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The Acquisition of Structural and Pragmatic Constraints on Pronominal Reference

Keiko Murasugi

The University of Connecticut
and
Tsuda College

1. Introduction

The central concern of Generative Grammar is to investigate the knowledge of language: its aspects of form and meaning which are determined by the language faculty or Language Acquisition Device (LAD), which is endowed innately in the human mind, yielding a particular language through interaction with experience. Chomsky (1986) raises three basic questions that arise in the study of knowledge of human language: (i) What constitutes knowledge of language? (ii) How is knowledge of language acquired? and (iii) How is this knowledge put to use? The first question concerns the specification of the nature of the language faculty, which has been the subject matter of the theory of generative grammar that aims to capture the principles of human language. This theory is called Universal Grammar; it represents the initial state of the language faculty. The second question concerns the specification of the principles of Universal Grammar, and an explanation of the learnability issue often referred to as Plato's Problem: How and why can children attain the final state on the basis of poor and degenerate input stimuli? The third question concerns a theory of how the knowledge of language attained enters the use of language.

The purpose of the present paper is to study the acquisition of anaphora in the framework of the Government and Binding (GB) theory, which attempts to answer the questions mentioned above. In particular, I will focus on the phenomenon of "backwards anaphora".[1] The goal of this paper is to seek support for the hypothesis that children have innate knowledge of Universal Grammar (UG). According to this hypothesis, coreference relations are determined by structural conditions. This position is contrasted with the view that coreference relations are crucially determined by pragmatic context. The main purpose of this study is to investigate whether or not the structural constraints have an important function for interpretation of pronominal reference, even for young children, and to evaluate the hypothesis that children do not "learn" the structural conditions in question, but know them *a priori*, thereby trying to provide a partial answer to the second question Chomsky raised, as discussed above.

Anaphora has been investigated from both syntactic and pragmatic points of view. The purpose of this study is to assess children's grammatical knowledge of binding condition C, which is assumed to be part of Universal Grammar. Our secondary aim is to identify the pragmatic factors which may sometimes override children's structural knowledge. Specifically, we chose to explore a pragmatic factor that may cause children to permit coreference in simple sentence such as (1).

(1) He is looking at the picture of Santa.

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[1] The term "backwards anaphora" refers to the anaphoric relation in which a pronoun precedes its antecedent in surface structure, and is coreferential with it.

Suppose that in the context corresponding to (1), there are two characters which could be candidates for the antecedent of the pronoun *he*: *Santa* and *Incredible Hulk*. Although structural constraints prohibit coreference between *he* and *Santa*, several studies have found that children allow coreference between *he* and *Santa* in (1) in certain tasks. This has been taken as evidence for the existence of an intermediate stage in grammar acquisition at which children violate condition C. We will offer an alternative explanation, in terms of pragmatics, and we provide empirical support for this viewpoint. Our experiments used a truth judgement technique with 20 English speaking children, 3 to 5 years-old. In this study, sentences like (1) were presented in two situations. In one context, *Santa* was looking at a picture of himself, but the *Incredible Hulk* was not looking at anything; he slowly walked away from the picture of *Santa*. In this case, children tended to accept *he* and *Santa* as coreferential. A second context had the *Incredible Hulk* looking at a picture of Kermit. In this context, children did not allow the ungrammatical reading, rejecting (1) as incorrect. We interpret this difference as evidence of a pragmatic factor, which we call 'plausible denial'.

The hypothesis of 'plausible denial' maintains that unless the character who is not named in the sentence is occupied in some salient activity which makes it clear why the sentence is false, children allow pragmatics to override their syntactic knowledge. The effect of 'plausible denial' is to bias children to pursue the ungrammatical reading when the context fails to satisfy the presupposition of the grammatical interpretation. Interestingly, a group of 20 adult control subjects also showed the effect of 'plausible denial', though to a lesser extent than children. Unless pragmatic factors like 'plausible denial' are controlled, children's syntactic knowledge may not be properly assessed. By controlling for 'plausible denial', however, young children who know the relevant constructions are shown to adhere to binding condition C. Our data, together with the results of earlier studies, are interpreted as evidence of the early emergence of structural knowledge, as anticipated by current linguistics theory.

2. Structural Conditions on Backwards Anaphora

Before starting the discussion of acquisition, let us briefly review structural constraints on pronominal reference in the adult grammar.

In the generative framework, the theoretical study of the linguistic phenomenon of "anaphora" has been investigated since the late 1960's. Extensive work has been undertaken to investigate the proper formulation of the structural conditions governing anaphor-antecedent pairs (e.g. Ross (1967), Lakoff (1968), Langacker (1969), Postal (1969), Wasow (1972), Lasnik (1976), Reinhart (1976), Chomsky (1981), Lasnik (1981), Lasnik and Uriagereka (1988)). Within this framework, the linguistic antecedents for anaphoric elements are determined by syntactic configurations.

The most detailed explanation of anaphora is given by the Binding Theory of Chomsky (1981: 188). The Binding Conditions are summarized as follows.

(2) Binding Theory:
a. An anaphor is bound in its governing category
b. A pronoun is free in its governing category
c. An R-expression is free

In this paper, we follow the definition of binding presented in Lasnik and Uriagereka (1988: 33): A binds B if and only if (i) A c-commands B and (ii) A and B are coindexed. As for the structural relation of c-command, we follow the definition of Reinhart (1976:146): Node A c-commands node B if neither A nor B dominates the other and the first branching node which dominates A dominates B. Condition C of the Binding Theory explains why backwards anaphora is permissible in (3a), but not in (3b).

(3) a. When he$_i$ was sick, John$_i$ read a book.
b. *He$_i$ read a book when John$_i$ was sick.

(3a) is grammatical under the reading where the NP "John" is coreferential with the pronoun "he" because the pronoun is coindexed with the name and the pronoun does not c-command the name; however, (3b) is not grammatical under the reading where the NP "John" is coreferential with pronoun "he" because, in this case, the pronoun is coindexed with the name "John" and the pronoun c-commands "John". The Binding Theory prohibits coreference between a pronoun and a lexical NP (such as a name) in these circumstances.

3. Experiment on "Plausible Denial" and Coreference

3.0. Introduction

This section explores the nature of pragmatic influences on the acquisition of anaphora, in order that we may control for them and thereby reveal children's syntactic knowledge. I focus on cases in which pragmatic factors do influence children's responses on experiments on the acquisition of the binding conditions. We thus reconsider the nature of pragmatic influences on the determination of coreference judgements. This is an experiment of "plausible denial", in which I examine a pragmatic factor that may interact with children's syntactic performance. This would show that this factor must be controlled for in any task whose purpose is to assess syntactic competence.

3.1. Purpose and Hypotheses

The purpose of this experiment is to assess the grammatical knowledge of Binding Condition C in English-speaking children and to investigate the nature of a potential pragmatic factor in experimental methodology which I call "plausible denial" that influences the determination of coreference judgements.

Our hypothesis consists of the following two sub-hypotheses:

(4)

(a) Innateness of UG
The Binding Condition C, a condition which is part of UG, is not "learned" but is given *a priori*.

(b) Pragmatic Satisfaction of "Plausible Denial"
Unless the pragmatic demands are satisfied so that it is reasonable for the subject to say "no" in response to the intrasentential reference reading of coreference, children's demonstration of their syntactic knowledge of the Binding Conditions may be masked.

The hypothesis of "plausible denial" predicts that unless the character who is not named in the sentence is occupied in some salient activity which makes it clear why the sentence is false, children may allow pragmatics to override their syntactic knowledge.

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The hypothesis of "plausible denial" predicts that unless the character who is not named in the sentence is occupied in some salient activity which makes it clear why the sentence is false, children may allow pragmatics to override their syntactic knowledge.

