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Binding Conditions in Young Children's Grammar: Interpretation of Pronouns Inside Conjoined NPs

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Some researchers attempt to explain children's prolonged delay in showing knowledge of Binding Condition B (Chien and Wexler (1990)) as an indication that Binding Condition B is relevant only to binding relations that involve pronouns interpreted as bound variables. This study extends the study of children's knowledge of Condition B to a construction containing pronouns embedded in conjoined noun phrases (NPs). Pronouns bound by a quantifier were included in the study. The results were surprising. A group of children accepted bound variable pronouns in violation of Condition B when the pronoun was embedded in a conjoined NP. The results support the argument of Reinhart and Reuland (1993) that anaphoric relations are constrained by more than one module of grammar.

1. INTRODUCTION

The goals for the study of grammar include understanding what the knowledge of grammar is as well as how this knowledge is acquired by children. To address these questions, Universal Grammar (UG) was proposed (Chomsky (1981; 1986)). UG represents innate linguistic competence that consists of grammatical principles and parameters. The Continuity Assumption states that "in the absence of compelling evidence to the contrary" (Pinker (1984, 7)), a child's knowledge of grammar is drawn from the same principles of grammar that are attributed to adults. According to this assumption, as soon as young children are able to produce and comprehend linguistic utterances, their knowledge of grammatical principles is assumed to be observable in their utterances and sentence comprehension.

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The Binding Conditions are considered to be a part of UG (Chomsky (1981; 1986)).[1] Hence, they should be available to children throughout the acquisition of their native language. However, one finding from Chien and Wexler (1990) seems to contradict this assumption. They found that some young children (age 2;6–6;6) appeared to show a prolonged delay in indicating their knowledge of Binding Condition B. For example, these children answered positively to the question *Is Mama Bear touching her?* as a description of the situation in which Mama Bear was touching herself. The results led to various interpretations in the literature.

Chien and Wexler (1990) and Grodzinsky and Reinhart (1993) independently argued that Binding Condition B is relevant to the exclusion of locally bound pronouns only when the pronouns are interpreted as bound variables. It is argued that two noncoindexed noun phrases (NPs) are not always disjoint in reference and that the possibility of this disjointness is determined by a pragmatic–semantic rule (Principle P in Chien and Wexler (1990), Rule I in Grodzinsky and Reinhart (1993)). For an example such as *Mama Bear is touching her*, young children observe Condition B when they correctly assign indexes as shown in the following example:

(1) Mama Bear$_1$ is touching her$_2$.

However, they do not apply the nonsyntactic principle in an adult-like way. As a result, their grammar allows the coreferential reading between *Mama Bear* and *her*. By contrast, the nonsyntactic rule is not relevant when the only interpretation of a pronoun is that it is a bound variable, as in the following example:

(2) Every bear is touching her.

To interpret a pronoun as a bound variable, it is required that the pronoun be coindexed with the antecedent. The subjects in Chien and Wexler's study rejected the coreferential reading of (2). This finding supports the distinction between a

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[1] The definitions of Binding Conditions in Chomsky (1981, 184, 220) are as follows:

(i) α is X-bound by β if and only if α and β are coindexed, β c-commands α, and β is in an X-position.
(ii) Binding Principle A (referred in the text as the Binding Condition A): An anaphor is bound in its governing category.
(iii) Binding Principle B (referred in the text as the Binding Condition B): A pronoun is free in its governing category.
(iv) 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.

The SUBJECT is the most prominent nominal element, which includes subject of infinitives, subject of noun phrase, subject of small clause, and Agr, when Infl contains one.

syntactic principle, such as Binding Conditions, and a nonsyntactic principle that restricts the interpretation of reference.

This analysis yields the prediction that young children should reject any bound variable pronoun when it is locally bound (i.e., when it is bound inside the governing category). This assumption is my working hypothesis. This study discusses young children's treatment of another relevant construction that is slightly more complicated than the baseline data. That is, I investigate children's interpretation of bound variable pronouns embedded in conjoined NPs.

