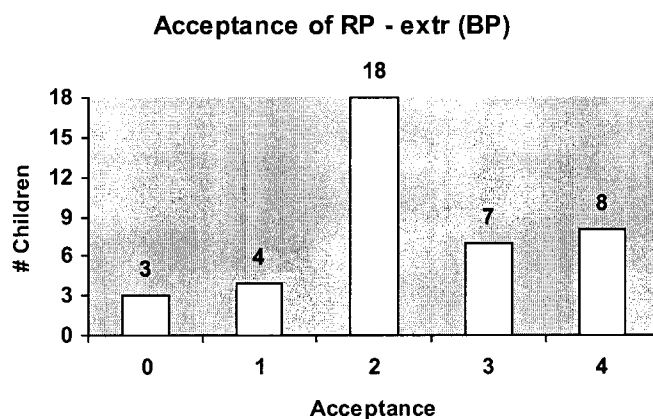
Histogram 5 below shows us that the same pattern of response found for sentences with QP antecedents is also found when pronouns are locally A-bound by DP antecedents. The majority of the children, 22 out of 40, accepted 2 sentences with a local DP antecedent for the pronoun.

Histogram 5:



Finally, in histogram 6 we see that again the majority of children accepted 2 out of 4 sentences with a RP in extractable position.

Histogram 6:



As these histograms show, most children are concentrated around the number 2 acceptances, indicating that the chance performance obtained for the group is reproduced for individual children as well.

As was the case with the English data, we need now to verify whether or not the likelihood of a 'yes' response was higher for certain items than for others. Applying a 2x4 Chi-square Contingency Test to the responses in each condition, we can check if the likelihood of a 'yes' response was the same for each of the four items in the condition (and for each subject in the study). For the DP – him condition, the observed frequencies are:⁹ (15,25), (20,20), (19,21), (17,23). $\text{Chi-sq.}(3)=1.49$, $p=.684$ (NS). For the QP – him condition, the frequencies are: (19,21), (17,23), (25,15), (18,22). $\text{Chi-sq.}(3)=3.88$, $p=.275$ (NS). Finally, for the Subj – extr condition, the observed frequencies are: (23,17), (18,22), (27,13), (25,15). $\text{Chi-sq.}(3)=4.60$, $p=.204$ (NS).¹⁰ These results indicate that there is no evidence that any particular test item was exceptional.

There were 3 children who rejected all of the ungrammatical sentences (ages: 6;4, 6;4 and 6;6). One child (age 6;5) accepted all 4 trials of the three ungrammatical cases (DP – him, QP – him, RP – extr). It is possible that children might adopt a 'yes' bias response when they are unsure, rather than a guessing strategy. This child might be an example of such case.

Discussion. The results reported above show that children displayed chance level performance with both locally A-bound pronouns and with A'-bound pronouns in

⁹ Observed frequencies are reported as ordered pairs of 'yes' and 'no' responses for each of the four items.

¹⁰ Calculations were performed using the following website:

http://www.physics.csbsju.edu/stats/contingency_NROW_NCOLUMN_form.html

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.

As the histograms show, the majority of children behaved at chance in the three cases that we predicted that they would. Given the clear results obtained, a statistical analysis was not needed.

4.3 General Discussion

4.3.1 Chance Level Performance

The results above show that by and large both English-speaking children and BP-speaking children behaved similarly in tests involving A- and A'-bound pronouns. In both languages, children exhibited chance level performance when sentences involving pronouns locally A-bound by DP and QP antecedents and RPs in extractable positions were tested. Children correctly accepted sentences with RPs in unextractable positions and, in the case of English-speaking children, they also correctly accepted cases of possessive pronouns.

The question to be addressed then is this: is there a commonality in children's chance level behavior in constructions with both A- and A'-bound pronouns? My claim is that their chance level behavior is due to one underlying source: the processing difficulty in performing the reference-set computations that are needed to exclude pronouns placed in extractable positions, be it in A or A' environments.

The fact that children did not behave at chance in sentences with RPs in unextractable positions and in sentences with possessive pronouns is also relevant. These are the cases that do not require reference-set computation, as the derivation with the pronoun is the only member in the reference-set in these cases. This brings evidence to the hypothesis stated in chapter 3 that it is only in the cases requiring reference-set computation that children should have processing problems.

The theories reviewed in chapter 2, such as Chien and Wexler (1990), Grodzinsky and Reinhart (1993) and Thornton and Wexler (1999), proposed that children's chance performance in sentences like (10) below is related to the coreferential reading of pronouns:

(10) Mama Bear is washing her.

Chien and Wexler and Thornton and Wexler claim that children lack a pragmatic principle, responsible for excluding cases of coreference in sentences like the one above. Grodzinsky and Reinhart claim that children do know the principle in question (which they call 'Rule I'), but that they have processing problems when trying to check if coreference is possible. These theories claim that children do not have problems with bound pronouns.

However, the results presented above clearly show that children do have problems with bound pronouns. Pronouns with QP antecedents and RPs cannot have a coreferential interpretation; they only have a bound reading. Therefore, children's chance performance in these cases cannot be explained by theories which resort to Rule I to account for children's problems: be it a processing problem in applying the Rule, as argued by Grodzinsky and Reinhart or be it a lack of such a Rule, as argued by Chien and Wexler

and Thornton and Wexler. In these theories, it has to be considered a coincidence that the same children behaved at chance in cases involving RPs in extractable positions and in cases of locally A-bound pronouns.

The hypothesis presented in chapter 3, however, accounts for children's problems with A- and A'-bound pronouns in one unifying way. It treats children's behavior in both domains as having one underlying cause: the processing problem related to executing reference-set computation when the reference-set has more than one derivation in it.

As discussed in chapter 3, children's chance level performance is predicted to emerge in comprehension tasks in experimental situations, but not in production. Let us consider the production side first. When building the derivation for a relative clause, for example, children will not consider inserting a RP in the relativized position if movement has succeeded. That is, the insertion of the pronoun is never considered if the need does not arise. In experimental situations involving comprehension, however, children are forced to do it, as the sentences they heard contained the pronoun. Consider the grammaticality judgment task conducted in the present study. Children heard a sentence (with an elsewhere element like a bound pronoun) and had to say whether it was acceptable or not. In order to give a judgment, children had to perform reference-set computations and this is when I claim they had difficulties and could not complete the task.

Contrary to their behavior in comprehension tasks, children's production of pronouns has been reported to be adult-like in A- and A'-domains. Bloom et al (1994) analyzed the spontaneous speech of three children acquiring English and found out that their production of A-bound pronouns was virtually perfect. Grolla (2000) studied the

spontaneous speech of a child acquiring BP as her native language and found out that her production of RPs was adult-like as well. Similar results have also been found for elicited production (cf. de Villiers and Cahillane (2004) for A-bound pronouns and McKee and McDaniel (2001) for RPs). Thus, the hypothesis presented in chapter 3 is compatible with the findings from studies in production, as described in chapter 2, and with the findings from comprehension, as reported in the previous sections.

4.3.2 Reaching the Steady State

The findings reported in section 4.2 show that only a few children behaved like adults in sentences DP – him, QP – him, and RP – extr: only one in English and three in BP. These children were among the oldest children tested. Their ages were: 5;8 (English) and 6;4, 6;4 and 6;6 (BP).

It is interesting that only such a small number of children behaved like adults. However, this is not unexpected. Chien and Wexler (1990) reported that children younger than 5;0 correctly rejected sentences with a pronoun locally A-bound by a DP antecedent only 39.26% of the time in their experiment 4. Children in the age-range of 5;0 – 6;0 rejected these cases 49.24% of the time. Children between 6;0 and 7;0 had a rejection rate of 76.67%.

In the case of RPs, McKee and McDaniel (2001) report that the older children in their study accepted RPs in extractable position at a much higher rate than the adults did. They separated the children tested into two groups. The ‘young’ group had 38 children ranging in age from 3;5 – 5;11 (mean age = 4;9) and the ‘old’ group had 44 children from

6;0 to 8;11 years of age (mean age = 7;5). The acceptance rates for RPs in extractable positions for adults, the old group and the young group are shown below:¹¹

<i>Sentence Type</i>	<i>Adults</i>	<i>Old</i>	<i>Young</i>
<i>Subject</i> : This is the man that he 's swimming.	2%	30%	50%
<i>Object</i> : This is the woman that Bert kissed her .	2%	50%	70%
<i>Preposition</i> : This is the baby that Cookie Monster played with her .	2%	42%	68%

Table 3 Acceptance rates (English) (McKee and McDaniel (2001))

Thus, it seems that in both A and A' domains, children take a long time to correctly reject these cases. We should expect children to get better at performing these reference-set computations as they get older and the results of my experiment, Chien and Wexler's and McKee and McDaniel's experiments indicate that it is only after the age of 6;0 that children might start showing this development. However, notice that even among the 6 year-olds, the rejection rate in Chien and Wexler's study is less than 80%, something still below what we would expect for fully developed children. The same observation holds for the results in McKee and McDaniel's study, where the children in the 'old' group still have a high rate of acceptance of these unacceptable cases.

It should be the case then that the processing problems we claim children have in performing these computations are persistent until close to 7;0 years. This indicates that children's working memory capacity does not reach a level where they are able to successfully perform reference-set computation until this relatively late age, although more detailed studies with older children in this age range would be necessary to pinpoint at exactly what age children start to consistently reject these cases.¹² The small

¹¹ The results reported here were taken from McKee and McDaniel's (2001) paper, page 137. The exact values had to be guessed, as their graph does not display the exact figures.

¹² In chapter 5, I suggest that it should be possible to establish correlation between children's performance on locally bound pronouns and their scores on tests on working memory capacity (such as those measuring

population investigated here indicates that some 6 year-olds might have already developed their working memories and are able to complete the task and verify that the sentences of interest here are not possible.

4.3.3 Avrutin and Wexler (1992) on the Acquisition of Russian

The theory proposed here accounts not only for the English and BP acquisition facts, but it can also account for the reported behavior of children acquiring Russian. The interesting fact about Russian is that it displays possessive anaphors. Differently from BP and English, Russian exhibits a phenomenon called the ‘antisubject orientation of possessive pronouns.’ This means that common possessive pronouns cannot be used to refer to the subject, as shown below (data from Avrutin and Wexler (1992), page 266):

- (11) a. Raisa_i pomnit eë_{?*i/j} dom.
 Raisa remembers her house.
- b. Raisa_i pokazala Ol’ge_j eë_{?*i/j} dom.
 Raisa showed to-Ol’ga her house.

The sentences above show that the possessive pronoun ‘eë’ cannot be used to refer to the subject. As illustrated below, the possessive anaphor ‘svoi’ is the correct form to use when the subject is the possessor (data from Avrutin and Wexler (1992), page 266):

- (12) a. Raisa_i pomnit svoi_{i/*j} dom.
 Raisa remembers self’s house.
- b. Raisa_i pokasala Ol’ge_j svoi_{i/?*j} dom.
 Raisa showed (to) Ol’ga self’s house.

digit span, or *M* space). We expect that children with a span closer to that of adults will correctly reject locally bound pronouns close to 100% of the time, and that children with lower spans will behave at chance in tests with locally bound pronouns.

This means that possessive pronouns are not possible when possessive anaphors are. In Hornstein's theory presented in chapter 3 this fact is straightforwardly explained. Given that anaphors are possible, the insertion of the pronoun isn't. The theory I proposed in chapter 3 predicts then that children should behave at chance when possessive pronouns used with subject possessors are tested, as they have to perform reference-set computation in order to exclude them.

Avrutin and Wexler (1992) investigated Russian-speaking children on this issue. They tested 16 children between the ages of 4;0 to 7;0 years. The experiment was a truth-value judgment task, in which the experimenter acted out short stories for children using props and toys. At the end of the story, a puppet said what he thought happened in the story. Children had to say if what the puppet said really happened in the story or not.

As was the case with the languages I investigated, Russian-speaking children accepted grammatical cases involving anaphors with DP and QP antecedents (for example: *Father Bear scrubbed himself* and *Every Bear scrubbed himself*) at a high rate. They also accepted the grammatical cases with possessive anaphors (e.g., *Father Bear scrubbed self's head* and *Every Bear scrubbed self's head*) at a high rate.