The hypothesis (4b) ties in with the claim that unless the context provides enough information to meet with the presupposition of the target test sentence, the subject cannot deny the coreference relationship between a pronoun and an R-expression in the sentence. On the other hand, if the context provides proper information for both possible antecedents for the pronoun in the target sentence, then the subject can judge the non-coreference relationship between a pronoun and an R-expression. It is hypothesized that the plausible denial problem arises in the former case. As Hamburger and Crain (1982) suggested, unless the presuppositions of a sentence is satisfied, then it is very hard for the children to understand it. After each protocol, the target sentence is pronounced. In one context, the target sentence includes a predicate which corresponds to only one predicate in the sentence used in the protocol. That is, only one toy is 'looking' or 'covering' -- hence that toy is the only possible antecedent. For example, in the sentence of (1), *Santa* was looking at a picture of himself, but the *Incredible Hulk* was not looking at anything; he slowly walked away from the picture of *Santa*. In this case, children tended to accept *he* and *Santa* as coreferential. In the other situation, on the other hand, the grammatical antecedent of the pronoun in the target sentence is clearly occupied in the action described by the target sentence. This context had the *Incredible Hulk* looking at a picture of Kermit. So the child can judge whether the correct antecedent is doing what the sentence says. In this context, children did not allow the ungrammatical reading, rejecting (1) as incorrect. We interpret this difference as evidence of a pragmatic factor, which we call 'plausible denial'.

The hypothesis of 'plausible denial' maintains that unless the character who is not named in the sentence is occupied in some salient activity which makes it clear why the sentence is false, children allow pragmatics to override their syntactic knowledge. The effect of 'plausible denial' is to bias children to pursue the ungrammatical reading when the context fails to satisfy the presupposition of the grammatical interpretation. Here, it is hypothesized that some of those children who can interpret the pronominal reference extrasententially, according to their knowledge of grammar, in the latter situation, might not be able to correctly judge the same sentence in terms of pronominal reference, in the former situation. The barrier covering their grammatical knowledge is the pragmatic factor concerning the experimental methodology. Those children who can detect the grammatical coreference relations in the pragmatically proper situation, might be biased to select only one reading when the context does not provide them enough information regarding presupposition for the target sentence to correctly be judged concerning the coreference relationship between the pronoun and the R-expression.

This bias could be related to a focus effect. Howard Lasnik has pointed out to me that plausible denial might involve sentence focus. Children could mistakenly have accepted sentence (1) with the first situation (the more vague situation), because the background information which should be provided in order to focus on the object NP "a picture of Santa" is not present in the context.

3.2. Method

In this experiment, a truth-judgement task was used to test the effect of pragmatic factors on children's coreference judgements for backwards anaphora. In order to examine whether or not the hypotheses given above are borne out, a cross-sectional experiment was conducted with 20 three- to six-year-old children. The subjects were from middle-upper class homes. These twenty children are divided into two groups. Group I contains ten children whose age ranged from 3;7 to 4;6. Group II contains ten children whose age ranged from 4;7 to 6;2. The experiments were held at Children's World and UConn Child Labs in Connecticut, U.S.A. Ten adults whose native language is English were also tested as a control group. These adult subjects are all students of the University of Connecticut, U.S.A.

Before discussing the test sentences, I briefly summarize the truth judgement task. In this task, on each trial one experimenter (Experimenter I) manipulates the toys in the experimental field, acting out the situations which correspond to one interpretation of a target sentence. Experimenter II controls a puppet. The subject and the puppet watch the event that is staged by Experimenter I. Then, the puppet which is controlled by Experimenter II says what he "thought" happened, using a target sentence, which includes a pronoun and an R-expression. On hearing the sentence, the subject is asked to feed the puppet a cookie, if he says the right thing about a story; a rag, if he says the wrong thing.

In this task, then, both an utterance and a meaning are provided by the experimenters: the meaning is provided by Experimenter I, who stages the situation by manipulating toys; the utterance is provided by Experimenter II, who controls the puppet. In this sense, it is different from other comprehension tasks, e.g., the act-out task. In the act-out task, the utterance is given by the experimenter; and the children themselves are in charge of the meaning. For the ambiguous utterances, as we saw, this task cannot be used to see if children know more than one meaning. On the other hand, the truth-judgement task has a merit in being capable of clearly assessing knowledge of alternative meanings by asking children to judge whether or not one utterance-meaning pair the experimenter presents is right or wrong. This task has a second virtue from a methodological standpoint. Since the child has only to judge the truth value of the utterance and meaning pair, he/she has a minimal requirement of planning in attaining the matching of utterance and meaning pairs. Finally, the task seems fun for children. It allows us to test 3- to 5- year old children for about twenty test sentences, which takes about 30 minutes to complete in one experimental session. For these reasons, this task seems to be a good task to attest the linguistic knowledge of ambiguous sentences, including sentences with pronouns.

The test sentences consist of two parts: One is the Pre-test; and the other is the Main Session. In the Pre-test, the relevant syntactic constructions used in the Main Session are tested in order to provide a control, so as to be able to examine the acquisition of linguistic knowledge of UG. The Pre-test aims to see whether or not the subject knows the relevant structure first of all. The sentences in the Pre-test do not contain pronouns. In the Main Session, the sentence type of backwards anaphora where the R-expression does not c-command the pronoun, but the R-expression is c-commanded by the pronoun, is tested. In these sentences, the pronoun precedes the name. This Main session examines the effect of "plausible denial" with the sentences including backwards anaphora which are out by Binding Condition C. Furthermore, according to the context presented by the protocol of the experimenter, test sentences were divided into two groups: (a) the pronoun in the target sentence takes external reference, and the anaphoric relation is corresponding to the presented situation (5 II: 1, 2, 3, 5, 6, 7); (b) the pronoun takes sentence external reference, and the anaphoric relation is *not* corresponding to the presented situation (5 II: 4, 8). The sentences tested are the following:

(5)
I. Pre-test

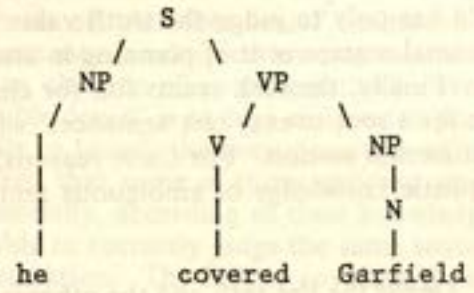
1. Smurf is looking at the picture of Teddy Bear.
2. Cabbage patch doll covered Mother.

II. Main Session

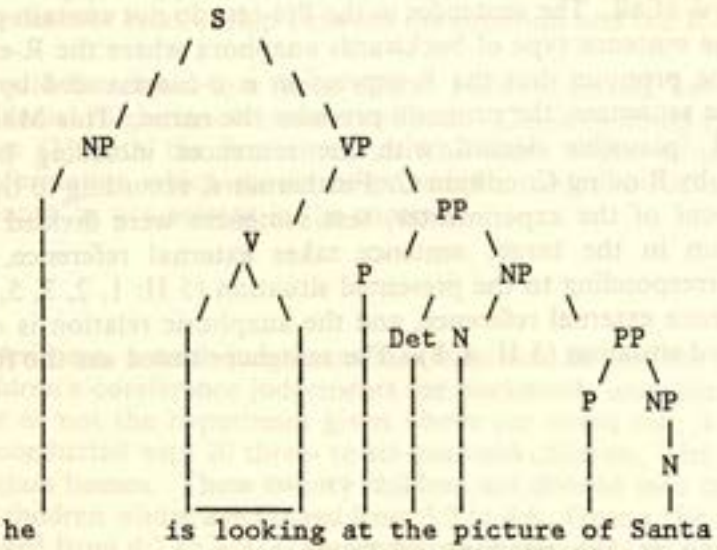
1. He covered Garfield.
2. She washed Sister Bear.
3. She smelled Strawberry Short Cake.
4. He tickled Teddy Bear. (control sentence)
5. She is standing on the drawing of Minnie Mouse.
6. He is looking at the picture of Santa.
7. He is playing with the mask of Donald Duck.
8. She is reading a book about Gummy Bear. (control sentence)

The Main session contains two syntactic types of sentences. Type 1 (i.e., (5 II: 1, 2, 3, 4)) is a simple sentence structure in which there is no NP-node between the pronoun and the R-expression. Type 2 (i.e., (5 II: 5, 6, 7, 8)) is a simple sentence structure in which there is structurally an NP which is commonly called a "picture noun phrase" between the pronoun and the R-expression. The S-structures of the sentences of Type 1 and Type 2 are diagramed below:[2]

(6) (a) Type 1:



(b) Type 2:



[2] The details of the internal structure of AUX and Tense are not expressed in the tree diagram, because it is irrelevant to our present concern.