According to the working hypothesis, even when they give the nonadult distinction between referential and bound variable pronouns, young children should reject all of the following sentences to the extent that adults do:

(3) Every frog$_1$ covered him$_1$.

(4) Every mermaid$_1$ scratched the frog$_2$ and her$_1$.

In these examples, the pronouns are locally bound by a quantified NP in violation of Condition B. Thus, if children have knowledge concerning Condition B, they should correctly rule out these sentences.

Sentence type (3) has been included in previous studies of children's knowledge of Binding Conditions. However, children's interpretation of sentence type (4) has never been fully investigated. The construction is more complicated than that of sentence (3), in that another NP intervenes between the pronoun and its binder. If young children correctly reject sentences such as (3) and (4), it would provide strong support for the argument that children have adult-like knowledge of Condition B. This study was conducted to test this prediction.

I investigate the grammar of the children who gave the baseline distinction between referential and bound variable pronouns among locally bound pronouns in sentences such as (3). Their performance will be compared to that of the children in the adult-like group, who rejected any locally bound pronoun regardless of the pronoun type.

2.   EXPERIMENT

2.1.   Method

An experiment was designed to test the hypothesis that children reject locally bound pronouns according to Condition B, as long as they are interpreted as bound pronouns. The relevant sentences are as follows:

(5) Every frog$_1$ covered him$_1$.

(6) Every mermaid$_1$ scratched the frog$_2$ and her$_1$.

The experiment was conducted in April 1993 at the University of Connecticut Child Development Laboratories (preschool and kindergarten programs). There were 19 participants whose ages ranged from 3;10 to 6;0 ($M = 4;10$). All the participants were familiarized with the task before they participated in the experimental sessions.

A Truth-Value Judgment task (Crain and McKee (1985)) was used in the experiment. In this task, one of the two researchers told a short story using toys as props. When the story was finished, the other researcher, manipulating a puppet, read a target sentence that was "one of the things that happened in the story." The child was asked to decide if the puppet was right or wrong and to indicate his or her decision by feeding one of two types of toy food to the puppet.

When a target sentence contained the *every* NP (e.g., *Every boy covered him*), the researchers provided at least three items of the same type (e.g., boys) to make the use of the quantifier more plausible. The stories were intentionally ordered so that the same sentence types were not tested consecutively. To avoid cuing or biasing the children's responses, the experimenter who told the story avoided the use of any reflexive pronoun (e.g., *herself, himself,* or *themselves*) in describing the stories. The researcher who manipulated the puppet was instructed to read the target sentence with stress on the verb to avoid stressing the pronoun.[2] All experimental sessions were audiotaped.

In many cases, when children judged the puppet to be wrong, they voluntarily explained the reason. When the reason for the judgment was not clear, the puppet would ask why he was wrong. By doing this, the researchers could assess whether children rejected a sentence based on their grammatical judgment or for some nonlinguistic reason. The experiments were designed so that the condition of Plausible Dissent Denial was satisfied (Crain et al. (1996), Murasugi (1988)).

The experimental session included 12 stories. The sentence types were chosen so that each child's response could be compared to locally bound pronouns inside conjoined NPs (e.g., *Every mermaid scratched the frog and her*) to his or her response to locally bound bare pronouns (e.g., *Every boy covered him*), in which a quantified NP binds a bare pronoun. There were four tokens of each type. To compare the data to those presented by Chien and Wexler (1990), a locally bound referential pronoun was included in the study (e.g., *The big brother washed him*). The researchers included two distractor sentences, which contained conjoined nonanaphoric NPs (e.g., *The cat caught the bunny and Road Runner*). Figure 1 contains story designs for sentences such as (7) through (9). See Appendix A for the complete list of the experimental sentences.

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[2]This was done to avoid the effect of focal stress on choice of referent (Chomsky (1981)). In the following example, focal stress on *HE* provides a reading in which *HE* and *him* are the same person, a reading which Binding Condition B would exclude.