The authors tested many types of sentences, but I will limit myself to comment only on the cases directly relevant to the discussion here.¹³ These sentences are listed in the table below (only the English translations are provided). The table also presents the adult judgments for each sentence and children's acceptance rates:

¹³ I will not discuss, for example, cases involving the operator 'who.' Avrutin and Wexler tested sentences like the following:

- (i) a. I know who scrubbed him. Every bear.
- b. I know who scrubbed his head. Every bear.

Adults did not accept (i)a, but children accepted it 17% of the time. Adults did not accept (i)b also, but children accepted it 20% of the time.

<i>Sentence Type</i>	<i>Children's Acceptance</i>	<i>Adults' Judgments</i>
a. Father Bear scrubbed him	52%	No
b. Every Bear scrubbed him	41%	No
c. Father Bear scrubbed his head	56%	No
d. Every Bear scrubbed his head	50%	No

Table 4 Acceptance rates (Russian) (Avrutin and Wexler (1992), page 283)

Interestingly, children behaved at chance in sentences with pronouns bound by DP and QP antecedents, as shown in (a) and (b) and in sentences with possessive pronouns (referring to the subject) with DP and QP antecedents, as shown in (c) and (d) respectively.

This chance behavior is exactly what our theory predicts. Given that the sentences in (a)-(d) are excluded by reference-set computation, children's working memory cannot deal with it and this makes them resort to guessing.¹⁴ The similar rates of acceptance (around 50%) for these four sentence types are supporting evidence to our claim.

¹⁴ Following Chien and Wexler's proposal, Avrutin and Wexler explain children's chance performance in the cases (a) and (c), with DP antecedents, by assuming that children lack the pragmatic principle responsible for excluding cases of coreference. However, they have to resort to some extra apparatus to explain why children also behave at chance in cases with QP antecedents, as coreference between a pronoun and a QP is not possible. Avrutin and Wexler claim that the Russian quantifier 'každyj' (every), used in the experiment, is different from the English quantifier 'every.' They say that this quantifier has two readings. In one of them, it is like 'every,' as shown in (i) below, but in its second reading, it is not, as shown in (ii):

- (i) [Každyj medved'] t potër ego.
[Every bear] t scrubbed him
- (ii) [[e] každyj] [[t medved'] potër ego].
[[e] Every] [[t bear] scrubbed him
(e = {bears})

According to Avrutin and Wexler, (i) has the same reading as its English counterpart, but (ii) has the reading below:

- (iii) $\exists S (S = \{\text{bears}\}) \forall \beta ([\beta \text{ bear}] \text{ scrubbed him})$

That is, there exists a previously specified set of bears, and the sentence is true for each specification of the members of this set. In this case, the antecedent for the pronoun is not a quantifier, but a definite $[\beta \text{ bear}]$. This reading would be regulated by the pragmatic principle that children are claimed to lack.

4.4 Quantified Antecedents

A final issue that needs to be discussed regards pronouns A-bound by QP antecedents. As the results for BP and English (and Russian) show, children accepted pronouns locally bound by QP antecedents and DP antecedents at a similar rate. This contrasts with the results in Chien and Wexler (1990) and Thornton and Wexler (1999), which showed a difference in the acceptance rate of pronouns locally bound by DP and QP antecedents. In Chien and Wexler's study, 5 year-olds 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: 4 year-olds accepted pronouns bound by DPs 58% of the time and pronouns bound by QPs 8% of the time, for the simple sentences.

The main objective of this section is to discuss the difference in the results of my experiments and Chien and Wexler's and Thornton and Wexler's experiments. I believe that the discrepancy has a principled explanation, which is related to the methodology employed in the studies. More specifically, I will argue that both Chien and Wexler's experiment and Thornton and Wexler's experiment had some confounding factors which influenced children's responses. This claim is corroborated by experimental data. In section 4.4.2.1, I will present an experiment conducted with the same 23 children who participated in experiment I. This experiment is a replication of Chien and Wexler's experiment, where it will be claimed that the type of pictures they used in their experiment was problematic. When these factors are removed, as I claim happened in my GJ task, children behave differently from the children in Chien and Wexler's and Thornton and Wexler's studies.

But before discussing this issue, in section 4.4.1, I will comment on the results of other studies where pronouns with DP and QP antecedents were tested, with the intention of illustrating that the literature on this issue is far from settled. In section 4.4.2, I discuss Chien and Wexler's experiment and in section 4.4.3, I discuss Thornton and Wexler's experiment. Section 4.4.4 is the conclusion.

4.4.1 "DP – him" vs. "QP – him" Acceptance Rates

Although there are studies that obtained a clear difference in acceptance rates between DP and QP antecedents, other studies have not found such a clear contrast. As just mentioned in section 4.3.3, Avrutin and Wexler (1992) is an example of such a result. Three other studies are going to be discussed in this chapter: Boster (1994), which will be discussed in section 4.4.2 below, McDaniel et al. (1990) and Lombardi and Sarma (1989).¹⁵

Lombardi and Sarma found that children in their experiment did not respond differently to pronouns with quantificational and referential antecedents. They used a truth-value judgment task and an act-out task. Their results are that each child who rejected pronouns locally A-bound by QP antecedents also rejected pronouns locally A-bound by DP antecedents. Likewise, the children who accepted pronouns bound by QPs

¹⁵ Kaufman (1988) is another study where there is no difference in children's acceptance of QP and DP antecedents. However, in Kaufman's results the 60 children she interviewed were adult-like in sentences with pronouns bound by DP and QP antecedents, as they rejected both of these sentences at a high rate. The younger group interviewed (from 2;7 to 3;11 years of age) rejected pronouns with DP antecedents 77% of the time and with QP antecedents 82% of the time. The rejection rate for the older group (from 5;0 to 6;5) was: for DP antecedents 90% and QP antecedents 87%. Kaufman's methodology was a truth-value judgment task. It differed from the methodology used in my Experiments I and II and also from the experiments in Chien and Wexler and in Thornton and Wexler. Chien and Wexler (1990) have a discussion of how the methodology employed by Kaufman was defective, as the discourse pragmatics were biased toward rejection. For this reason, I do not discuss her results in the text.

also accepted them bound by DPs. As for McDaniel et al's study, these authors tested 19 English-speaking children from 2;9 to 6;7 years of age and their method was a GJ task. They had only one trial of each of the sentences below:

- (13) a. NP – Pr: Grover is washing him.
b. QP – Pr: Everyone is patting him.

Their result is the following: 10 children correctly rejected both of these sentences and 1 child was unsure on both of them. The 8 remaining children behaved as follows:

- (a) 3 children allowed NP – Pr and rejected QP – Pr
- (b) 3 children allowed NP – Pr and QP – Pr
- (c) 2 children allowed NP – Pr and were unsure on QP – Pr

The children in the (a) group behaved as Chien and Wexler and Thornton and Wexler predict. That is, they allowed the case where coreference is possible, but rejected the case of the pronoun bound by a QP, which cannot be coreferential. The behavior of children in the (b) group could be seen as favorable to my proposal, as children accepted both cases of pronouns with a local antecedent, with no distinction between DPs and QPs. The behavior of children in group (c) is unclear.

These different behaviors are part of the reason that these results are inconclusive. Another problem is that it is difficult, if not impossible, to observe chance behavior with just one trial per sentence type. Given that my theory predicts chance behavior, there is no way to check if it is confirmed or not by these results.

This discussion is intended to demonstrate that it is not the case that all of the tests with pronouns bound by local QP antecedents gave clear-cut results, in which children

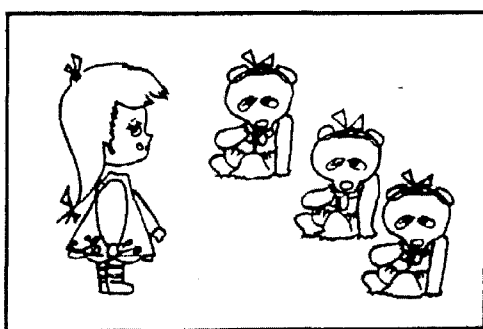
uniformly rejected them. The experiments I conducted in English and BP increase the number of studies where this uniform rejection is not the case.

4.4.2 Chien and Wexler (1990)

In this section, I will discuss some of the reasons for the different results obtained in my experiments on the one hand, and in Chien and Wexler (1990) on the other. As mentioned previously, my discussion will center on the methodologies employed in these two studies.

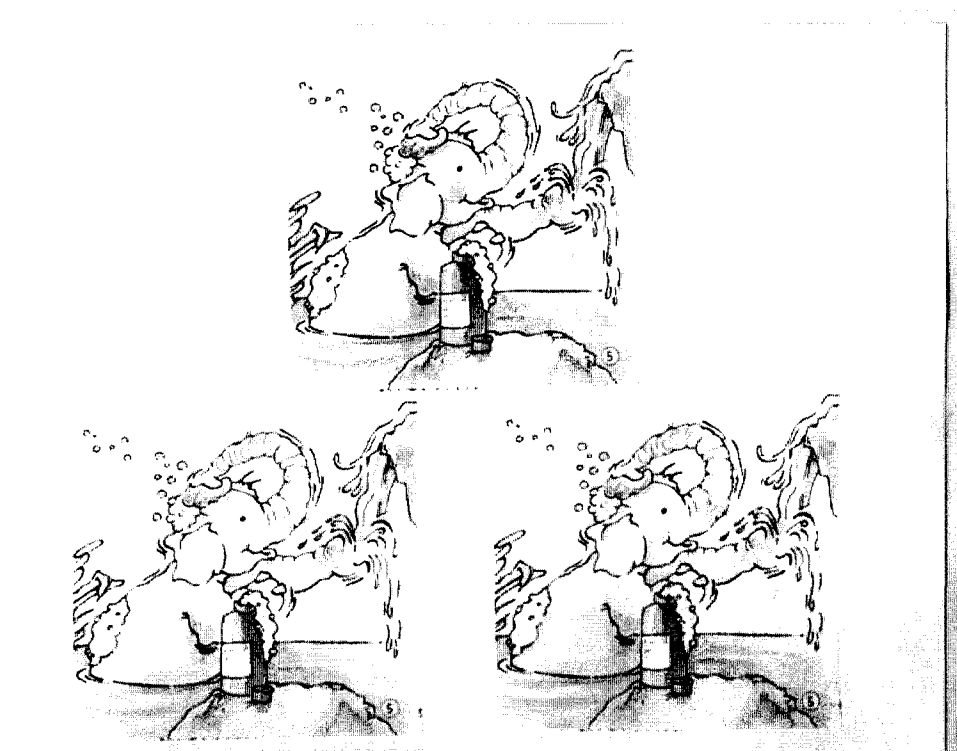
There are important differences between the GJ task I used in experiments I and II and the yes/no questions accompanied by pictures procedure, used in Chien and Wexler's study. Although both experiments make use of pictures, they differ in what needs to be depicted in them. In the case of Chien and Wexler's pictures testing pronouns with possible QP antecedents, the pictures depicted three identical characters performing a reflexive action and a fourth character next to them. In the picture presented in Chien and Wexler's paper, and reproduced below, there are three bears touching themselves and Goldilocks is next to them. Children did not interact with a puppet, only with the experimenter, who presented the picture and then asked children:

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



The rationale is that there are two potential antecedents for the pronoun, the QP ‘every bear’ and the DP Goldilocks. It is possible to check which antecedent the child assigned to the pronoun depending on her answer. Given that the picture shows every bear touching herself, if the child answers ‘yes,’ she is picking the QP as antecedent; if she answers ‘no,’ she is picking Goldilocks as the antecedent.

In the GJ task I used, children are not instructed to answer a yes/no question or to say if what the puppet said was true or false. Children are carefully trained to pay attention to form and indicate if the puppet said the sentence ‘the right way’ or ‘the wrong way’ (or, as in my new addition, to say if the sentence was ‘weird’). In this case, the puppet never says things that are false. He is always attentive, but gets mixed up sometimes because he is learning the language. In one of the trials in my experiment, there was a picture of three elephants in a lake washing themselves, as shown below:



Then, the following exchange between the experimenter, the puppet (named Gobbo) and the child ensued:

(15) Experimenter: In this picture we have three elephants. They are doing some washing. Tell us what is going on in this picture, Gobbo!¹⁶

Puppet: Every elephant is washing him.