Further, there are two contexts corresponding to sentence (5, II), which I call Situation 1 and Situation 2. All subjects were given all 8 sentences in Situation 1 first (the sentences given in random order), and then all 8 sentences were given in Situation 2. For example, for the sentence 6 in (5, II), the following two situations are set up.

(7) He$_{*i/j}$ is looking at a picture of Santa$_i$

<Situation 1>: a. Santa is looking at a picture of himself.
b. Bat Man is not doing anything.

(Protocol)
Santa and Bat Man walk along and go in opposite directions.
Santa comes to his own picture and looks at it to see it :
"Bat Man! Look what I found!"
Bat Man slowly walks away.

<Situation 2>: a. Santa is looking at a picture of himself.
b. Bat Man is looking at a picture of Kermit the Frog.

(Protocol)
Santa and Bat Man walk along and go in opposite directions.
Santa comes to his own picture and looks at it to see it :
"Bat Man! Look what I found!"
Bat Man says: "I can't see from way over here. I am looking at the picture of Kermit!"

In Situation 2, the two possible antecedents are looking at different things. Thus, the contrast between the action of the 'correct' antecedent and the 'incorrect' antecedent is clear in the field of the experiment. In Situation 1, however, only one of the two possible antecedents is doing the action mentioned in the sentence; but the other character, who *could* be the antecedent of the pronoun is not performing the kind of action mentioned in the sentence. Therefore, this might be a case where the child chooses the answer, not on the basis of his syntactic knowledge, but because he cannot see why the sentence is false. If so, we cannot deduce that the child does not know the structural constraints on pronominal reference; rather, the reason could be due to this pragmatic factor. To summarize:

(8)

	Test Sentences			
	Situation allows extra-sentential Reference (Response:yes)		Situation does not extra-sentential Reference (Response:no)	
Sentence Type	Type 1	Type 2	Type 1	Type 2
Situation 1	4	8	1, 2, 3	5, 6, 7
Situation 2	4	8	1, 2, 3	5, 6, 7

In order to focus on the effect of "plausible denial", the Main Session controls the following factors. First, the test sentences include only the backwards anaphora where the grammar predicts that the coreference relationship is not allowed between the R-

expression and the pronoun. Moreover, the fact that the test sentences include only backwards anaphora entails that the linear order of antecedent-pronoun is controlled. Furthermore, the context provided by Experimenter I with the protocol consistently ends up with the story about the character (referred to as an R-expression) which is different from the one mentioned in the sentence. That is, taking the hypothesis of Lust et al. (1980) into consideration, the last mentioned person in the protocol in this Main Session is always the name which is predicted by the grammar as the antecedent for the pronoun in the target sentence. This is for the control of a pragmatic factor. By observing the discourse principle as well, which might concern the determination of pronominal reference, we aim to see the effect of plausible denial.[3] Thereby, it is testing whether or not the phenomenon of "plausible denial" is observed in the experiment on acquisition of pronominalization, in the situation where the discourse principle as well as the grammar in the narrower sense are controlled consistently to direct the subject to choose the extrasentential antecedent reading, and thus, leads him/her to judge target sentences like (5 II: 1, 2, 3, 5, 6, 7) as "No". That is, it tests whether or not children judge the coreference relation between the R-expression and the pronoun *intrasententially* for sentences like (5 II: 1 - 8) in the situation where the discourse principle as well as the grammar in the narrower sense drive the subject to determine the antecedent of the pronoun *extrasententially*, thereby, testing the existence of the "plausible denial" phenomenon in the acquisition of structural constraints on pronominal reference.

All subjects were tested first with sentences (randomly ordered) in Situation 1, followed by Situation 2. Then, in the follow-up experiment, nine subjects who showed an effect of the phenomenon of "plausible deniable" were re-tested with the same sentences, this time, in Situation 2 first, followed by Situation 1: five subjects from Group I, and four subjects from Group II were tested. The follow-up test aimed to test whether or not the phenomenon of "plausible denial" was found even in reverse ordered situations. As a control group, ten adults were also tested.

The prediction of Experiment of "plausible denial" is as follows. In Situation 2, coreference judgements by the child should reflect the knowledge of his/her grammar. Thus, the grammar (and, possibly, discourse principles) yields that the reading for the pronoun in those test sentences must be extrasentential. However, in Situation 1, where the problem of plausible denial arises, children's responses will be affected by the pragmatics of the situation. Since the context does not contain an action that makes the sentence false, there will be a bias for letting the children accept the sentence in the incorrect context. Even if the discourse principle as well as the grammar tell them to say "no", the linguistic knowledge is overridden by the pragmatic condition concerning "plausible denial", and thus, in the truth judgement task, the meaning of the target sentence is judged to be "yes". In this case, the child's competence is not, thus, properly being attested. Rather, what I show is the difficulty one has in seeing why the sentence is false.

3.3. Results

This section summarizes the results. All the subjects in the three age groups passed the Pre-Test. The results of the Main Session are summarized in the tables (9) through (12). These results include only subjects who passed the control sentences (5 II: 4,8).

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[3] It should be noted that there are only two R-expressions which could be candidates for the antecedent of the pronoun in the experimental field. Therefore, whether (i) the subject tells directly on the basis of his grammar (and discourse principle) that the extrasentential object is coreferential with the pronoun, or (ii) the subject deduces from both context and his knowledge of grammar that the name in the sentence is not coreferential with the pronoun, the result observed in this truth-judgement experiment ends up with the same answer: "yes" or "no".

That is, the correct responses for the test sentences (5 II: 1, 2, 3, 5, 6, 7) are summarized. (9) and (10) show the results of the experiment with Situation 1 first (the main Experiment). In (9), the results of Situation 1 are given; in (10), the results of Situation 2 are given.

(9)

Situation 1 First

Percentage of correct responses for Situation 1

Sentence Type	Type 1	Type 2
Age Group		
Group I (3;7-4;6: N = 10)	76.7(%)	36.6(%)
Group II (5;7-6;2: N = 10)	85.8(%)	57.15(%)
Group III (adults: N = 10)	100(%)	94.2(%)

(10)

Situation 1 First

Percentage of correct responses for Situation 2

Sentence Type	Type 1	Type 2
Age Group		
Group I	100(%)	96.6(%)
Group II	100(%)	100(%)
Group III	100(%)	100(%)

(11) and (12) show the results of the experiment with Situation 2 first (the follow-up test). (11) is a table showing the percentage of correct response for Situation 1; (12), Situation 2. Notice that all the subjects who were given the experiment with Situation 2 first were among those who showed the phenomenon of "plausible denial" in the experiment with Situation 1 first.