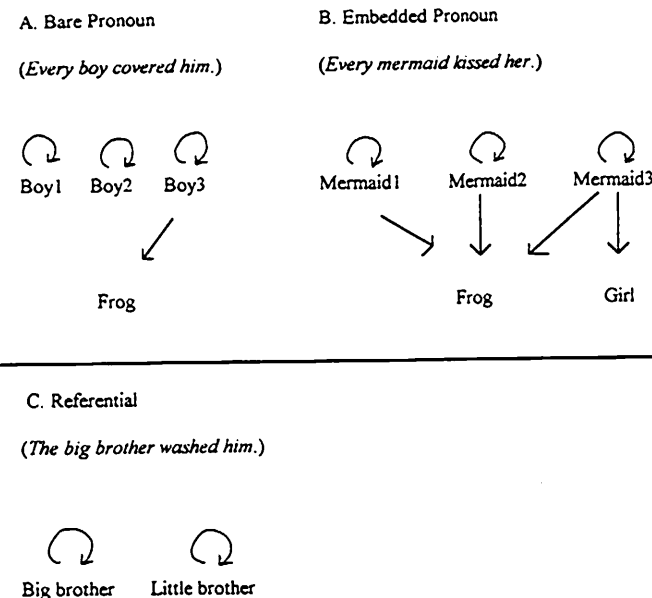(i) No one likes Bill. Well, HE likes him.

FIGURE 1 Story patterns for the experiment.

(7) Every boy covered him.

(8) Every mermaid scratched the frog and her.

(9) The big brother washed him.

As an example, the story that was designed for the test sentence, *Every boy covered him*, can be summarized as follows: There were three boys and a frog. The first boy covered himself with a blanket but refused to cover the frog. The second boy did the same thing. The third boy covered the frog; then the boy also covered himself. A "Yes" response to the test sentence was interpreted as an indication that the child interpreted *him* as each member of the set of boys (in violation of Condition B), whereas a "No" response was interpreted as an indication that the child interpreted *him* as the frog.

2.2. Results

Three children did not finish the experiment, and their data were excluded from analysis. Data from 2 children, who did not distinguish between the referential and bound variable pronouns, were also not included in the analysis. The re-

maining participants were divided into two groups according to whether they distinguished two types of nonembedded pronouns (referential and bound variable) in terms of Condition B violations. The first group of children (the Contrast group) consistently rejected locally bound pronouns when they functioned as bound variables ($p = .0009$).

The other group of children (the Adult-like group) rejected both types of locally bound nonembedded pronouns. Children in this Adult-like group, whose mean age was 5;2, were significantly older than the children in the Contrast group, whose mean age was 4;9 ($p < .0001$). See Appendix B for the list of the participants in each category.

2.2.1. The Contrast group.

Table 1 is a summary of the responses obtained from the Contrast group ($n = 5$ [26%], age range = 4;1–5;1, $M = 4;9$). These children rejected pronouns bound by the quantifier when the pronouns were not embedded. However, they treated the two types of bound variable pronouns differently. That is, they accepted a locally bound pronoun when the pronoun was embedded in a conjoined NP ($p < .0001$). There was no significant difference in the way they treated embedded pronouns and nonembedded referential pronouns ($p = .7391$).[3] Among the participants included in the analysis, there was no child who gave the opposite response; no one rejected the locally bound pronoun in the conjoined NP but accepted it when the pronoun was bare.[4]

2.2.2. The Adult-like group.

Children in this category rejected all Condition B violations. Table 2 is a summary of the responses obtained from these children ($n = 9$ [47%], age range = 4;3–6;0, $M = 5;2$).

2.3. Summary

The experiment tested the hypothesis that young children have knowledge concerning Condition B, whereas they lack the pragmatic–semantic rule. The hypothesis yields the following prediction: The children should reject any locally bound pronoun as long as it is interpreted as a bound variable.

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[3]As one reviewer pointed out, there seems to be a correlation between the acceptance of referential pronouns and the acceptance of embedded pronouns bound by the operator. It is not clear how this correlation is explained, as binding relations of referential pronouns and bound variable pronouns are constrained by different principles in the current theory.