Child: right/wrong/weird

Children had to say if this sentence is the right way to describe what is going on in the picture. Thus, in this type of task, we do not need more than one antecedent for the pronoun. Consequently, if there were no other potential antecedents, the pronouns were never ambiguous, and could only refer to the element performing the reflexive action.

Having established how these two methodologies work, let's return to Chien and Wexler's study. These authors investigated children's knowledge of Principle B.¹⁷ They reasoned that, if children were constrained by this principle, only the fourth character (Goldilocks, in the picture above) could be taken as the antecedent for the pronoun. This is so because, if the QP was taken as antecedent for the pronoun, the sentence would violate Principle B. The only other available antecedent for the pronoun was then the extra sentential character. Conversely, if children were not constrained by Principle B, the QP could be taken as the antecedent for the pronoun. The result of Chien and Wexler's study is shown below. The figures indicate the percentage of correct responses, that is, the rejection rates:

¹⁶ It should be noted that most of the time children would help the experimenter in describing the pictures to the puppet. So, while the experimenter is presenting the characters, children would frequently interrupt and make remarks. In the case of the picture with the three elephants mentioned in the text, for example, children would usually show the puppet the bottles of shampoo and the bubbles and comment how funny it was that the elephants were using shampoo.

¹⁷ Although I assume that Principle B is not part of the grammar (as discussed in chapter 3), I will use this term here in order to make the discussion coherent with Chien and Wexler's assumptions.

<i>Ages</i>	<i>Is every bear touching her?</i>	<i>Is Mama Bear touching her?</i>
Under 4;0	46.88%	30.90%
4;0-5;0	60%	39.26%
5;0-6;0	83.71%	49.24%
6;0-7;0	86.67%	76.67%

Table 5 Rejection rates (English) (Chien and Wexler (1990); experiment 4)

Children between 4 and 5 years rejected pronouns with QP antecedents 60% of the time. The children between 5 and 6 years rejected these sentences close to 84% of the time. Children between 6 and 7 had a rejection rate of almost 87%. Although these are not perfect rates, they are higher than children's rejection rates for DP antecedents, shown in the third column.

Thus, children answered 'no' most of the time for QP antecedents, probably taking Goldilocks in the example above as the antecedent for the pronoun. The authors concluded that *because* Principle B blocks an interpretation where 'her' has 'every bear' as antecedent, children picked Goldilocks as the antecedent.

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 exceedingly salient in the context. I believe this possibility is highly likely, as the following factors indicate. First, observe that in the picture shown in Chien and Wexler's paper and reproduced above, 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 the types of pictures presented to children in those experiments have a great influence in their responses. In pictures

displaying three characters performing the same action and a fourth character not performing the same action as the others, children tend to concentrate their attention in the different character (see Crain, Thornton, Boster, Conway, Lillo-Martin and Woodams (1996); Drozd and van Loosbroek (1998); Philip (1995); Sugisaki and Isobe (2001), among others). For example, in Philip's (1995) study, children were shown a picture with four elephants and three boys. The picture showed three of the elephants being ridden by a boy and the fourth not being ridden by anyone. 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 by a boy. 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.¹⁸

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) conducted an experiment in order to test her concerns about this gender issue. She tested 24 children in the age range of 3;3 to 6;2 years. She used a yes/no question task, modeled after Chien and Wexler's experiment. Boster's trials were of three types. In one of them, the pictures depicted two animals, with one of them

¹⁸ I would like to thank Diane Lillo-Martin for bringing these studies to my attention.

performing a reflexive action, and the test sentences were of the form “*Is Mama Bear washing her?*” Children accepted local coreference in these cases around 37% of the time.¹⁹ In the other test, the pictures depicted three identical animals performing a reflexive action and a fourth character watching the scene. Boster was careful to make the gender of the animals clear to children, differently from what happened in Chien and Wexler’s experiment. Also, the fourth character was roughly of the same size as the other animals. The test sentences were of the form “*Is every bear touching her?*” Children accepted local coreference in these cases around 34% of the time.²⁰

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:

(16) Is every monkey patting them?

Children accepted local coreference in this case around 42% of the time.²¹ 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 around 16% of the time and the later around 50% of the time. As an

¹⁹ The acceptance rate according to age group is: 3;7 – 4;9 years of age accepted local coreference 45% of the time. 5;0 – 5;7 accepted it 30% of the time. 6;0 – 6;2 accepted local coreference 37.5%.

²⁰ The acceptance rate according to age group is: 3;7 – 4;9 years of age accepted local coreference 40% of the time. 5;0 – 5;7 accepted it 30% of the time. 6;0 – 6;2 accepted local coreference 31.25%.

²¹ The acceptance rate according to age group is: 3;7 – 4;9 years of age accepted local coreference 42.5% of the time. 5;0 – 5;7 accepted it 40% of the time. 6;0 – 6;2 accepted local coreference 43.75%.

illustration of these different results, a comparison is made below, pairing off the findings in Boster's study for 5 year-olds and the findings in Chien and Wexler's study, also for 5 year-olds:²²

<i>Sentence type</i>	<i>Boster (1994)</i>	<i>Chien and Wexler (1990)</i>
Is Mama Bear washing her?	30%	50.7%
Is every bear washing her?	30%	16.2%
Is every monkey patting them?	40%	--

Table 6 Acceptance rates (English) (Boster (1994) and Chien and Wexler (1990))

The increase in acceptance rate observed in the case of (16) 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 fourth character in the pictures 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 (16) there was not a more salient character to be considered, children picked the sentence internal QP as its antecedent more often.

The hypothesis entertained here is that, in Chien and Wexler's experiment, children chose Goldilocks as the antecedent for the pronoun in sentences involving QPs not because of Principle B, but because the extra sentential character was more salient. 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

²² I compare only the results of the 5 year-olds, as this was the youngest group in Chien and Wexler's study to exhibit a clear difference in the acceptance rates for DP and QP antecedents.

through.²³ 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 order to test my hypothesis about the saliency of the fourth character present in Chien and Wexler’s experiment pictures, I conducted an experiment different from the one conducted by Boster. It is described in the next subsection.

4.4.2.1 Experiment III: The Saliency Factor

Experiment III was designed to investigate the effect that the saliency of this fourth character present in the types of picture in Chien and Wexler’s experiment would have on sentences where Principle B is not operative. Children’s answers to these sentences could then be compared to their answers to sentences where Principle B is claimed to be

²³ Grimshaw and Rosen (1990) have also claimed that Chien and Wexler’s experiment had problems and that their results are due to experimental artifacts. They suggested that in testing knowledge of Principle B, the context preceding the target sentence should contain appropriate linguistic antecedent for the pronoun. They claimed that it is not enough to have the referent for the pronoun mentioned in discourse, as was the case in Chien and Wexler’s study. The referent must be also prominent in the context. If this condition is not met, children will not know what to do and may take the nearest NP as the antecedent for the pronoun. Thus, when hearing a sentence like ‘Mama Bear washed her,’ if there is no prominent linguistic antecedent, children will be forced to violate Principle B in order to satisfy the pragmatics. They will, therefore, take the pronoun as referring to Mama Bear at chance level. However, when Grimshaw and Rosen conducted their experiments, trying to correct this potential confounding factor, they obtained results similar to those in Chien and Wexler’s study. This indicates that their hypothesis about the problems with Chien and Wexler’s experiment was not on the right track. Differently from what happened in Grimshaw and Rosen’s case, as we will see below, my claim about the problems with Chien and Wexler’s experiments will be corroborated by experimental findings.

operative: if their answers were similar, this would indicate that Principle B could not be the sole factor guiding children's responses.

Two types of pictures were presented to children. Type I was similar to the ones in Chien and Wexler's experiment: it had three identical elements performing a reflexive action and a fourth, bigger character not performing a reflexive action. Type II depicted three identical characters touching (or holding) some item of clothing they were wearing (either a hat or a dress) and the fourth character, also wearing the same type of clothing, but not touching it. Examples of the sentences accompanying these pictures are shown below:

- (17) a. Type I (QP – him): Is every monster scratching him?
b. Type II (QP – his NP): Is every dog touching her hat?

The rationale was the following. As discussed in chapter 1, Principle B states that pronouns cannot be bound inside their local domains. In sentence (17)b above, the DP 'her hat' constitutes the local domain for the pronoun. Therefore, the QP in subject position is not in the local domain of the pronoun and so can bind it without violating Principle B. If the pronoun is bound by the QP 'every dog,' we obtain the reading where every dog is touching her own hat. If the antecedent for the pronoun is the character outside the sentence, we obtain the reading where every dog is touching that character's hat. Both interpretations for the pronoun are possible and Principle B is not relevant in this case.

Therefore, if children's attention was drawn to the fourth, more salient character, they should pick that character as the antecedent for the pronoun and so answer 'no' to question (17)b more often. If children pick this fourth character as the antecedent for the

pronoun, this choice cannot be attributed to Principle B. However, if their attention was not drawn to that salient character, then they could pick the QP as the antecedent for the pronoun and answer ‘yes’ to this question more often.

In cases like (17)a, Principle B is relevant. The pronoun ‘him’ cannot be bound by the QP ‘every monster,’ as the pronoun and the QP are in the same local domain. If the pronoun is bound by the QP, violating Principle B, we obtain the reading where every monster is scratching himself. If the pronoun has an element outside the sentence as its antecedent, we get the reading where every monster is scratching that element. Therefore, a ‘yes’ answer constitutes a Principle B violation and a ‘no’ answer doesn’t.

The idea was to compare children’s response to these two types of questions. If our hypothesis concerning the saliency of the fourth character is on the right track, we predict that children will pick this character as the antecedent for the pronoun more often in both cases, answering ‘no’ at a higher rate. This would indicate that saliency was indeed influencing children’s answers. In that case, Principle B would have nothing to do with this behavior; their answers would not have been guided by a grammatical factor, but by something outside the grammar.

Subjects. The same 23 English-speaking children interviewed in Experiment I (the GJ task described in section 4.2.1) were tested in this experiment. They ranged in age from 3;7 to 5;11 (mean age = 4;7).

Procedure. The experiment is modeled after the one used in Chien and Wexler's study. Children were shown pictures and then the experimenter asked yes/no questions about them. No interaction with a puppet took place.

Materials. As discussed above, two types of sentences were tested. Below I provide examples of these sentences:

(18) These are the monsters, this is Aladdin. Is every monster scratching him?

The picture accompanying this sentence was similar to the ones in Chien and Wexler's experiment. It depicted three smaller monsters scratching themselves and a bigger picture of Aladdin, not scratching himself. As mentioned, in this case, a 'yes' answer violates Principle B; a 'no' answer doesn't.

In type II pictures, as shown below, three characters are touching their hats:



(19) These are the dogs, this is Mama Bear. Is every dog touching her hat?

In this case, neither the ‘yes’ answer nor the ‘no’ answer violates Principle B. Since Principle B does not block the QP from being the antecedent for the pronoun in this case, and the dogs are indeed touching their hats, ‘yes’ is a possible answer, just like ‘no’ is.

There were 4 trials of each sentence type for a total of 8 sentences tested. There were also 3 filler questions, intended to break the pattern of sentences with QPs and pronouns. The fillers were yes/no questions also, but they did not contain pronouns or QPs. These fillers were interspersed at regular intervals (one filler after two target questions).