(11)

Situation 2 First

Percentage of correct responses for Situation 1

Sentence Type	Type 1	Type 2
Age Group		
Group I (3;7-4;6: N = 5)	86.7(%)	71.4(%)
Group II (5;7-6;2: N = 4)	100(%)	73.3(%)
Group III (adults: N = 10)	100(%)	100(%)

(12)

Situation 2 First

Percentage of correct responses for Situation 2

Sentence Type	Type 1	Type 2
Age Group		
Group I	93.3(%)	92.9(%)
Group II	100(%)	100(%)
Group III	100(%)	100(%)

3.4. Analysis

Analyses of children's judgement error types provide evidence that plausible denial has a strong effect on children. Analyses of variance shows that the effect was statistically significant ($p < 0.001$).

First let us look at the results concerning sentence Type 1, that is, simple sentences with no NP-node intervening between the binder and the bindee. In Situation 1, the situation where the character which should be an antecedent in the adult grammar was not occupied in the salient activity, sentence Type 1 was correctly answered by 76.7% in Group I; 85.8% in Group II. The most errors were found for sentence 3, in which the verb "smell" was the head of the VP predicate. (The reason for this will be discussed later.) In Situation 2, on the other hand, where both characters (possible antecedents) were occupied in the actions introduced by the verb, 100 % of the children in both age groups could interpret the binding relations between pronoun and R-expression as adult subjects do.

Second, let us look at the results concerning sentence Type 2, that is, simple sentences including a picture NP. In Situation 1, where the character which should be an antecedent in the adult grammar was not occupied in the salient activity, sentence Type 1 was correctly answered by 36.6% in Group I and 57.15% in Group II. In Situation 2, on the other hand, where both characters (possible antecedents) were occupied in the actions introduced by the verb, 96.6 % of the children in Group I and 100 % of the children in Group II could correctly interpret the binding relations between pronoun and R-expression. In the tests of both sentence Type 1 and sentence Type 2, there were no children who said "yes" in Situation 2 but said "no" in Situation 1. That is, there were no children who interpreted the anaphoric relation as intrasentential, violating Binding Condition C, in Situation 2; while interpreting pronominal reference extrasententially, observing Binding Condition C in Situation 1.

The effectiveness of "plausible denial" is strongly supported by the follow-up experiment. As the results given in (11) and (12) show, the effect of "plausible denial" was observed less often in the case where Situation 2 was presented preceding Situation 1 for the same sentence. Unlike the experiment with Situation 1 first, the presence of the specific actions for the extrasentential reference in the first cycle of the experiment significantly aided the interpretation success in all age groups, since the anaphoric relations for the test sentence was more clearly shown in the experimental field. Therefore, we can speculate that for some subjects, after finishing one session with Situation 2, the context for the correct anaphoric relations was retained in the subject's mental image, and that the fact that the clearer context was presented prior to the vague context pro-

vided the subject an indirect cue for another cycle of the test of the same sentence with Situation I, in which no specific action of the antecedent for extrasentential reading was given in the context. Thus, those who made some 'mistakes' in the test with Situation 1 first, followed by Situation 2, made no mistakes in the follow-up test with Situation 2 first followed by Situation 1. This effect was also true for some of the children in the younger group (Group I). It should be noticed, however, that in this younger group, the "plausible denial" phenomenon was also observed. In this follow-up experiment also, for both sentence types Type 1 and Type 2, there were no children who said "yes" in Situation 2 but said "no" in Situation 1. The children who did not make any different judgements from adults' in the test with Situation 1 first also did not make any in the test with Situation 2.

Finally, we summarize the effect of age difference. The results on the truth judgement task with children revealed no significant effect of age in sentence Type 1, but they did show a significant effect in sentence Type 2. The phenomenon of plausible denial was observed just in case of Situation 1 with sentence Type 2 even in adult controls, though to a lesser extent than children.

3.5. Observational Data

In this section, I introduce some anecdotal comments that were made by subjects after they were provided the context with the protocol and the target sentence.[4]

In the experiment, the effect of plausible denial was also observed in children's comment. According to the protocol (Appendix 3), the same sentence was presented in two different situations. As was predicted in many cases, the same subject gave different judgements for the same sentence: in Situation 1, "yes"; in Situation 2, "no". The experimenters elicited comments from those children who showed the phenomenon of plausible denial, by asking what those children thought happened in the story and why they judged the test sentence the Kermit the Frog (Experimenter II) said was right/wrong. Thereby, the experimenters interpreted the reason why the pronoun is judged to be coreferential/noncoreferential with the R-expression in each situation. First, let us look at the comment given by RC (3;7) for both situations after the protocol was given by Experimenter I, to see how the phenomenon of plausible denial was observed in the experiment. (For the protocol, see Appendix 3). In the example shown below, for the *same* test sentence, RC gives the opposite judgements: "yes" for Situation 1; "no" for Situation 2.[5]

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[4] The data was recorded by Sony Cassette-corder TCM-5000 EV.

[5] In the observational data, "S" denotes "subject"; "E1", Experimenter I; "E2", Experimenter II.

(13)

RC (3;7)

(Situation 2 First)

6. He is looking at the picture of Santa.
   a. Situation 1:
   ----> S: Right. (gives a puppet a cookie)
   E2: Yeaa.. Cookie! yum...
   E1: What happened in the story, RC?
   ----> S: Santa was looking at the Santa (point to the picture of Santa.)
   E2: hm. the picture.

   b. Situation 2:
   ----> S: Wrong.. (gives the puppet a rag)
   E2: Oh, no. What really happened?
   E1: What really happened, RC?
   ----> S: He (pointing to Bat Man) was looking at the picture of Kermit the Frog.

7. He is playing with the mask of Donald Duck.
   a. Situation 1:
   ----> S: (gives a puppet a cookie)
   E2: Right? RC, who was playing with the mask of Donald Duck Donald Duck Donald Duck?
   E1: RC, could you teach Kermit the Frog who was playing with Donald Duck Donald Duck Donald Duck? Kermit, what did you say?
   E2: I said he is playing with the mask of Donald Duck Donald Duck Donald Duck.
   E1: Is that what happened in the story, RC?
   S: (nodding)
   E2: Is that what happened in the story?
   S: (nodding)
   E2: OK.

   b. Situation 2:
   ----> S: Wrong. (gives a puppet a rag)
   E1: Wrong? What happened in the story?
   ----> S: He (pointing to the Papa Smurf) was playing that mask (pointing to the mask of Mickey Mouse)
   ----> E2: Isn't that what I said?
   ----> S: (shake head)
   E2: Did I say that somebody else was playing with that mask?

Next, let us consider the responses of AD (4;6). He also showed the phenomenon of plausible denial. In his case, the phenomenon was also observed in the test sentences of Type 2: sentences including picture noun phrases. The Situation 1 was given first, followed by the Situation 2.

(14)

AD (4;6)

5. She is standing on the picture of Minnie Mouse.
(Situation 1):
----> S: I don't know.
E1: Kermit the Frog has to eat something, though. What did you say, Kermit?
E2: I will say it again. She is standing on the picture of Kermit the Frog.
----> S: She (pointing to Smurfette) isn't ... on here (pointing to the picture of Minnie Mouse).. So, eat this (gives a puppet a rag)!
(Situation 2):
----> S: I don't think so.
E1: You don't think so?
----> S: She (pointing to Smurfette) isn't.
----> Eat this (gives a puppet a rag).

6. He is looking at the picture of Santa.
(Situation 1):
----> S: Yes!
(Situation 2):
----> S: Him (point to Bat Man), or him (point to the Santa Claus)?
E1: What did you say, Kermit the Frog?
E2: I said he is looking at the picture of Santa.
----> S: Again... rag. (gives a puppet a rag)
E1: Why was he wrong?
----> S: Because he (pointing to the Bat Man) was over here and he was over here (pointing to Santa).