[4]There was 1 child among the 19 participants who gave the opposite response to that of the Contrast group children. Her data were not included in the analysis because she failed to satisfy the criterion (to give a consistent judgment to sentences with referential pronouns). However, her response could be interpreted as an indication that the distinction shown by the Contrast group children (the distinction between the embedded and nonembedded pronouns) could be related to their interpretation of referential pronouns, contrary to what is assumed in footnote 3. I leave this issue open.

TABLE 1
Contrast Group

	Yes		No		NJ		
	n	%	n	%	n	%	Total
Bare pronoun	4	20	16	80	0	0	20
Embedded pronoun	16	80	3	15	1	5	20
Referential	7	70	2	20	1	10	10

Note. NJ = no judgment given.

TABLE 2
Adult-Like Group

	Yes		No		NJ		
	n	%	n	%	n	%	Total
Bare pronoun	0	0	36	100	0	0	36
Embedded Pronoun	0	0	35	97	1	3	36
Referential	0	0	18	100	0	0	18

Note. NJ = no judgment given.

The prediction was not borne out. The participants accepted a locally bound nonembedded pronoun 20% of the time and accepted an embedded pronoun 80% of the time even though it was locally bound. This finding cannot be explained by the hypothesis proposed in previous literature.

The number of children in the Adult-like group is considerably larger than the number of children in the Contrast group. This tendency was not observed in Chien and Wexler's (1990) study, in which a much smaller percentage of the participants gave an adult-like response.

3. DISCUSSION

The data from the Contrast group replicated Chien and Wexler's (1990) observation that, in their grammatical judgment, young children distinguish referential pronouns from bound variable pronouns.[5]

(10) Every boy$_1$ covered him$_1$ (acceptance rate = 20%).

(11) The mom$_1$ dressed her$_1$ (acceptance rate = 70%).

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[5]I am indebted to the anonymous reviewers of *Language Acquisition* and to Danny Fox for this interpretation of the data.

The data also showed that the children accepted sentences like (12), which adults would exclude:

(12) Every mermaid$_1$ scratched the frog$_2$ and her$_1$ (acceptance rate = 80%).

The pronoun in (12) is interpreted as a bound variable, and hence, the children who accept (11) should reject (12). However, that did not happen in this experiment. The test result is mysterious if we assume Binding Condition B as presented in Chomsky (1981) and modified by Chien and Wexler (1990). Young children should not treat (10) and (12) differently in terms of Condition B because they both contain bound variable pronouns that violate that condition.

The distinction that young children make seems to support the dissociation between Reflexivity and the Chain Condition proposed in Reinhart and Reuland (1993). Reinhart and Reuland argued that there are two constraints that govern an anaphoric relation. Reflexivity requirements consist of Conditions A and B, which are formulated in terms of a "reflexive-marked predicate" (p. 663). The relevant definitions are as follows:

(13) a. The syntactic predicate formed of (a head) P is P, all its syntactic arguments, and an external argument of P (subject). The syntactic arguments of P are the projections assigned theta-role or Case by P.
b. The semantic predicate formed of P is P and all its arguments at the relevant semantic level.
c. A predicate is reflexive iff two of its arguments are coindexed.
d. A predicate (formed of P) is reflexive-marked iff either P is lexically reflexive or one of P's argument is a SELF anaphor.

(14) Condition B: A reflexive semantic predicate is reflexive-marked.

(15) Condition A: A reflexive-marked syntactic predicate is reflexive.

(16) An NP is +R iff it carries a full specification for phi-features and structural Case.

(17) The syntactic requirement on A-Chains: A maximal A-chain (a1, . . . , an) contains exactly one link—a1—that is both +R and Case-marked.

(18) The semantic requirement on A-Chains: A maximal A-chain (a1, . . . , an) has
a. exactly one link—a1—that is both +R and marked for structural Case, and
b. exactly one theta-marked link.