Results. The table below provides the acceptance rates for ‘QP – him’ and ‘QP – his NP’ by age group:

<i>Sentence type</i>	<i>3 year-olds</i> (N = 4)	<i>4 year-olds</i> (N = 9)	<i>5 year-olds</i> (N = 10)	<i>Total Group</i> (N = 23)
QP – him	56.2%	36.1%	27.5%	35.8%
QP – his NP	68.7%	27.7%	32.5%	36.9%

Table 7 Acceptance rates (Saliency test)

As the table shows, the 3 year-olds accepted these sentences at a much higher rate than the 4 and 5 year-olds. Given the small number of 3 year-old subjects (N = 4), I decided to exclude them from further analysis:

<i>Sentence type</i>	<i>Group (N = 19)</i>
QP – him	31.5%
QP – his NP	30.2%

Table 8 Acceptance rates from 4 and 5 year-olds (Saliency test)

As the table shows, 4 and 5 year-old children behaved similarly in both cases tested, even though in one case a ‘yes’ response constitutes a Principle B violation, while in the other case it does not. This supports my hypothesis about the saliency of the fourth character present in the pictures.

It is interesting to observe now the answers that these same 4 and 5 year-old children gave to similar sentences using a different methodology. The table below provides the acceptance rate for ‘QP – him’ and ‘QP – his NP’ sentences from Experiment I, the GJ task discussed in section 4.2.1:

<i>Sentence Type</i>	<i>4 year-olds</i>	<i>5 year-olds</i>	<i>Group</i>
QP – him	44.4%	42.5%	43.5%
QP – his NP	97.2%	97.5%	97.3%

Table 9 Acceptance rates from 4 and 5 year-olds (GJ task)

Comparing children’s answer in tables 8 and 9, we see that children behaved differently in the two tests. In the GJ task, they accepted pronouns locally A-bound by QP antecedents 43.5%. In the yes/no question experiment, they accepted them only 31.5%. Turning now to possessive pronouns, we can see that children accepted them around 97% of the time in the GJ task, but in the yes/no question method, they accepted them only around 30% of the time.

The relevant difference between these two experiments is the presence of the fourth character in the pictures of Experiment III. The saliency of this character could be taken as a factor influencing children’s responses in both cases tested in this experiment. This suggests that children’s answer to the questions in Chien and Wexler’s study might also have been due to the saliency of the DP antecedent, and not to Principle B.

In experiments I and II, using the GJ task, the context (i.e., the pictures) did not provide other potential antecedents for the pronoun, as discussed above. The advantage of this methodology over the one used by Chien and Wexler is then clear: experiments I and II did not have a salient character able to influence children's answers. If the salient character is not present, the confounding factor is absent, making my results more reliable than Chien and Wexler's results.

I conclude that the difference between the results of experiments I and II, on the one hand, and of Chien and Wexler's experiment, on the other, has a principled account. In the next section, I show that many of the observations made above for Chien and Wexler's experiment extend to Thornton and Wexler's methodology as well.

4.4.3 Thornton and Wexler (1999)

As discussed in the beginning of section 4.4, Thornton and Wexler (1999) found that children accepted pronouns bound by DP antecedents 58% of the time and pronouns bound by QP antecedents 8% of the time. Similarly to the claim made by Chien and Wexler, Thornton and Wexler argue that children had a low acceptance rate of pronouns bound by QPs because they were constrained by Principle B. As was the case with the experiment in Chien and Wexler's study, I believe that Thornton and Wexler's experiment has a confounding factor in cases involving possible QP antecedents. Let us take a look at the general lines of a story leading up to a sentence with a pronoun potentially bound by a QP (Thornton and Wexler (1999:142)):²⁴

²⁴ Thornton and Wexler mention that these are just the general guidelines of the story. In narrating the stories, the experimenter was careful not to use reflexive pronouns, for example.

- (20) “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. As is clear from the story above, these other three animals are not as prominent 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 (and we have no reason to suspect they aren’t), 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.

Note that this problem does not arise when the possible antecedent for the pronoun is a DP. Observe the general lines for a story of this type, as shown below (Thornton and Wexler (1999:96)):

- (21) “Goldilocks trips and falls in a puddle, so she stops at Mama Bear’s house and asks Mama Bear to help her get clean. Mama Bear says that she would love to help, but her baby has just eaten his dinner, and he spilled it all over her. So, unfortunately, Mama Bear is unable to help Goldilocks because she needs to clean herself up. She is able to give Goldilocks a facecloth, though, so Goldilocks can attend to herself.”

Following the action of Mama Bear and Goldilocks washing, the puppet says:

(22) **Puppet:** That was a story about Goldilocks and Mama Bear. I know one thing that happened in the story. **Mama Bear washed her.**

Here, both Goldilocks and Mama Bear are salient. Although it can be said that the story is about Goldilocks (the story starts with her falling in a puddle), both she and Mama Bear have problems (Goldilocks is dirty from falling in a puddle and Mama Bear is dirty because her baby spilled food on her) and both are equally depicted as wanting to clean themselves. Both characters are salient, have names and are depicted as having ‘problems.’ The context does not provide an obvious antecedent for the pronoun, as it did in the case of QPs.

4.4.4 Conclusion

The problems detected in Chien and Wexler’s methodology are remarkably similar to the ones detected in Thornton and Wexler’s experiments. It seems that studies using the TVJ task and the yes/no questions for 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 reindeers). We cannot exclude the possibility that this is the reason why children took that DP as the antecedent for the pronoun, and if that is the case, then their knowledge of Principle B was not actually tested on those experiments.

These methodological problems cannot be ignored when we analyze children’s answers. If their attention was drawn to that salient character, and this guided their

answers, then these cannot be taken as evidence that they were ‘obeying’ Principle B. At most, their answers only indicate that they are sensitive to the saliency of the characters in a story. This makes the results of these experiments unreliable.

On the other hand, given that the confounding factor identified above is not present in GJ tasks, like the one used in experiments I and II, this should be the preferred methodology for studies investigating the acquisition of locally A-bound pronouns. Thus, the discussion above brings important supporting evidence to the claim that the results of my GJ tasks are more reliable than the results obtained in Chien and Wexler (1990) and Thornton and Wexler (1999).

4.5 Conclusion to Chapter 4

The research question presented in the introduction of this chapter asked if there was a commonality in the problems children face in the case of RPs in extractable positions and in the case pronouns locally A-bound. Children’s chance level performance in these two domains, as reported in section 4.2, indicates that there is.

As the results of experiments I and II show, children acquiring BP and English behaved at chance level in all and only the cases requiring reference-set computation, which are pronouns locally A-bound by DP and QP antecedents and RPs in extractable positions. These results bring supporting evidence to the hypothesis presented in chapter 3, which, following Reinhart’s (1999) hypothesis, claims that children’s more limited working memory capacity cannot handle reference-set computations. Children’s high rate of acceptance of RPs in unextractable positions and of possessive pronouns is also

significant, as it demonstrates that in cases where reference-set computation is not necessary, their performance is not at chance level.

The results obtained in experiment III indicate that the methodologies used in Chien and Wexler's (1990) and Thornton and Wexler's (1999) studies have some potential confounding factors, which render their results unreliable. The methodology employed in experiments I and II, on the other hand, does not have such problems and therefore yields more dependable results.

The ultimate consequence of this finding is that the theories designed to account for the data in those studies should be discarded. If children exhibit chance level performance with (A- and A'-) bound pronouns, then their problems cannot be due to Rule I (be it a lack of such rule or a processing problem in trying to execute it). An alternative hypothesis able to account for these data is the theory proposed in chapter 3, as it predicts that children should have problems with bound pronouns, both in A and in A' domains.

Chapter V – Final Remarks

5.1. Introduction

In the previous chapters, I have proposed an account for children's non-adult behavior with respect to pronouns and have reported experimental findings that support this proposal. In this last chapter, I will summarize the main points of this dissertation in section 5.2. In section 5.3, I will discuss how my results relate to an alternative proposal concerning the elimination of Principle B from the theory of grammar and in section 5.4, I will present some implications that the present proposal brings for future research.

5.2. The Acquisition of Bound Pronouns

In this study, I have assessed the consequences for language acquisition of analyzing bound pronouns as elsewhere elements, as proposed in Hornstein (2001). I have also incorporated Grodzinsky and Reinhart's (1993) claim that young children have problems in performing reference-set computation, due to their limited working memory capacity. These two assumptions led me to the hypothesis that children have processing problems in checking if locally A- and A'-bound pronouns are licit or not.

More specifically, the theory developed in chapter 3 proposed that children have difficulty in building reference-sets and then comparing the derivations in them in order to check which one is more economical. This assumption led us to predict that children would have processing problems only in the cases where the reference-set had two derivations. In the cases where the reference-set had just one derivation, no comparison was necessary and no processing problems should emerge. As discussed in Grodzinsky and Reinhart (1993) and in Reinhart (1999), the processing problems children are claimed to have lead them to guess the answer, as they have no way to complete the computation. This guess behavior results in 50% correct responses, also referred to as chance level performance.

In chapter 4, I presented experiments that were conducted with children acquiring English and Brazilian Portuguese (BP). The results of these experiments brought corroborating evidence to the proposal presented in chapter 3. Children behaved at chance level in cases where the reference-set had two derivations in it. These were sentences with pronouns locally A-bound by DP and QP antecedents and RPs in extractable positions. Significantly, however, children did not behave at chance level in cases where the reference-set had just one derivation, like sentences with RPs in unextractable positions and sentences with possessive pronouns. Children correctly accepted these cases at a high rate.

The chance level performance found with RPs in extractable positions and with pronouns bound by DP antecedents was not unexpected, as previous studies had also obtained similar results. However, the chance level performance observed with pronouns locally bound by QP antecedents was potentially controversial, in the sense that some of

the previous studies that had investigated this construction did not obtain this result. As discussed in the previous chapter, there is not a consensus in the literature in this respect. In some studies, children were found to behave at chance level only in tests with pronouns locally bound by DPs and to correctly reject pronouns locally bound by QPs (e.g., Chien and Wexler (1990) and Thornton and Wexler (1999)). In other studies, children behaved more uniformly in both tests, that is, children accepted pronouns bound by DPs and QPs at the same rate (e.g., Boster (1994) and Lombardi and Sarma (1988)).

I have claimed that the difference between the results of my experiments reported in section 4.2 and 4.3 and those obtained by Chien and Wexler (1990) and Thornton and Wexler (1999) had a principled explanation. This difference had to do with the methodologies employed, as Chien and Wexler's and Thornton and Wexler's experiments were shown to have confounding factors. This claim is corroborated by the results of the experiment reported in section 4.4, where we could see that the same children displayed different behaviors when the same sentences were tested on two different methodologies.

The consequences of this finding are straightforward. If the facts Chien and Wexler (1990) and Thornton and Wexler (1999) report are not correct, the theories resorted to account for these facts must be incorrect also. That is, if children in fact behave at chance in cases involving bound pronouns, then theories which claim that children's problems are related to coreferential pronouns cannot be on the right track. In these theories, children's chance level performance with RPs and pronouns bound by quantified antecedents must be viewed as coincidental, contrary to the theory advocated here, which predicts this behavior to occur.

Children's non-adult behavior is claimed to be due to their limited working memory capacity and not to a lack of linguistic knowledge. Therefore, in the experimental settings, this extra-linguistic factor caused children's linguistic performance to be non adult-like. Children are assumed to have all the knowledge necessary to perform the computations, but to lack a mature working memory, which would enable them to carry out the steps required. Children will be able to perform the required computations when their working memories develop. This means that there is nothing to be acquired or learned. Children will stop behaving at chance in these experiments when they have a more developed working memory. Therefore, this theory does not raise learnability problems: as children grow older, they will be able to deal with these computations more efficiently.

Note that it would be impossible for children to have acquired the correct distribution of pronouns solely based on the input, without any linguistic knowledge already in place. It is necessary to posit that children have an innate linguistic endowment which makes it possible for them to correctly reach the final adult state. In order to see why this is the case, note that the distribution of A-bound pronouns is restricted by their interpretation. For example, in the sentence below, the pronoun can be present in the object position of 'scratch,' but it cannot be interpreted as having 'Pluto' as its antecedent:

- (1) Pluto scratches him.

That is, sentences like the one above are present in the input to the child with only the deictic interpretation. Children cannot generalize from this interpretation and assume that the bound reading is also possible. However, it is difficult to see how children would

refrain from generalizing, since in the similar sentences below, both the deictic and bound reading are available:

- (2) a. Pluto scratches his leg.
 b. Goofy thinks he is a genius.