7. He is playing with the mask of Donald Duck.
(Situation 1):
----> S: Yes!
(Situation 2):
----> S: Him (pointing to Papa Smurf)?
E1: Is that what happened in the story?
----> S: I think... a rag!
E1: Sorry, Kermit.

Further, this subject showed the same phenomenon of plausible denial even when Situation 2 was presented before Situation 1.

(15)

6. He is looking at the picture of Santa.
(Situation 1):

----> S: Yes. (gives a cookie.)
E1: What did Kermit say?
----> S: He said (pointing to Santa) Santa is looking at the picture of Santa.

(Situation 2):

----> S: No.
E1: What happened really?
----> S: Santa is looking at the picture of Santa.

7. He is playing with the mask of Donald Duck.
(Situation 1):

----> S: Yes. (gives a cookie)
E1: What did Kermit say?
S: ....
E1: What did you say, Kermit the Frog?
S: He is playing with the mask of Donald Duck.
----> E1: Who is he?
----> S: Donald Duck.

(Situation 2):

----> S: No. (gives a puppet a rag)
E1: What happened really?
----> S: He (point to Donald Duck) played with that (point to the mask of Donald Duck) and he (point to Papa Smurf) played with that (point to the mask of Mickey Mouse).

These anecdotes provide supporting evidence for the phenomenon of plausible denial. In Situation 2, where the context contains actions that make the sentence either true or false, the children's comments reveal the grammatical knowledge of Binding Condition C. However, in Situation 1, where the context did not contain a specific action that makes the sentence false, children's comments show a bias for the overacceptance of sentences.

Further, the following anecdotes provide supporting evidence for the phenomenon of plausible denial. There were two children who judged "no" in both situations, but gave different comments for both situations. For example, RC (3;7) gave the following judgements and comments.

(16)

1. He covered Garfield.
   a. (Situation 1):

```
                S:  ...(gives a puppet a rag)
               E2: Wrong?  Oh...
               E1: ... What happened in the story really?
      --->     S:  Garfield (point to Garfield) covered hisself.
               E2: Oh, OK. Garfield covered hisself?
               S: (nod)
```

   b. (Situation 2):

```
                S: Wrong.  (gives a puppet a rag)
               E2: Wrong?  Oh.... what really happened, RC?
      --->     S: He (point to the Bert) covered Snow White.
               E2: Oh. That's right.  Actually, I wasn't paying
                   attention.
```

2. She washed Sister Bear.
   a. (Situation 1):

```
               S: No... (gives a puppet a rag)
               E2: No? Oh no... what really happened, RC?
      --->     S: She (pointing to Sister Bear) washed her face.
               E2: Oh... She washed her face.
```

   b. (Situation 2):

```
               S: (gives a puppet a rag)
               E2: No? Oh, I am wrong?
                   What happened really, RC?
      --->     S:  She washed the dishes.
                   And Sister Bear washed herself.
               E2: Oh, she washed the dishes!
                   And Sister Bear washed herself.
```

Although the subject judged the pronominal reference, as the adults do, in both situations, the comments she gave showed the effect of plausible denial. In Situation 1, she commented that the sentence is wrong because it is not a grammatical antecedent, but the character which is *not* a grammatical antecedent, who is doing the action which corresponds to presupposition of the target sentence. In Situation 2, she commented, on the other hand, that the sentence is wrong because action that the grammatical antecedent is doing does not meet with what happened in the context. This example shows that some children could correctly deny a sentence like (1) with both situations, but they reject it by different reasons. In the first (the more vague) situation, they rejected the sentence because the presuppositional information which should be provided in order to focus on the object NP is not present in the context; in the second situation, on the other hand, they rejected the sentence because the focus of the target sentence does not meet with the provided context, while the the presuppositional information provided by the head of the predicate in order to focus on the grammatical antecedent is met. This comment can also be interpreted as another case of plausible denial.

Examining the results, however, it was found that the correct response for Situation 2 with sentence Type 2 in Group 1 was not 100%; but 96.6%. Does this mean that there were some cases where the subject did not follow the Binding Condition C where the pragmatic conditions are met? Here we show the observational data of GL (4;0), who is one of the examples that did not give the judgement that observes the Binding Condition C. GL, who admitted intrasentential reading for some sentences which should

not be allowed in the adult grammar (as shown in the adult control test in this experiment) in Situation 2, made the following comments. Notice here that in Situation 1, he always allowed the intrasentential reading for the case where the intrasentential reading was judged to be allowed in Situation 2. In his case, there was observed also a tendency of plausible denial, although his judgement in the experiment was not crystal clear in the sense that he did not give a clear-cut judgement. However, the comments he made after each test for several Type 2 sentences in the Situation 2 have some distinct characteristics which show that it was significantly harder for him to decide the intrasentential reference reading than that for the same sentence in the (Situation 1).

(17)

GL (4;0)

3. She smelled Strawberry Short Cake.
   a. (Situation 1):
   ----> S: Yes. Cookie.
   b. (Situation 2):
   ----> S: Yes... That's hard.
   (repeat the protocol)
   ----> S: Well, it's kind of confusing again.
   E1: Well, so rather, which one do you want to feed the Kermit, a cookie or a rag? Which one is closer, cookie or a rag?
   S: (giving a puppet a cookie)
   ----> Both.

5. She is standing on the drawing of Minnie Mouse.
   a. (Situation 1):
   ----> S: A cookie...
   E1: yea... good.
   b. (Situation 2):
   ----> S: She? (pointing to Smurfette)
   E1: Well, what did you say, Kermit the Frog?
   E2: I said she is standing on the drawing of Minnie Mouse.
   S: (pause) ... yes. (gives a puppet a cookie.)

6. He is looking at the picture of Santa.
   a. (Situation 1):
   ----> S: Yes.
   b. (Situation 2):
   ----> S: ... (pause).. yes.
   E1: Yea?
   ----> S: Because I don't know which one.
   E1: OK.
   ----> S: That's too hard. Because they're both boys.
   | E1: Oh, are both boys OK?
   | S: No. Because I need a girl AND a boy.
   | E1: Oh.
   | S: Because if they can mixed up... if they can mixed
   | up, anyone could be like that.
   ----> That one was too hard.
   E1: Oh, that one was too hard?
   Well... let me tell you the story again.
   (repeat the protocol of (Situation 2))
   E2: He is looking at the picture of Santa.
   ----> S: ... that's a ... that's not a bo...
   | because, Santa is a boy, and Santa is looking
   ----> at himself..., and I don't know which one is.
   E2: That's a good point.
   S: That's a hard one for everyone.
   E2: Yes, that's especially hard for me.
   E1: Because he doesn't know our words.

7. He is playing with the mask of Donald Duck.
   a. (Situation 1):
   ----> S: (gives a puppet a cookie)
   b. (Situation 2):
   ----> S: This kind is confusing, too. See?
   | That's the mask of Donald Duck... I really don't
   ----> know.
   (repeat protocol)
   E2: He is playing with the mask of Donald Duck.
   ----> S: They're both men!
   | That's hard, too. That's hard, too.
   ----> (does not give a cookie nor a rag)

In Situation 1, GL did allow coreference between a pronoun and an R-expression intrasententially without any hesitation. On the other hand, in Situation 2, GL seemed to know that the grammatical antecedent can be the character (R-expression) introduced only in the context. He also noticed that the pronoun can be used deictically. Thus, the comments given above are interpreted as the following. In the former case, GL denied the extrasentential readings for the target sentences because of the problem of plausible denial. In the latter case, on the other hand, because the condition of plausible denial was satisfied, GL's grammatical knowledge was revealed in the experiment.[6]

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[6] Here, a problem arises. Why didn't GL deny coreferential relation between the pronoun and the R-expression in the sentence in Situation 2? For this question, the following two possible analyses could be provided. First analysis is that GL remembered that he judged the same target sentence in almost in the same situation as "wrong" in Situation 1, interpreting the coreferential relation as intrasentential. This is the reason why he gave the comments shown above. Second analysis is that if the pronoun is acquired as deixis first, followed by as anaphora, the child was in the intermediate stage. This is the reason why

3.6. Further Discussion

In this section, we will discuss *why* the phenomenon of plausible denial takes place.