Both (10) and (12) violate Condition B in (14) because an unmarked reflexive predicate is formed in the semantics. The relevant semantic representation for

(12) is the following: *(every mermaid (λ x(x scratched the frog & x scratched her)))*. Note that the Chain Condition in Reinhart and Reuland (1993) excludes (10) but not (12). (12) does not violate the Chain Condition for the following reasoning: The coargument of the subject *(every mermaid)* is *the frog and her*. However, the conjoined NP as a whole does not carry the same index as the subject, and hence, there is no chain link formed. Young children's acceptance of (12) is explained if we assume that their grammar is at a stage in which the Chain Condition, but not Condition B in (14), is fully operative. This interpretation implies that the Chain Condition and Condition B develop in different stages of language acquisition, supporting the argument of Reinhart and Reuland that the constraint on anaphoric relations consists of two components.

It has been observed that young children's performance in the interpretation of the English reflexive is learned earlier than that of pronouns (Chien and Wexler (1990)). More extensive research is necessary to consider why interpretation of the two anaphoric relations is acquired at different times. One possible explanation is based on the observation that reflexive anaphors are marked with the SELF morpheme, although there exists language-specific variations among anaphoric pronouns. For example, *zich* in Dutch is a simplex expression (SE) pronominal anaphor, which behaves differently from the reflexive anaphor *zichself* 'herself/himself' or pronouns such as *hem* 'him'. The SE anaphors and pronouns are considered to form one class (for a discussion, see Reinhart and Reuland (1993)). By contrast, languages such as English do not contain SE anaphors. This lexical complexity among different languages could be the source of the delay in demonstrating knowledge of Condition B.[6,7]

Another possible explanation is to assume that the principles that apply at the level outside the syntactic module of the grammar are fully acquired at a later stage.[8] This could be because of the level of abstraction required to compute semantic representation of sentences.

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[6]As pointed out by one of the reviewers, Reinhart and Reuland (1993) observed that Condition B violations are generally weaker than Chain Condition violations. This difference could be related to the fact that, unlike the Chain Condition, Condition B is subject to lexical variations among languages or to the fact that the two conditions apply at different levels.

[7]Based on their experimental data from Dutch children, Philip and Coopmans (1995) argued that the delay in lexical learning is a source of the "delay of Principle B" phenomenon. The Dutch children do not realize that *hem* 'him' and *haar* 'her' have phi- and Case features to be obligatorily interpreted as [+R], which results in their nonadult performance. Philip and Coopmans's study is relevant to the discussion in the text because it illuminates the possibility that children's delay of lexical learning plays a role in their nonadult acceptance of Binding Condition violations. However, the delay in the lexical learning in Philip and Coopmans's study interacts with application of the Chain Condition, whereas we relate the difficulty of lexical acquisition to the delay in acquisition of Condition B.

[8]Young children's acceptance of locally bound referential pronouns indicates that the binding of referential pronouns is not constrained by the Chain Condition. See Chien and Wexler (1990) for their arguments for the Pragmatic Principle P.

4. CONCLUSIONS

In this study, I presented experimental data that seemingly contradict the assumption that Binding Condition B is part of innate linguistic competence. That is, I found a group of children who accepted a pronoun, locally bound by an operator, when the pronoun was embedded in a conjoined NP.

The results are explained clearly if we assume the argument of Reinhart and Reuland (1993) that the Reflexivity Condition (Conditions A and B) and the Chain Condition are applied to anaphoric relations. The data strongly indicate that those two modules of grammar become fully operative at different stages of language development and, hence, support the dissociation proposed by Reinhart and Reuland.

Children's acceptance of sentences interpreted as in (19) does not empirically support two accounts in previous literature, which were proposed to explain Chien and Wexler's (1990) findings.

(19) Every frog$_1$ washed [Ariel$_2$ and him$_1$].

First, the data suggest that young children can interpret any quantifier–variable pair, contrary to the claim made by Grimshaw and Rosen (1990). Also, this finding raises an empirical problem against Sano's (1992) interpretation of Chien and Wexler's data. Sano argued that English-speaking children incorrectly assume that an English pronoun cannot be a bound variable. However, young children's acceptance of (19) cannot be explained by his hypothesis. This observation supports the original explanation of the finding, discussed in Chien and Wexler, that a referential pronoun and a bound variable pronoun are constrained in different modules of the language faculty.[9]

ACKNOWLEDGMENTS

[9]Another possible assumption, which maintains the Continuity Assumption in its strictest sense, is that young children's grammar contains a fully operative Condition B but that the grammar applies the condition at the wrong level; that is, it applies the condition to syntactic predicates. The experimental results are compatible with this assumption. However, this raises a serious learnability question. It is not clear what sort of positive evidence is available to tell the children that Condition B must be applied at the semantic level. I consider a slightly weakened version of the Continuity Hypothesis and assume that a certain module of grammar takes more time than others to be fully operative due to nongrammatical cognitive factors.