That is, the sentences in (1) and (2) involve pronouns with potential intrasentential antecedents and only in the case of (2) is it possible to have a bound interpretation. We would have to posit that children somehow ‘know’ that they cannot generalize from the bound cases they might experience in (2) to the case in (1). It could be argued, however, that the chance level performance observed is exactly due to this difficulty in learning based on evidence present in the input. That is, children behave at chance level because they are still detecting if the bound reading is possible in the case of (1). However, note that this acquisition would require some kind of negative evidence, an undesirable and less appealing proposal.

Thus, the most straightforward way to account for children’s behavior is to assume that children do have some innate linguistic knowledge. The question then becomes what is necessarily innate. This study has worked with the hypothesis that Binding Principle B is not part of the grammar. That is, the knowledge necessary to correctly rule out cases like (1) does not include Principle B, a very specific constraint on the distribution of locally A-bound pronouns, but involves more general knowledge such as the rules regulating movement (that is, knowing that movement into theta-positions is allowed and that DPs cannot move after checking Case), and the Case filter (that is, knowing that DPs need Case). Finally, children must also know the elsewhere character

of pronouns, which will be necessary not only to rule out cases like (1), but will also be necessary to acquire the distribution of RPs, as discussed in chapter 3.

5.3. The Elimination of Principle B from the Theory of the Grammar

In chapter 3, I adopted Hornstein's (2001) theory of pronouns, which sought to eliminate Principle B from the theory of the grammar by allowing movement to occur more freely. In this section, I will discuss another theory that also has as its agenda the elimination of Principle B from the theory of grammar. This theory, advocated by Safir (2004a, b), differs from Hornstein's theory in many ways, as it does not allow movement to occur more freely, for example. After presenting the main aspects of this proposal, I will compare both proposals by checking how they fare with the results of the acquisition study conducted here and in other studies.

For exposition purposes, I will base the discussion to follow on Safir (2004b), although the main ideas of this theory have also been proposed in Burzio (1991, 1996, 1998). This theory eliminates Principle B by assuming a hierarchy of most dependent forms, shown below:

- (3) Anaphor > Pronoun > R-Expression

This hierarchy indicates that anaphors are forms more dependent than pronouns, which are in turn more dependent than R-expressions. Safir then proposes that one form can be used only if there is no more dependent form available. This is achieved by means of two principles, stated below:

- (4) Local Antecedent Licensing (LAL): An anaphor must be anteceded in domain D.
(5) Form-to-Interpretation Principle (FTIP):

If x c-commands y and z is not the most dependent form available in position y with respect to x, then y cannot be directly dependent on x.

Safir does not adopt the notion ‘bound,’ but the LAL condition can be seen as an updated version of Principle A: it requires anaphors to be bound in a local domain D, which, for our purposes, can be considered to be the domain for Principle A of the Binding Theory. The second principle, FTIP, derives the complementarity between pronouns and anaphors by requiring that bound readings, or, in Safir’s terms, ‘dependent readings with c-commanding antecedents’ can occur only when the form that is used to achieve the dependent reading is the most dependent form available in a given context. For Safir, a form is available if the lexicon contains it and nothing prevents it from occurring in a given position.

This means that pronouns, which are less dependent than anaphors, are licit only when anaphors aren’t. So, if anaphors are available for a given position, as required by the LAL, then a pronoun cannot occur in that position. Conversely, if anaphors are impossible for a given position, then the pronoun should be the next possible form chosen to fill that position. Violations of these two types are shown below:

- (6) a. * *Mickey Mouse* is washing *him*.
b. * *He* thinks *Mickey Mouse* is a genius.

Both cases above are excluded because they violate the FTIP. (6)a is not possible because it contains a pronoun, when the most dependent form available for that position was an anaphor. (6)b is excluded because it has an R-expression when a pronoun was available. Thus, in Safir’s theory, the FTIP captures the effects of both Binding Principles B and C.

Comparing this theory to Hornstein's, first note that both systems require comparison of derivations in order to check if pronouns are possible in a given structure. Safir makes this comparison explicit with the FTIP algorithm, as quoted below (Safir 2004: 81):

- (7) "The input is a given numeration and the resulting LF that contains a nominal A potentially dependent on and c-commanded by a nominal B. Substitute the next most dependent form for the lexical content of A (the target) in the given numeration. If the new test numeration permits an LF to be derived that permits the same dependency relation without crashing, then a dependent reading on B for the target form is unavailable, but if the test derivation crashes, then repeat the process with an even more dependent form substituting for the target until there is no more dependent form to be tested. If there is no substitution of a more dependent form for the target that permits the derivation to converge, then the dependent reading is indeed available for the target."

Given that in this system a comparison is necessary in order to check if pronouns are possible or not, it can be an alternative to the theory adopted in chapter 3. If we assume this theory and add to it Grodzinsky and Reinhart's (1993) hypothesis regarding children's working memory limited capacity, we end up with the same predictions we stated in chapter 3, that is, we predict that children should behave at chance level when locally A-bound pronouns are tested. Children should not have processing problems with possessive pronouns as in this case no alternative with the anaphor converges, and no comparison of derivations takes place.

In this system, children should also behave at chance in cases like (6)b, a Principle C effect. This is so because in this case a comparison of derivations is required: the R-expression in (6)b is excluded because a more dependent form exists to fill that position. Hornstein's system makes a different prediction for these cases. As discussed in chapter 3, Hornstein does not propose a way of eliminating Principle C from the theory of the grammar. However, we saw in that chapter that cases like (6)b are excluded in his system as a violation of the extension condition. In this sentence, in order to have a bound interpretation for the pronoun, the antecedent, 'Mickey Mouse,' must move from the matrix subject position to the embedded subject position. The pronoun is then inserted in the matrix subject position. The movement of 'Mickey Mouse' from the higher subject position to the lower one violates the extension condition. Thus this type of sentence is excluded as an extension condition violation, with no comparison to be performed. The simplest assumption is then that children know the extension condition and do not have problems in correctly ruling out these cases at a high rate.

Thus, although the two theories make the same predictions with respect to children's behavior on sentences like (6)a, they differ in their predictions for sentences like (6)b. Data on the acquisition of this type of sentence can distinguish the two theories.

However, it is not an easy task to make this comparison. There are a number of studies on the acquisition of Principle C, but they have obtained different results for sentences like the ones below:

- (8) a. * *He* said that *Bert* touched the box.
- b. Because *he* heard a lion, *Tommy* ran fast.

Some researchers have found that children reject both sentences above. Although (8)a is not possible and should be excluded, (8)b is acceptable. So, researchers have claimed that children might have rejected (8)a not because they know Principle C, but because of a directionality effect, that is, children appear to reject backward coreference in general, as their rejection of (8)b seems to indicate (see, among others, Lust e Clifford (1982); Lust, Loveland e Kornet (1980); Solan (1978); and Tavakolian (1977)).

However, Thornton e Wexler (1999) dismiss this analysis, claiming that these results are the product of the experimental methodology. They note that the studies that showed the directionality effect used either act-out tasks or elicited imitation tasks. In the case of act-out tasks, children took the pronoun in sentences like (8)a to refer to an individual not referred to in the sentence when acting it out with toys. Thornton and Wexler correctly note that this does not imply that the backward anaphora interpretation is missing from children's grammar; it only shows that children have a preference for the alternative, deictic interpretation.

In the case of elicited-imitation tasks, children sometimes avoided repeating (8)b verbatim, but reversed the order of the pronoun and the name, as in "Because Tommy heard a lion, he ran fast." Thornton and Wexler note that this reversal has been incorrectly taken to show that children do not allow backward anaphora. They mention the observations made in Lasnik e Crain (1985), who note that children would not be able to rearrange the sentence in this way if they did not have an understanding of the coreference relations.

In order to eliminate the linearity effect, some studies have investigated sentences like the following:

(9) * Near *Ann*, *she* saw a lion.

In these cases, children behaved at chance (see Ingram e Shaw (1981) and Taylor-Browne (1983)). However, Thornton and Wexler note that in Taylor-Browne's study, adults ruled out this sentence only 84% of the time and in two other types of sentences, presented below, adults' rejection was only around 60%:

- (10) a. Across *Vicky's* bed, *she* laid the dress.
b. In front of *Ken*, on the bus which takes the children home from school, *he* saw a friend.

Thornton and Wexler reason that, whatever factor is responsible for adults' difficulty with the task is likely to be responsible for children's difficulty with it as well. Therefore, children's poor performance in these cases cannot be taken as indication of children's lack of knowledge of backward anaphora.

Another study where children did not display adult-like performance is Grimshaw e Rosen (1990). In their study, which was a truth-value judgment task modeled after Crain and McKee (1985), children accepted sentences like (8)a 37.5% of the time, which was similar to their acceptance rates on sentences with locally A-bound pronouns.

On the other side of the debate, there are two studies with clear results that indicate that children in fact correctly accept cases like (11) and reject cases like those in (12) below:

(11) When *she* was outside playing, *Strawberry Shortcake* ate an ice-cream cone.

- (12) a. * *He* washed *Luke Skywalker*.
b. * *He* ate the hamburger when the *Smurf* was in the fence.

One of these studies is Crain e McKee (1985), which tested 62 children between 3 and 6 years of age in a truth-value judgment task. Children accepted (11) 73% of the time and rejected sentences like those in (12) 88% of the time. Besides this study, Thornton e Wexler (1999) also reported that children in their study correctly rejected cases like (12)a 92% of the time, as discussed in chapter 2.

Due to this controversy, it is difficult to decide which theory (Safir's or Hornstein's) fares better with the experimental results. However, I am inclined to consider Thornton and Wexler's and Crain and McKee's studies as having better methodologies for these cases. If so, then Hornstein's predictions would be borne out, as opposed to Safir's.

The last point where we should compare these two theories is with respect to RPs. As argued in chapters 3 and 4, Hornstein's theory allowed us to develop an analysis where children are predicted to behave at chance level when RPs are placed in extractable positions, but to perform with a high rate of acceptance when RPs are placed in unextractable positions. This is so because RPs are analyzed as elsewhere elements, which require reference-set computation.

Safir (2004a) does not assume that pronouns are elsewhere elements, as stated in the following passage of his book (page 170): "I do not assume, [...], as Shlonsky [1992] argues, that pronouns are inserted as a last resort." So, in Safir's system, a relative clause can have a gap or a RP in the relativized position and, in case it has a RP, this element is in the numeration. He does not discuss how RPs are banned from extractable positions in English, but let us assume that this is a characteristic of English, that is, English is an "intrusive pronoun" language. If this is the case, then the distribution of RPs and the

distribution of locally A-bound pronouns are not regulated by the same constraints and we should not expect a correlation between children's behavior in the case of A and A'-bound pronouns.

This discussion has indicated that, although Safir's theory is able to account for children's chance level performance with locally A-bound pronouns, his system does not predict a correlation between children's behavior on A and A' domains. More study is required, but it seems that it cannot predict children's adult behavior with respect to sentences like (8)a as well. Hornstein's theory, on the other hand, seems to make the right predictions in both of these cases. Thus, facts from language acquisition seem to favor Hornstein's theory over Safir's.

5.4. Implications for Future Research

In this section, I discuss some of the implications of this study for future research on language acquisition. One of the central issues concerns the choice of methodology for investigating the acquisition of bound pronouns. The discussion in section 4.4 of the previous chapter showed how the same children exhibited distinct behaviors for the same construction types when different methods were employed. This demonstrates how crucial it is to have a thorough examination of the methodology, where possible confounding factors can be detected.

The use of the grammaticality judgment task in tests of bound pronouns has proven useful in the cases discussed in chapter 4. Given the controversy on the results of studies on the acquisition of Principle C effects, it would be desirable to conduct a study with children testing this kind of sentence with the grammaticality judgment task. We

could verify if this methodology can contribute to the debate, bringing unambiguous results when sentences like (8)a and (12)a above are tested.