In the protocol of Situation 1, the action of the extrasentential referent is always described by a verb different from the verb for describing the action of the referent that is mentioned in the target sentence, and the verb used in the target sentence. On the other hand, in Situation 2, the two possible antecedents are occupied in the action described by the predicate with the same verb, but with a different object NP. The plausible denial problem arises in the former case.

There are several possible explanations for this difference. The reason for this plausible denial phenomenon (at least in part) could be attributed to the lexical meaning of such verbs as "smell"; which is contrasted with the verb "cover". Recall that one child accepted the sentence (1) in the pilot study with the comment that the *Incredible Hulk* might have looked at the picture of *Santa*, but that *Incredible Hulk* was pretending that he did not look at it. This observation seemed to suggest that the vagueness of the lexical meaning of the verb as well as the vague situation presented in the experimental field covered the children's linguistic knowledge. In the experiment, in order to look at this phenomenon more closely, the verbs "smell" and "look", whose lexical meaning does not necessarily require the agent's intention were used in some of the sentences, in order to describe the action of the extrasentential reference which should be a grammatical antecedent. There was only one child who commented, after allowing the sentence-internal coreference in (5 II: 3), as follows:

(18)

OT (4;6)

```
    E1:
      Here is Strawberry Short Cake and Minnie Mouse.
      Strawberry Short Cake said, "I smell something very nice.  What's that?
      Hmmm.  That's me. I smell so sweet."
      Minnie Mouse is just looking at Strawberry Short Cake.
   E2:  She smelled Strawberry Short Cake.
---> S:  ... (pause) Yes.
   E1: So,  what does Kermit eat?
   S:  Cookie!
   E2:  Thank you.  Yum yum...
   E1:  OT, what happened in the story?
---> S:  Minnie Mouse smelled Strawberry Short Cake.
   EI:  Oh, really?  Let me see... in this story,
        Strawberry Short Cake said, "I smell very nice,"
        and...
    S: She (pointing to the Minnie Mouse) can smell, too.
```

It seems that this could be sometimes interpreted as a case for the phenomenon of plausible denial.

GL could not give a clear-cut judgement on the basis of Condition C. The first analysis can be tested by presenting Situation 2 first, followed by Situation 1 with the same sentences. The second analysis can be tested by holding the pretest of "lexical Test", examining whether or not the subject knows that the pronoun can be used as anaphora as well as deixis.

A related suggestion was proposed by Stephen Crain (p.c.). He suggests that contexts which do not offer the chance for plausible denial were ones in which the correct interpretation of a sentence has an unmet presupposition. In this circumstance, the child may not be able to do what Lewis (1979) suggests adult do, 'accommodate' the presuppositional failure, by mentally fixing things up so that the presupposition is met (Hamburger and Crain, 1984: 133). Hamburger and Crain (1984) claim that accommodating presuppositional failure is a significant cognitive achievement for children.

However, there were several children who really *understood* the situation and yet accepted the sentences (5 II: 5,6,7). For example, as the examples (13), (14) and (15) show, there were some children who commented on the pronominal reference for several sentences by revealing their reading as intrasentential reference.

The reason for the plausible denial effect, as we have discussed in 3.2, might also involve sentence focus. Children could mistakenly have accepted sentence (1) with Situation 1, because the presupposition which should be provided in order to focus on the object NP "a picture of Santa" is not present in the context.[7] As there was only one referent (by the intrasentential reading) that can satisfy the presupposition of the target sentence, the intrasentential reading for *he*, which can function deictically as well as anaphorically, might have been taken for a sentence like "$He_{*i/j}$ is looking at a picture of $Santa_i$" by the children.

The present writer observed in the experiment that there were several subjects who were looking at the extrasentential referent when they heard sentences like (5 II:5, 6, 7) in Situation 1, but thought for a while, looked at the other character, and then concluded by accepting the sentence internal reference reading, giving the comment of "Yes, he was." In this case, "he" is used deictically, but not as an anaphor. MT (3;4), who did not allow sentence internal reference in Situation 2 allowed it in Situation 1, with the following comments.

(19)

MT (3;4)

```
    E1:  MT, in this story, here is Smurfette,
         Minnie Mouse and a drawing of Minnie Mouse.
         Smurfette and Minnie Mouse look at this drawing (point).
         Minnie Mouse says: " I like this drawing.  But I have to stand
         on it to see it better."
         Smurffete is just looking at Minnie Mouse.
    E2:  She is standing on the drawing of Minnie Mouse.
---> S:  Yes!  (gives the puppet (Exp. II) a cookie)
    E1:  Can you tell Kermit why he was right?
    E2:  I said a right thing! yum yum ...
---> S:  Because, she (pointing to Minnie) was standing on this
         picture.
```

On the other hand, this subject gave the following comments with the same sentence with Situation 2.

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[7] Here, it should be noted that the last mentioned name in the pragmatic lead (in the protocol) should also direct the subject to choose the extrasentential reading.

(20)

```
   E1:  MT, in this story, here is Smurfette,
        Minnie Mouse.  Here is a drawing of Minnie Mouse.
        Here is a present.  At first,
        Smurfette and Minnie Mouse look at this drawing (point).
        Minnie Mouse says: " I like this drawing.  But I have to stand
        on it to see it better."  Smurfette said, "I don't think
        it's a good idea to stand on the drawing of Minnie Mouse.
        I think I will stand on the present!"
   E2:  She is standing on the drawing of Minnie Mouse.
---> S:  No... (gives the puppet (Exp. II) a rag)
   E2:  No?  Oh... yucky rag!
   E1:  Can you tell Kermit why he was wrong?
---> S:  Because, she (pointing to Smurfette) was standing on this
           present, and she (higher pitch) was standing on the
           picture.
   E2:  Oh, I see.
   E1:  Well, so what did Kermit say before?
--->E2: She is standing on the drawing of Minnie Mouse.
--->E1:  MT, who is "she"?
---> S:  Smurfette.
```

This subject also showed the relevancy of the phenomenon of plausible denial in the follow-up test where two situations were given in the opposite order from the Main Session. There were several children who gave comments in the same line. Thus, here we conclude that the plausible denial strongly affects the experimental study on Binding Condition C.