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APPENDIX A

Sentences Used in the Experiment[10]

The following is a list of all sentences used in the experiment. The stories were intentionally ordered so that the same sentence type was not tested consecutively.

[10]One reviewer showed concern about the possibility that the participants were biased by the choice of the predicates used in the session. Namely, young children gave more reflexive interpretation to pronouns in an intrinsically reflexive predicate. However, I believe that is not the case for the following reasons. The researchers used nonintrinsic predicates for most of the conjoined NP sentences (e.g., *comb, paint,* and *kiss*). Target sentences with the referential pronouns contained intrinsic predicates headed by verbs such as *wash* and *dress*: This seems to explain the children's nonadult response. However, the same children gave similar responses during the pilot study, in which nonintrinsic predicates were used (e.g., *Minnie Mouse dried her*). During the pilot study, they accepted the reflexive reading more often with a sentence having a nonintrinsic predicate (acceptance rate = 80%) than with the test sentence having an intrinsic predicate (e.g., *Donald Duck washed him* acceptance rate = 40%). At the same time, the children rejected bound variable bare pronouns, even though the sentence contained the potentially intrinsic predicate (e.g., *Every monkey dressed him* acceptance rate = 0%). Based on the participants' performance in both the pilot study and the experiment, I argue the choice of the predicates in the target sentences did not bias the responses. I thank William Snyder for helpful comments in this area.

- Every boy covered him.
- Every spaceman dried him.
- Every pony combed her.
- Every panda bear splashed him.

- Every mermaid scratched the frog and her.
- Every tiger painted Ariel and him.
- Every monkey kissed the duck and him.
- Every girl brushed the cat and her.

- The big brother washed him.
- The mom dressed her.

(Distractors)
- The cat caught the bunny and Road Runner.
- The penguins ate the egg and orange.

APPENDIX B
List of Children Who Participated in the Experiments

Contrast Group[a]		Adult-Like Group[b]	
Initials	Age	Initials	Age
R. S.	5;1	K. A.	5;8
K. P.	5;0	K. N.	5;1
N. M.	4;11	K. K.	6;0
S. C.	4;7	G. D.	4;3
A. C.	4;1	D. ST.	5;4
		M. A.	4;5
		A. K.	5;7
		K. T.	4;9
		K. O.	5;9

[a]$n = 5$. [b]$n = 9$.

Determiner Phrases and the Debate on Functional Categories in Early Child Language

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The apparent omission of determiners by young English-speaking children has led to the proposal that the DP-layer is universally absent in very early child grammars. In this article, I challenge this hypothesis by investigating the longitudinal development of the determiner system of a Swedish child (age 1;8–2;1). The article addresses phenomena such as suffixed and free articles, double definiteness, genitives, pronouns and "nominal style." I show that analyses of these early data must invoke at least one functional projection above the NP. These data therefore argue against any claim about the universal absence of functional structure in early child grammar.

1.   INTRODUCTION: FUNCTIONAL CATEGORIES AND LANGUAGE ACQUISITION THEORY

In this article, I investigate the acquisition of functional elements and projections in early child language. Syntactic theory now generally assumes that the clause contains several layers of functional or inflectional projections, such as for verbal agreement, tense, and complementizer (Comp). Similarly, for phrases other than the clause, functional categories have been proposed as heads. It has been argued, for instance, that the determiner (D) is the head of the nominal phrase (Abney (1987), Hellan (1985–1986), Szabolcsi (1983–1984)).

The introduction of functional projections into the syntactic tree has had repercussions for language acquisition theory. If adults have functional projections, what about children? Is the adult-like grammatical knowledge fully available to the child right from the beginning, or does it come in later? Radford

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