Another issue to which the research reported here can contribute is related to the development of children's working memory capacity. The claim that young children's limited working memory capacity is the cause of children's chance level performance on tests involving bound pronouns can be more directly investigated. Children's working memory development could be paired with their performance in tests on bound pronouns, where a correlation between children's working memory span and their behavior on tests with bound pronouns is expected. We would predict that children with lower spans would behave at chance on this test and that children with a span closer to that of adults would not behave at chance, but would reject these sentences at a high rate. If this correlation is found, this would be one strong piece of evidence for the proposal developed here. This test could also identify the span at which children start to behave like adults.

The present study also has consequences for the study of the acquisition of coreferential pronouns. We claimed in the previous chapters that children's chance level performance in tests containing pronouns with DP antecedents was not due to their problem with coreferential pronouns, but because of their problems with bound pronouns. As discussed in previous chapters, the distribution of coreferential pronouns is regulated by Rule I. Observe the sentence below:

(13) Only John admires him.

Ignoring the reading where the pronoun refers to some relevant element not mentioned in the sentence, (13) is acceptable in some contexts, but unacceptable in others. Below, I provide one example of each context:

(14) Almost nobody in John's office admires himself: Mary doesn't admire Mary, Peter doesn't admire Peter, and Sue doesn't admire Sue. ***Only John admires him.**

(15) Almost nobody in John's office admire John. Mary doesn't admire John, Peter doesn't admire John, and Sue doesn't admire John. **Only John admires him.**

The context in (14) serves to establish the set of self-admirers. It says that this set is almost empty. The last sentence says that John is its only member. The sentence in (13) is not acceptable following this context. On the other hand, (13) is possible following the context in (15). This context establishes that the set of John's admirers is almost empty; John is the only member in it.

So, coreferential readings of pronouns in cases like (13) are possible only when there is a context indicating this reading. There is no reason to believe that children considered the coreferential reading of pronouns in the experimental settings of the studies I conducted, as this 'special context' was never presented to them.

In Reinhart's system, Rule I allows the coreferential reading in (15), but not in (14). In (14), the bound reading and the coreferential reading are not distinguishable and so coreference is ruled out. In (15), the coreferential reading is distinguishable from the bound reading, and so coreference is allowed. The comparison that takes place in these cases involving coreference is different from the comparison that takes place in the case of bound pronouns. In the case of coreferential pronouns, the comparison is between interpretations, in order to check if they are different from each other. In the case of bound pronouns, the interpretation is held constant, and the comparison is between

derivations with and without the pronoun, in order to check which derivation is more economical.

Given that a comparison takes place in the case of coreferential pronouns (albeit different in nature from the one in the case of bound pronouns), let us assume as the null hypothesis that children will have processing problems when these cases are tested. However, no acquisition experiment testing cases with explicit context favoring the coreferential readings was ever carried out. There are many difficulties to be overcome in order to conduct such a study, perhaps the most challenging of which is the fact that children are known to have problems with words like ‘even’ and ‘only,’ which are necessary to establish the coreferential reading (cf., Gualmini, Maciukaite e Crain (2002)).¹ It would be necessary to check children’s knowledge of these words before conducting the experiments. There is the possibility that only the older children would qualify for the experiment, and we run the risk of having only children whose working memory has already developed and so can perform the task as adults. This would leave us without results for the young children – precisely the subjects for whom a chance level performance is expected.

Another topic to which this study is relevant is related to the acquisition of deictic pronouns, as shown below:

¹ A possible way to conduct such a study would be to have a truth-value judgment task, with a story acted-out along the following lines:

Narrator: Little John is wearing a brand new Batman costume for Halloween. John’s mother told her friends, Peter, Mary and Sue, about it. So, they want to see John in his new costume. Peter, Mary and Sue arrive at John’s house to see him: “Where’s John? We want to see him!” But John doesn’t know if he likes his costume or not and he doesn’t want people to see him dressed as Batman. Before anyone could see him, he goes inside the bedroom, stops in front of a mirror (with his eyes closed) and wonders if he wants to see how the costume looks on him. As he is curious, he opens his eyes and sees it. Then, he hides. Nobody else saw John.

Puppet: I know what happened. Almost nobody saw John: Peter didn’t see him, Mary didn’t see him, and Sue didn’t see him. **Only John saw him.**

- (16) a. I see the *fish*. *It* is yellow.
b. *Batman* is coming. Robin called *him*.

Adopting the theory of pronouns discussed in chapter 3, we do not predict children to have processing problems with deictic pronouns. In (16)a, the pronoun does not have an intrasentential antecedent. Therefore, it cannot have a bound interpretation. As discussed in chapter 3, deictic pronouns are not elsewhere elements and so are not regulated by economy conditions like the ones affecting bound pronouns. If no comparison is required, children should not have processing problems. In (16)b, the pronoun does not have an intrasentential antecedent also, although here there is a potential antecedent inside the sentence. I assume that in these cases, it is the context that makes it clear that the pronoun is deictic and refers to Batman, which means that children should not have problems with these cases as well.

An indication that this is indeed the case comes from the pretest I carried out with children in my study. The pretest was carried out before presenting the actual experiment sentences to children and after children were instructed on how to play the game. The pretest serves to indicate to the experimenter if children understood the ‘game’ and can also help check if they have some specific linguistic knowledge necessary to participate in the experiment. One type of sentence included in the pretest contained a pronoun with an extra sentential antecedent. For example, in one picture there were a fish and a seal looking at one another with their mouths open. The experimenter presented the picture as follows: “in this picture we have a seal and a fish. The seal is talking to the fish. I want Gobbo to tell us something about this fish.” The puppet then said: “You want to know something about the fish? Ok, the seal is talking to him.” Observe that in this case, there

is a potential intrasentential antecedent for the pronoun, ‘the seal.’ On the other hand, ‘the fish’ had been mentioned by the puppet in his previous sentence and is also a possible antecedent for the pronoun. The context (that is, the picture) clearly shows that the seal was talking to the fish. Children overwhelmingly accepted this sentence, showing that they did not have problems in assigning an extra sentential antecedent to the pronoun. As this was simply a pretest with only two trials, it would be interesting to conduct a study with more trials.

The last case that I will mention here concerns the acquisition of clitics. As research on the acquisition of Catalan, French, Italian and Spanish has shown, children do not display chance level performance when clitics locally A-bound are tested: they correctly reject these cases at a high rate (see Baauw (1999); Baauw, Coopman and Philip (1999); Baauw and Delfitto (1999); Baauw, Escobar e Philip (1997); Berger (1997); Escobar e Gavarró (1999); Hamann (2002); Hamann, Kowalsky e Philip (1997); Jakubowicz, Müller, Kang, Riemer e Rigaut (1996); McKee (1988); Varela (1988); among others). Interestingly, however, children acquiring French and Italian exhibit chance performance with strong pronouns. Hamann (2002: 133) reports some preliminary tests on ‘lui’ ‘him’ in French. Children behaved at chance level in these cases, but correctly rejected sentences with locally A-bound clitics. Also, in a pilot study carried out by Berger (1997) with Italian-speaking children, children accepted constructions containing strong pronouns, like ‘lui’ in (17)a much more often than constructions containing clitics, like ‘lo,’ in (17)b:

- (17) a. * Il ragazzo sta indicando *lui*.
 b. * Il ragazzo *lo* sta indicando.

‘The boy is pointing at him.’

Hornstein’s (2001) theory is centered in English and so it does not present an analysis for clitics. For the analysis developed in chapter 3, children’s behavior in this case indicates that clitics are different from strong pronouns, in that they are not elsewhere elements and so do not require reference-set computation. Although an analysis of these elements is beyond the scope of this study, I will make some brief speculations.

Cardinaletti e Starke (1999) observe that in languages that display clitics, these elements are preferred over pronouns. That is, in a position where both a clitic and a strong pronoun are possible, the clitic is always the preferred form. They suggest that the choice of pronoun obeys the following rule: choose the most deficient possible form. This rule comes from the fact that, in their system, strong pronouns have more structure than deficient pronouns. For example, a pronoun like ‘lui’ in French is an XP, while the clitic ‘il’ is an X⁰. The possibility of deficient pronouns always blocks the use of strong ones, due to a principle called ‘minimize structure.’

Hence, in this system, strong forms have to be compared to deficient forms by means of reference-set computation in order to check if they are licit. Given the possibility of strong and clitic pronouns, the French counterpart of a sentence like ‘John saw himself’ has three logical alternatives, shown below:

- (18) a. * *Jean* a vu *lui* (strong pronoun)
 b. * *Jean* *l'* a vu t (clitic object)
 c. *Jean* *s'* a vu t (clitic anaphor)
- John him has seen him

The ‘minimize structure’ principle excludes (18)a: given that clitics are possible, the strong pronoun is ruled out. However, this principle does not indicate which clitic should be used, as we are left with the two options in (18)b and (18)c. Given that children do not behave at chance level when sentences like (18)b are tested, it must be the case that no comparison between (18)b and (18)c takes place. Although I do not have an account to offer at this time, the acquisition data indicate that this is the direction we would have to take in trying to find one.

To conclude, the topics mentioned in this section constitute open issues, whose investigation I leave for the future. Hopefully, the research reported in this dissertation will help us in the next steps of this agenda.

Appendix I – Sentences used in Experiment I (English)

DP – himself

1. The dog is scratching himself.
2. The spider is washing herself.

QP – himself

3. Every duck is brushing herself.
4. Every animal is dressing himself.

DP – him

5. The little dragon is scratching him.
6. The spider is brushing her.
7. The elephant is washing him.
8. The little bear is brushing him.

QP – him

9. Every spider is washing her.
10. Every elephant is washing him.
11. Every dog is scratching him.
12. Every bear is brushing him.

QP – his NP

13. Every cat is washing her face.
14. Every kangaroo is cleaning his glasses.
15. Every witch is washing her crystal ball.
16. Every duck is carrying his guitar.

RP – extr

17. The frog that he fell will go home.
18. The frog that he is skating is happy.
19. The bird that he got on the hippo's head is small.
20. The bear that he is smiling is Papa bear.

RP – unextr

21. This is the frog that the swan laughed when he fell.
22. This is the bird that the lizard got mad when he flew by.
23. This is the bird that the hippo laughed when he got there.
24. This is the bear that the butterfly got there when he was playing.

Appendix II – Sentences used in Experiment II (Brazilian Portuguese)

DP – himself

1. O cachorro está se coçando.
'The dog is scratching himself.'
2. A aranha está se ensaboando.
'The spider is washing herself.'
3. O burrinho está se olhando.
'The little donkey is looking at himself.'
4. A menina está se olhando.
'The girl is looking at herself.'

QP – himself

5. Toda patinha está se escovando.
'Every little duck is brushing herself.'
6. Todo bichinho está se vestindo.
'Every little animal is dressing himself.'
7. Toda menina está se olhando.
'Every girl is looking at herself.'
8. Todo porquinho está se ensaboando.
'Every little pig is washing himself.'

DP – him

9. O dragão está coçando ele.
'The dragon is scratching him.'
10. A aranha está escovando ela.
'The spider is brushing her.'
11. O elefante está ensaboando ele.
'The elephant is washing him.'
12. O ursinho está escovando ele.
'The little bear is brushing him.'

QP – him

13. Toda aranha está ensaboando ela.
'Every spider is washing her.'
14. Todo elefante está ensaboando ele.
'Every elephant is washing him.'
15. Todo cachorro está coçando ele.
'Every dog is scratching him.'
16. Todo ursinho está escovando ele.
'Every little bear is brushing him.'

RP – extr

17. O sapo que ele caiu vai pra casa.
'The frog that he fell will go home.'
18. O sapo que ele está esquiando está contente.
'The frog that he is skating is happy.'
19. O passarinho que ele pousou na cabeça do hipopótamo é pequenininho.
'The bird that he got on the hippo's head is small.'
20. O urso que ele está rindo é o papai urso.
'The bear that he is smiling is Papa bear.'

RP – unextr

21. Este é o sapo que o cisne riu quando ele caiu.
'This is the frog that the swan laughed when he fell.'
22. Esse é o passarinho que a lagarta ficou brava quando ele passou voando.
'This is the bird that the lizard got mad when he flew by.'
23. Esse é o passarinho que o hipopótamo riu quando ele chegou.
'This is the bird that the hippo laughed when he got there.'
24. Este é o urso que a borboleta chegou quando ele estava brincando
'This is the bear that the butterfly got there when he was playing.'