Here arises another problem. Examining the data closely, we found that the statistical analysis of variance showed a moderately significant effect of the variable of "Sentence Type" ($p < 0.08$). The percentage of the accuracy of sentence type 2 including "picture NPs" was also lower than that of sentence type 1 in both situations. Furthermore, the interaction between the variables of "Sentence Type" and "Situation" was statistically significant ($p < 0.01$). That is, the effect of the difference of situations on the sentence containing a complex NP was greater than that on the sentence containing a simple NP. The other factors being controlled, the only difference between Type 1 and Type 2 sentences is, syntactically, whether or not there is an intervening NP-node between the subject NP and lower NP in the predicate.[8] This result suggests that some other factor besides the pragmatic condition of plausible denial is concerned to derive the subject to allow the violation of Binding Condition C for the case where an NP-node is intervening between the binder (in this case, a pronoun) and the bindee (in this case, a R-expression) much stronger than for the case where there is no NP-node intervening between the binding NP and bound NP. I offer the following highly speculative analysis

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[8] It should be noted here that the tense and the aspect of the Type 1 sentences are different from those of Type 2. The reasons are summarized as follows. First, it was because of the naturalness of the sentence, due to the natures of the verb and the picture NPs. The selected verbs that can take a picture NP as direct object were judged to be more natural with the progressive form in the experimental context in question by native speakers of English. For example, it was considered that test sentence 1 would be interpreted natural with past tense; the test sentence 5 would be interpreted natural with present progressive. Further, we tried to avoid the repetition of using the same pattern of the verb forms. The other variables, for example, the type of situation, the structure of the test sentence and the linear order of pronoun-name in the target sentence are all controlled. Therefore, the protocol as well as the target sentences might sound to the subjects always in the same pattern, causing a loss of attention. In order to control the inconsistency of form of verbs in sentences of Type 1 and Type 2, the tense and the aspect of the verbs in the Pre-Test were designed to correspond to those of the verbs used in the test sentences in the Main Session.

for this problem. The upper NP in the predicate, or the picture NP, makes one semantic unit, and the inner structure within the upper NP is invisible to those children (and, even for some adults) and it, therefore, makes them admit the coreferential relationship between the subject NP and lower NP in the predicate. So, the upper NP makes an 'island', and the lower NP can thus be coreferential with an outside NP. In this paper, this explanation would be called an hypothesis of "anaphoric island".

For the alternative hypothesis, the following explanation could be also given. The reason why the lower NP is an invisible R-expression could be due to the fact that R-expressions in a picture NP are different from other usual R-expressions. That is, the R-expression of lower NP in picture NPs and that of upper NP belong to different semantic classes.[9] This is because, although the R-expression in a picture NP is describing the image of the referent, it does not directly refer to the NP in the actual world as it is. It could be roughly stated that the R-expression in picture NPs is an R-expression which refers to the denotation in the imaginary possible world of the speaker/reader, while the usual R-expression refers to the denotation in the actual world.

Then, how does this distinction of R-expressions account for the fact that some of the younger group of children (and even some adults) fail to rule out sentences like (23)? My conjecture is that it may be easier to put an index to a more "referential" NP, since the unmarked use of an index is to indicate a real entity in the actual world, as the name "referential index" suggests. Therefore the upper NP as the noun referring to the actual object in the world is easier to get an index as an R-expression, and thus functions as a candidate for a bindee. However, "he" and "a picture of Santa", for example, are interpreted as semantically anomalous when they are assigned the same index, because of the difference in gender. On the other hand, the lower NP which is also a name but which does not refer directly to the referent in the actual world, cannot get an index, at least, for some adults and children, because it is not a usual R-expression.

Whichever analysis is true, the following scenario would be provided to explain why the accuracy of sentence type 2 including picture NPs was lower than that of sentence type 1 in both situations. In the experiment, the pragmatics of the experiment supports the intrasentential reading. First, the plausible denial enters in this case. In the experimental field, for example, the situation where *Donald Duck* is playing with *the mask of Donald Duck* is acted out using the actual toys of *the mask of Donald Duck* and *the doll of Donald Duck*. Then, the subject hears the target sentence "He is playing with the mask of Donald Duck." The presented context provides the subject a visual input that *Donald Duck* is playing with *the mask of Donald Duck*. The pronoun 'he' can be used deictically because of its lexical property. Further, the lower NP *'Donald Duck'* is invisible for the children (and even for some of the adults) as a bindee to get an index with the preceding pronoun, and the upper NP also gets a different index, for the semantic or syntactic reason. Thus, the subject might have concluded on the basis of these computations that the target sentence is describing the situation correctly; thus, the subject's answer is "yes". If the pronoun 'he' can be used deictically, then, truly, *'he'* is playing with *"the mask of Donald Duck"*.

Therefore, even if the child knows the structural relationships of c-command, and irrespective of their noticing that "Donald Duck" functions as a noun and the pronoun c-commands the R-expression in the target sentence, the Binding Condition C does not apply in this case because it is not coindexed with the pronoun. In other words, the actual situation and the linguistic knowledge that (i) there are two main characteristics of R-expressions, (ii) the R-expression in the picture NP is different from usual R-expressions and (iii) a pronoun can be used deictically as well as anaphorically, lead the

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[9] This suggestion ties in with the new proposal of "there are two kinds of 'R-expressions'".

children to the 'incorrect' answer in the present experimental task. Notice, however, that this explanation does not directly concern the question of whether or not the Binding Condition C is acquired in those children, because this condition is not *applied*. Before the condition of UG is applied, children (and even some adults) have some problems in the sentence including pronoun and picture NP to detect that the lower NP inside the picture NP can be an R-expression which can be a bindee in the target sentence.

So far, we discussed two possible analyses: the explanation of "island" and that of "image". Howard Lasnik pointed out to me that NPs with the genitive could be used in order to disentangle these two possible hypotheses, as in (21). The sentence (21) has two readings, as shown in (21a) and (21b).

(21) *He$_i$ is looking at John$_i$'s picture.

a. Ben is looking at the picture of John (i.e., the image of John.)
b. Ben is looking at the picture drawn by John.

According to the "island" explanation, the upper NP is "visible" but the the lower NP is not. Therefore, if this analysis is correct, then, the sentence (21) should be accepted by the subjects whichever reading they give it: (21a) or (21b). That is, the subjects would interpret the pronominal reference in (21) intrasententially regardless of the reading. However, suppose the "image" hypothesis is correct. Then, the subjects who accept the reading (21a), would not accept the reading (21b). If the subject interprets the sentence (21) with (21a) reading, then, according to this hypothesis, the lower NP is invisible because it is not a usual referential expression; rather, it describes an image. It is interpreted with the reading of (21b), however, the lower NP is not invisible because a lower NP as well as an upper NP belong to the same semantic class of R-expression. Therefore, if the experimental context leads subjects to choose the reading in (21b) when sentence (21) is presented, according to the "image" hypothesis, reference" is true, then, the pronominal reference in (21) would be interpreted extrasententially. In this way, the two possible analyses could be disentangled. This project remains for future study.

Further, in order to test the "image" hypothesis, the following small experiment was held using two subjects who had showed the effect of plausible denial in the previous experiment. Those subjects were tested with the sentence "She is reading a book about Gummy Bear", a sentence which was used as a control test in the previous experiment to test whether or not the subject can *accept* the intrasentential reading. Howard Lasnik pointed out to me that the sentence shown above is different from others tested in the Main Session. *Gummy Bear* in *the book about Gummy Bear* denotes a character in the actual world whereas *Santa* in *a picture of Santa*, merely describes an image. In this experiment, we used the same technique as was used in the experiment of "plausible denial", to test whether or not those subjects who showed the plausible denial effect in other sentences would also accept the intrasentential reading for this sentence.

The result of this small experiment showed the those two subject could allow the extrasentential reading without showing the plausible denial phenomenon. In the context of Situation 1, those subjects answered "no" for the target sentence given in the context where grammatical antecedent should not be the R-expression (*Gummy Bear*, in this case) in the adult grammar. The subjects allowed the intrasentential reading in other sentences, but did not allow the intrasentential reading in such a sentence as "She is reading a book about Gummy Bear", in which the lower NP in the picture NP is more "R-expression-like" than the other lower Nps in the tests. This result provides support for our "image" hypothesis on why it is more difficult to detect that Binding Condition C applies to the lower NP than the other simpler NPs.