Appendix III – Sentences used in Experiment III (Saliency Test)

QP – him

1. Here are the girls. Here's the dog. Is every girl touching her?
2. Here are the monsters. Here's the prince. Is every monster scratching him?
3. Here are the bears. Here's the monster. Is every bear touching him?
4. Here are the monsters. Here's Aladdin. Is every monster scratching him?

QP – his NP

5. Here are the dogs. Here's Mama Bear. Is every dog touching her hat?
6. Here are the girls. Here's Snow White. Is every girl holding her dress?
7. Here are the princesses. Here is Mama Bear. Is every princess holding her dress?
8. Here are the dogs. Here's Cinderella. Is every dog touching her hat?

References

- Atkinson, M. 2002. Review of Thornton and Wexler (1999). *Journal of Child Language* 29:212-223.
- Avrutin, S. 1999. *Development of the Syntax-Discourse Interface*. Dordrecht: Kluwer Academic Publishers.
- Avrutin, S., and Thornton, R. 1994. Distributivity and Binding in Child Grammar. *Linguistic Inquiry* 25:265-271.
- Avrutin, S., and Wexler, K. 1992. Development of Principle B in Russian: Coindexation at LF and Coreference. *Language Acquisition* 2:259-306.
- Baauw, S. 1999. The Role of the Clitic-Full Pronoun Distinction in the Acquisition of Pronominal Coreference. In *Proceedings of the 23rd Boston University Conference on Language Development*, eds. A. Greenhill, H. Littlefield and C. Tano. Somerville, MA: Cascadilla Press.
- Baauw, S., Coopmans, P., and Philip, W. 1999. The Acquisition of Pronominal Coreference in Spanish and the Clitic-Pronoun Distinction. In *U.i.L. OTS. Yearbook 1998-1999*, eds. J. Don and T. Sanders. Utrecht University.
- Baauw, S., and Delfitto, D. 1999. Coreference and Language Acquisition. In *Recherches de Linguistique Française et Romane d'Utrecht (Utrecht Studies in Romance Linguistics) XVIII*, eds. D. Delfitto, J. Schroten and H. de Swart. Utrecht University.

- Baauw, S., Escobar, L., and Philip, W. 1997. A Delay of Principle B Effect in Spanish Speaking Children: the Role of Lexical Feature Acquisition. In *Proceedings of Generative Approaches to Language Acquisition*, eds. A. Sorace, C. Heycock and R. Shillock, 16-21. Edinburgh.
- Baddeley, A., and Hitch, G. J. 1974. Working Memory. In *The Psychology of Learning and Motivation*, ed. G. Bower, 47-90. New York: Academic Press.
- Bar-Shalom, E., and Vinnitskaya, I. 2004. Relative Clauses in Child Russian: a Comparison with Serbo-Croatian. In *UConn Working Papers in Linguistics 12*, eds. M. Rodríguez-Mondoñedo and E. M. Ticio. Storrs, University of Connecticut.
- Berger, C. 1997. Acquisition of Syntax. Ms., *Utrecht University*.
- Bloom, P., Barss, A., Nicol, J., and Conway, L. 1994. Children's Knowledge of Binding and Coreference: Evidence from Spontaneous Speech. *Language* 70:53-71.
- Boskovic, Z. 1994. D-Structure, Theta-Criterion, and Movement into Theta-Positions. *Linguistic Analysis* 24:247-286.
- Boskovic, Z., and Takahashi, D. 1998. Scrambling and Last Resort. *Linguistic Inquiry* 29:347-366.
- Boster, C. 1994. Children's Failure to Obey Principle B: Syntactic Problem or Lexical Error? In *UConn Working Papers in Linguistics 4*, eds. J. Abe, L. Ferro, L. Laporte-Grimes, D. Takahashi and M. Yamashina. Storrs, University of Connecticut.
- Bowerman, M. 1988. The "No Negative Evidence" Problem: How Do Children Avoid an Overly General Grammar? In *Explaining Language Universals*, ed. J. Hawkins. Oxford: Blackwell.
- Brown, R., and Hanlon, C. 1970. Derivational Complexity and the Order of Acquisition in Child Speech. In *Cognition and the Development of Language*, ed. J. R. Hayes. New York: Wiley.
- Büring, D. 2005. Bound to Bind. *Linguistic Inquiry* 36.
- Burzio, L. 1991. The Morphological Basis of Anaphora. *Journal of Linguistics* 27:81-105.

- Burzio, L. 1996. The Role of the Antecedent in Anaphoric Relations. In *Current Issues in Comparative Grammar*, ed. R. Freidin, 1-45. Dordrecht: Kluwer.
- Burzio, L. 1998. Anaphora and Soft Constraints. In *Is the Best Good Enough?*, eds. P. Barbosa, D. Fox, P. Hagstrom, M. McGinnis and D. Pesetsky. Cambridge, MA: MIT Press.
- Cairns, H., McDaniel, D., Hsu, J., and Konstantyn, D. 1995. Grammatical and Discourse Principles in Children's Grammars: The Pronoun Coreference Requirement. In *Proceedings of CUNYForum 19*, ed. E. Fernandez. City University of New York.
- Cardinaletti, A., and Starke, M. 1995. The Tripartition of Pronouns and Its Acquisition: Principle B Puzzles are Ambiguity Problems. In *Proceedings of NELS 25*, ed. J. Beckman. University of Massachusetts, GLSA: Amherst.
- Cardinaletti, A., and Starke, M. 1999. The Typology of Structural Deficiency: on the Three Grammatical Classes. In *Language Typology: Vol 8. Clitics in the Languages of Europe*, ed. H. Riemsdijk. Berlin: Mouton.
- Case, R. 1972. Validation of a Neo-Piagetian Mental Capacity Construct. *Journal of Experimental Child Psychology* 14:287-302.
- Case, R., Kurland, D. M., and Goldberg, J. 1982. Operational Efficiency and the Growth of Short-Term Memory Span. *Journal of Experimental Child Psychology* 33:386-404.
- Chien, Y.-C., and Wexler, K. 1990. Children's Knowledge of Locality Conditions in Binding as Evidence for the Modularity of Syntax and Pragmatics. *Language Acquisition* 1:225-295.
- Chomsky, N. 1975. *The Logical Structure of Linguistic Theory*. New York: Plenum.
- Chomsky, N. 1981. *Lectures on Government and Binding*. Dordrecht: Foris.
- Chomsky, N. 1986a. *Barriers*. Cambridge, MA: MIT Press.
- Chomsky, N. 1986b. *Knowledge of Language: Its Nature, Origin, and Use*. New York: Praeger.
- Chomsky, N. 1993. A Minimalist Program for Linguistic Theory. In *The View from Building 20*, eds. K. Hale and S. J. Keyser. Cambridge, MA: MIT Press.
- Chomsky, N. 1995. *The Minimalist Program*. Cambridge, MA: MIT Press.

- Chomsky, N., and Lasnik, H. 1993. The Theory of Principles and Parameters. In *Syntax: An International Handbook of Contemporary Research*, eds. J. Jacobs, A. v. Stechow, W. Sternefeld and T. Vennemann. Berlin: de Gruyter.
- Crain, S., and McKee, C. 1985. The Acquisition of Structural Restrictions on Anaphora. In *Proceedings of the 16th North Eastern Linguistic Society*, eds. S. Berman, J.-W. Choe and J. McDonough. Amherst, MA: University of Massachusetts, GLSA.
- Crain, S., Ni, W., and Conway, L. 1994. Learning, Parsing, and Modularity. In *Perspectives on Sentence Processing*, ed. C. e. a. Clifton, 443-467. Hillsdale, New Jersey: Lawrence Erlbaum.
- Crain, S., Thornton, R., Boster, C., Conway, L., Lillo-Martin, D., and Woodams, E. 1996. Quantification without Qualification. *Language Acquisition* 3:83-153.
- Cyrino, S. 1997. Objeto Nulo no Português do Brasil, Ph.D. Dissertation, Universidade de Londrina.
- Daneman, M., and Carpenter, P. 1980. Individual Differences in Working Memory and Reading. *Journal of Verbal Learning and Verbal Behavior* 19:450-466.
- de Villiers, J., and Cahillane, J. 2004. What Can Production Reveal about Principle B? Paper presented at *Generative Approaches to Language Acquisition - North America. Hawaii December 2004*.
- Demirdache, H. 1991. Resumptive Chains In Restrictive Relatives, Appositives and Dislocation Structures, Ph.D. Dissertation, Massachusetts Institute of Technology.
- Deutsch, W., Koster, C., and Koster, J. 1986. Children's Errors in Understanding Anaphora. *Linguistics* 24:203-225.
- Dickey, M. 1996. Constraints on the Sentence Processor and the Distribution of Resumptive Pronouns. *UMass Occasional Papers in Linguistics* 19. Amherst, MA.
- Drozd, K., and van Loosbroek, E. 1998. The Effect of Context on Children's Interpretation of Universally Quantified Sentences. Ms., *Max Planck Institute for Psycholinguistics and Nijmegen University*. Nijmegen.
- Escobar, L., and Gavarró, A. 1999. The Acquisition of Catalan Clitics and Its Implications for Complex Verb Structure. In *Proceedings of Generative Approaches to Language Acquisition*, ed. I. Lasser. Frankfurt/Berlin: Peter Lang Verlag.

- Ferreira, M. 2000. Argumentos Nulos no Português Brasileiro, Masters Thesis, IEL, UNICAMP.
- Fiengo, R., and May, R. 1994. *Indices and Identity*. Cambridge, MA: MIT Press.
- Fodor, J. 1975. *The Language of Thought*. Cambridge, MA: Harvard University Press.
- Fox, D. 1998. Locality in Variable Binding. In *Is the Best Good Enough? Optimality and Competition in Syntax*, eds. P. Barbosa, D. Fox, P. Hagstrom, M. McGinnis and D. Pesetsky. Cambridge, MA: MIT Press.
- Gathercole, S., and Baddeley, A. 1993. *Working Memory and Language*. Hove: Lawrence Erlbaum Associates.
- Georgopoulos, C. 1991. *Resumptive Pronouns and A-bar Binding in Palauan*. Dordrecht: Kluwer.
- Goodluck, H., and Stojanovic, D. 1996. The Structure and Acquisition of Relative Clauses in Serbo-Croatian. *Language Acquisition* 5:285-315.
- Grimshaw, J., and Rosen, S. 1990. Knowledge and Obedience: the Developmental Status of the Binding Theory. *Linguistic Inquiry* 21:187-222.
- Grodzinsky, Y., and Kave, G. 1993. Do Children Really Know Condition A? *Language Acquisition* 3:41-54.
- Grodzinsky, Y., and Reinhart, T. 1993. The Innateness of Binding and Coreference. *Linguistic Inquiry* 24:69-101.
- Grolla, E. 2000. A Aquisição da Periferia Esquerda da Sentença em Português Brasileiro, Masters Thesis, IEL, UNICAMP.
- Grolla, E. 2004. Resumptive Pronouns as Last Resort: Implications for Language Acquisition. In *Proceedings of the 28th Annual Penn Linguistics Colloquium*, eds. S. Arunachalam, T. Scheffler, S. Sundaresan and J. Tauberer. Philadelphia - PA.
- Gualmini, A., Maciukaite, S., and Crain, S. 2002. Children's Insensitivity to Contrastive Stress in Sentences with ONLY. *Proceedings of the 26th Annual Penn Linguistics Colloquium. University of Pennsylvania, PA*.
- Hamann, C. 2002. *From Syntax to Discourse*. Dordrecht: Kluwer Academic Publishers.
- Hamann, C., Kowalsky, O., and Philip, W. 1997. The French "Delay of Principle B" Effect. In *Proceedings of the 21st Annual Boston University Conference on*

- Language Development*, eds. E. Hughes, M. Hughes and A. Greenhill: Cascadilla Press: Somerville, MA.
- Heim, I. 1991. Anaphora and Semantic Interpretation: A Reinterpretation of Reinhart's Approach. Ms., MIT, Cambridge, MA.
- Heim, I. 1998. Anaphora and Semantic Interpretation: A Reinterpretation of Reinhart's Approach. In *The Interpretive Tract (MIT Working Papers in Linguistics 25)*, eds. U. Sauerland and O. Percus. Cambridge, MA: MIT, Department of Linguistics and Philosophy.
- Hiramatsu, K., and Lillo-Martin, D. 1998. Children Who Judge What They Produce Ungrammatical. *Proceedings of the 22nd Boston University Conference on Language Development*:337-347.
- Hornstein, N. 2001. *Move! A Minimalist Theory of Construal*. Oxford: Blackwell Publishers.
- Hornstein, N. 2004. Pronouns in a Minimalist Setting. Ms. University of Maryland, College Park.
- Ingram, D., and Shaw, C. 1981. The Comprehension of Pronominal Reference in Children. Ms., *University of British Columbia, Vancouver*.
- Jakubowicz, C. 1984. On Markedness and Binding Principles. In *Proceedings of NELS 14*, ed. C. J. a. P. Sells: Univesity of Massachusetts, GLSA: Amherst, MA.
- Jakubowicz, C., Müller, N., Kang, O.-K., Riemer, B., and Rigaut, C. 1996. On the Acquisition of Pronominal Reference in French and German. In *Proceedings of the 20th Annual Boston University Conference on Language Development*, eds. A. Stringfellow, D. Cahana-Amitay, E. Hughes and A. Zukowski: Cascadilla Press: Sommerville, MA.
- Kang, B. 2003. The Nature of Children's Resumptives. Ms. General Examination Paper, University of Connecticut.
- Kato, M. 1993. Recontando a História das Relativas. In *Português Brasileiro: Uma Viagem Diacrônica*, eds. I. Roberts and M. Kato. Campinas: Ed. Unicamp.
- Kaufman, D. 1988. Grammatical and Cognitive Interactions in the Study of Children's Knowledge of Binding Theory and Reference Relations, Ph.D. Dissertation, Temple University.

- Kayne, R. 1994. *The Antisymmetry of Syntax*. Cambridge, MA: MIT Press.
- Kayne, R. 2002. Pronouns and Their Antecedents. In *Derivation and Explanation in the Minimalist Program*, eds. S. Epstein and T. D. Seely, 133-166. Oxford: Blackwell.
- Kuno, S. 1987. *Functional Syntax: Anaphora, Discourse and Empathy*. Chicago: University of Chicago Press.
- Labelle, M. 1988. Predication et Mouvement: Le Developpement de la Relative Chez les Enfants Francophones, Ph.D. Dissertation, University of Ottawa.
- Labelle, M. 1990. Predication, Wh-Movement and the Development of Relative Clauses. *Language Acquisition* 1:95-119.
- Lakoff, G. 1968. Pronouns and Reference. In *Syntax and Semantics. Vol 7: Notes from the Linguistic Underground*, ed. J. D. McCawley, 275-336. New York: Academic Press.
- Lasnik, H. 1981. On Two Recent Treatments of Disjoint Reference. *Journal of Linguistic Research* 1:48-58.
- Lasnik, H. 1991. On the Necessity of Binding Conditions. In *Principles and Parameters in Comparative Grammar*, ed. R. Freidin, 7-28. Cambridge, MA: MIT Press.
- Lasnik, H., and Crain, S. 1985. On the Acquisition of Pronominal Reference. *Lingua* 65:135-154.
- Lasnik, H., and Stowell, T. 1991. Weakest Crossover. *Linguistic Inquiry* 22:687-720.
- Lees, R. B., and Klima, E. S. 1963. Rules for English Pronominalization. *Language* 39:17-28.
- Lidz, J., and Idsardi, W. 1997. Chains and Phono-Logical Form. *UPenn Working Papers in Linguistics* 8:109-125.
- Lombardi, L., and Sarma, J. 1989. Against the Bound Variable Hypothesis of the Acquisition of Condition B. Paper presented at *Linguistic Society of America Annual Meeting*, Washington, DC. December.
- Lust, B., and Clifford, T. 1982. The 3D Study: Effects of Depth, Distance and Directionality on Children's Acquisition of Mandarin Chinese. In *Proceedings of the 12th North Eastern Linguistic Society*, eds. J. Pustejovsky and P. Sells. Amherst, MA: University of Massachusetts, GLSA.

- Lust, B., Loveland, K., and Kornet, R. 1980. The Development of Anaphora in First Language. *Linguistic Analysis* 6:217-249.
- Maratsos, M. 2002. Review of Thornton and Wexler (1999). *Contemporary Psychology* 47:121-123.
- Marcus, G. 1993. Negative Evidence in Language Acquisition. *Cognition* 46:53-85.
- McDaniel, D., and Cairns, H. S. 1996. Eliciting Judgments of Grammaticality and Reference. In *Methods for Assessing Children's Syntax*, eds. D. McDaniel, C. McKee and H. S. Cairns. Cambridge, MA: MIT Press.
- McDaniel, D., Cairns, H. S., and Hsu, J. R. 1990. Binding Principles in the Grammars of Young Children. *Language Acquisition* 1:121-138.
- McDaniel, D., and Maxfield, T. 1992. Principle B and Contrastive Stress. *Language Acquisition* 2:337-358.
- McKee, C. 1988. Italian Children's Mastery of Binding, Ph.D. Dissertation, University of Connecticut.
- McKee, C. 1992. A Comparison of Pronouns and Anaphors in Italian and English Acquisition. *Language Acquisition* 1:21-55.
- McKee, C., and McDaniel, D. 2001. Resumptive Pronouns in English Relative Clauses. *Language Acquisition* 9:113-156.
- McKee, C., Nicol, J., and McDaniel, D. 1993. Children's Application of Binding Principles during Sentence Processing. *Language and Cognitive Processes* 8:265-290.
- Morgan, J. L., and Travis, L. 1989. Limits on Negative Information in Language Input. *Journal of Child Language* 16:531-552.
- Nunes, J. 1995. The Copy Theory of Movement and Linearization of Chains in the Minimalist Program, University of Maryland.
- Pérez-Leroux, A. T. 1995. Resumptives in the Acquisition of Relative Clauses. *Language Acquisition* 4:105-138.
- Philip, W. 1995. Event Quantification in the Acquisition of Universal Quantification, Ph.D. Dissertation, University of Massachusetts.
- Philip, W., and Coopmans, P. 1996. The Double Dutch Delay of Principle B Effect. In *Proceedings of the 20th Annual Boston University Conference on Language*

- Development*, eds. A. Stringfellow, D. Cahana-Amitay, E. Hughes and A. Zukowski: Cascadilla Press: Somerville, MA.
- Pollard, C., and Sag, I. 1994. *Head-Driven Phrase Structure Grammar*. Stanford and Chicago: CSLI and University of Chicago Press.
- Reinhart, T. 1983a. *Anaphora and Semantic Interpretation*. London: Croom Helm.
- Reinhart, T. 1983b. Coreference and Bound Anaphora: A Restatement of the Anaphora Questions. *Linguistics and Philosophy* 6:47-88.
- Reinhart, T. 1986. Center and Periphery in the Grammar of Anaphora. In *Studies in the Acquisition of Anaphora (Vol. 1)*, ed. B. Lust. Dordrecht: D. Reidel.
- Reinhart, T. 1999a. The Processing Cost of Reference-Set Computation: Guess Patterns in Acquisition: Lectures given in Rutgers Cognitive Colloquium.
- Reinhart, T. 1999b. Strategies of Anaphora Resolution. Utrecht: Utrecht Institute of Linguistics (UiL OTS): OTS Working Paper.
- Reinhart, T. to appear. Processing or Pragmatics? - Explaining the Coreference Delay. In *The Processing and Acquisition of Reference*, eds. T. Gibson and N. Pearlmuter. Cambridge, MA: MIT Press.
- Reinhart, T., and Reuland, E. 1993. Reflexivity. *Linguistic Inquiry* 24:657-720.
- Reuland, E., and Everaert, M. 2001. Deconstructing Binding. In *The Handbook of Contemporary Syntactic Theory*, eds. M. Baltin and C. Collins. Malden, MA: Blackwell Publishers.
- Rizzi, L. 1990a. On the Anaphor-Agreement Effect. *Rivista de Linguistica* 2:27-42.
- Rizzi, L. 1990b. *Relativized Minimality*. Cambridge, MA: MIT Press.
- Ross, J. 1970. On Declarative Sentences. In *Readings in English Transformational Grammar*, eds. R. Jacobs and P. Rosenbaum, 222-272. Waltham, MA: Ginn.
- Safir, K. 2004a. *The Syntax of (In)dependence*. Cambridge, MA: MIT Press.
- Safir, K. 2004b. *The Syntax of Anaphora*. Oxford: Oxford University Press.
- Sells, P. 1984. The Syntax and Semantics of Resumptive Pronouns, Ph.D. Dissertation, University of Massachusetts.
- Sharvit, Y. 1999. Resumptive Pronouns in Relative Clauses. *Natural Language and Linguistic Theory* 17:587-612.

- Shlonsky, U. 1992. Resumptive Pronouns as a Last Resort. *Linguistic Inquiry* 23:443-468.
- Sigurjónsdóttir, S., and Coopmans, P. 1996. The Acquisition of Anaphoric Relations in Dutch. In *Amsterdam Series on Child Language Development 5*, eds. W. Philip and F. Wijnen.
- Sigurjónsdóttir, S., and Hyams, N. 1992. Reflexivization and Logophoricity: Evidence from the Acquisition of Icelandic. *Language Acquisition* 2:359-413.
- Silva, C. 1989. Language Acquisition of Portuguese: Some Aspects of Binding Theory, Ph.D. Dissertation, University of California.
- Solan, L. 1978. Anaphora in Child Language, University of Massachusetts.
- Solan, L. 1983. *Pronominal Reference: Child Language and the Theory of Grammar*. Dordrecht: D. Reidel.
- Squire, L., and Zola-Morgan, S. 1991. The Medial Temporal Lobe Memory System. *Science* 253:1380-1386.
- Sugisaki, K., and Isobe, M. 2001. Quantification without Qualification without Plausible Dissent. Paper presented at *Semantics of Under-Represented Languages in the Americas*, University of Massachusetts, Amherst.
- Tarallo, F. 1983. Relativization Strategies in Brazilian Portuguese, Ph.D. Dissertation, University of Pennsylvania.
- Tavakolian, S. 1977. Structural Principles in the Acquisition of Complex Sentences, Ph.D. Dissertation, University of Massachusetts.
- Taylor-Browne, K. 1983. Acquiring Restrictions on Forwards Anaphora: A Pilot Study. *Calgary Working Papers in Linguistics 9: University of Calgary*.
- Thornton, R. 1991. Whither Principle B: Panel discussant. Cognitive science colloquium, MIT, Cambridge, MA, November.
- Thornton, R., and Wexler, K. 1999. *Principle B, VP Ellipsis, and Interpretation in Child Grammar*. Cambridge, MA: MIT Press.
- Varela, A. 1988. Binding in Spanish: A Theoretical and Experimental Study, Ph.D. Dissertation, University of Connecticut.
- Varlokosta, S., and Armon-Lotem, S. 1998. Resumptives and Wh-Movement in the Acquisition of Relative Clauses in Modern Greek and Hebrew. In *Proceedings of*

- the 22th Annual Boston University Conference on Language Development*, ed. A. e. a. Greenhill, 737-746: Cascadilla Press: Somerville, MA.
- Wexler, K., and Chien, Y.-C. 1985. The Development of Lexical Anaphors and Pronouns. *Papers and Reports on Child Language Development* 24:138-149.
- Woolford, E. 1999. More on the Anaphor Agreement Effect. *Linguistic Inquiry* 30:257-287.
- Zwart, J.-W. 2002. Issues Relating to a Derivational Theory of Binding. In *Derivation and Explanation in the Minimalist Program*, eds. S. Epstein and T. D. Seely, 269-304. Oxford: Blackwell.