4. Concluding Remarks

Linguistic theory has sought to explain how and why children make the transition from the initial state of language to the final state on the basis of the primary linguistic data. It is commonly assumed further that the data available to the learner are highly limited in character. For one thing, negative data -- evidence that certain sentences are ill-formed -- are not available for the acquisition of grammar. Chomsky (1986) terms this 'Plato's Problem': How is it that we can know so much given that we have such limited evidence? The rules that concern the interpretation of anaphoric elements, which are pervasive in many natural languages, are a part of language which is not "learned". Despite the absence of negative data, children become able to tell the anaphoric relations in (3a) from the disjoint reference in (3b).

On the basis of these assumptions, this study has proposed to test whether the effects of the plausible denial in the experiment affect responses regarding coreference judgements. Examining these factors in the Main Session, we aimed to study the acquisition of structural constraints on pronominal reference, trying to examine whether or not the prediction that "once the children know the the relevant syntactic structure, the innate knowledge of structural constraints may emerge" was true. Thus, by noticing the importance of pragmatic factors, we studied the condition in which pragmatic factors override children's syntactic analyses. In particular, we presented evidence that, under certain pragmatic circumstances (which we call "plausible denial") children override Binding Condition C, and allow backwards coreference in structure which should be prevent it. However, when this pragmatic conditions are controlled, children consistently respond according to structural constraints. Moreover, adult controls also show (though to a lesser extent) the effect of plausible denial. The experiments used a truth judgement task with 20 English-speaking children 3 to 5 year-olds. Our data, together with the results of earlier studies, are interpreted as support for the early emergence of structural knowledge, as anticipated by current linguistics theory.

In passing, we considered the possibility of dividing "R-expressions" into two subclasses, thereby trying to capture the nature of picture NPs which behave syntactically in a different way from other NPs.

In the present state of our knowledge, remarks of this sort could only be suggestive of the many, largely unexplored ways in which the (adult and) child grammar on pronominal reference is studied. It is desired that this study will be one of the stepping stones for further research on the nature of picture NPs in general and the structural as well as pragmatic conditions on pronominal reference.[10]

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Appendix 1

SENTENCES

I. Pre-Test

1. Smurf is looking at the picture of Teddy Bear.
2. Cabbage patch doll covered Mother.

II. Main Session

1. He covered Garfield.
2. She washed Sister Bear.
3. She smelled Strawberry Short Cake.
4. He tickled Teddy Bear.
5. She is standing on the drawing of Minnie Mouse.
6. He is looking at the picture of Santa.
7. He is playing with the mask of Donald Duck.
8. She is reading a book about Gummy Bear.

Appendix 2

PROTOCOL (Pre-Test)

1. Here is a Teddy bear. He has a flower-patterned bag.
   On the other side, there is a picture of Teddy Bear.
   Smurf came along, went to the direction where Teddy Bear was standing and said, "Oh, Teddy Bear, you have a pretty bag.
   I like it very much! hmmm, wonderful."

2. Here is Cabbage Patch Doll.
   Here is Mother.
   Mother is sick, today.
   Mother said to Cabbage Patch Doll, "Could you please tuck me in?"
   Cabbage Patch Doll said, "OK", and goes like this. (Cabbage Patch Doll covers Mother.)

Appendix 3

PROTOCOL (Main Session)

1. (Situation 1)
Here is Garfield and Arnie.
Garfield is sleepy, and goes to bed.
"Arnie, will you please tuck me in?"
But Arnie says: "You are too big for me to tuck you in.
Do it yourself." And Garfield covers himself.
Arnie is just standing here.

(Situation 2)
Here is Garfield and Arnie. And here is Snow White.
Garfield is sleepy, and goes to bed.
"Arnie, could you please tuck me in?"
But Arnie says, "No, you do it by yourself."
So, poor Garfield covers himself.
Then Arnie found Snow White sleeping without any blanket.
"I will tuck you in. Is that warm?"

2. (Situation 1)
There is a Mother and Sister Bear.
Sister Bear woke up and said, "Mother, Mother, could you wash my face?"
But Mother said, "No. You are six years old.
You can do it by yourself. Do it by yourself."
So, Sister Bear washes the face by herself.
Mother is just standing over there.

(Situation 2)
There is a Mother and Sister Bear.
Sister Bear woke up and said, "Mother, Mother, could you wash my face?"
But Mother said, "No. You are six years old.
You can do it by yourself. Do it by yourself."
So, Sister Bear washes the face by herself.
Then Mother said, " I have to wash the dishes."
And Mother washes the dishes.

3. (Situation 1)
Here is Strawberry Short Cake and Minnie Mouse.
Strawberry Short Cake said, "I smell something very nice. What's that?
Hmmm. It's me. I smell so sweet."
Minnie Mouse is just standing over there.

(Situation 2)
Here is Strawberry Short Cake and Minnie Mouse.
And here is a beautiful flower.
Smell Strawberry Short Cake. Smell the flower.
(Aren't they smell nice?)
Strawberry Short Cake said, "I want to smell something nice.

Hmmm. Oh, I smell very nice. How nice it smells!"
Minnie Mouse said, "I don't think so.
Hmmm. Here is a beautiful flower. This flower smells
so sweet."

4. (Situation 1)
Here is Teddy bear and Mickey Mouse.
Mickey Mouse feels like tickling somebody. Mickey Mouse found
Teddy Bear, and ---- tickle tickle tickle. (Mickey Mouse tickled
Teddy Bear.)

(Situation 2)
Here is Teddy bear, Mickey Mouse and Minnie Mouse.
Mickey Mouse and Minnie Mouse are very good friends, you know.
One day, the nasty Teddy Bear tickled Minnie Mouse.
Tickle, tickle, tickle. Mickey Mouse look at that, and got upset.
"Teddy Bear is tickling my best friend!"
So, Mickey Mouse goes like this.
---- tickle tickle tickle. (Mickey Mouse tickled Teddy Bear)

5. (Situation 1)
Here is a picture of Minnie Mouse.
Smurfette and Minnie Mouse look at the picture.
Minnie Mouse says: " I like this drawing. But I have to stand
on it to see it better."
Smurffete is just looking at Minnie Mouse.

(Situation 2)
Here is a picture of Minnie Mouse.
Smurfette and Minnie Mouse look at the picture.
Minnie Mouse says: " I like this drawing. But I have to stand
on it to see it better."
Smurffete says: "I don't think it is a good idea to stand on the
drawing of Minnie Mouse. I think I will stand on the present."

6. (Situation 1)
Santa and Bat Man walk along and go in opposite directions.
Santa comes to own picture and looks at it to see it :
"Bat Man! Look what I found! It's me!"
Bat Man slowly goes away.

(Situation 2)
Santa and Bat Man walk along and go in opposite directions.
Santa comes to his own picture and looks at it to see it :
"Bat Man! Look what I found! It's me!"
Bat Man says: "I can't see from way over here. I am looking
at the picture of Kermit!"

7. (Situation 1)
Here is a mask of Donald Duck.
Donald Duck and Papa Smurf are looking at the mask.
Donald Duck says: "I like this mask very much.
I want to play with it."
But Papa Smurf is just standing by the mask.

(Situation 2)

Here is a mask of Mickey Mouse.
Here is a mask of Donald Duck.
Here are Donald Duck and Papa Smurf.
They are looking at the mask of Donald Duck.
Donald Duck says: "I like this mask. It's big and nice.
I will play with it!"
But Papa Smurf says: "I don't like this mask.
Oh, here is a mask of Mickey Mouse.
I like the mask of Mickey Mouse."

8. (Situation 1)
Here is Gummy Bear and Here is Wonder Woman.
They go to school. Gummy Bear found a big book
in a classroom. "Oh, no. It's embarrassing. It's
a book about me." And Gummy Bear goes away.
But Wonder Woman said, "I don't think so. I want to read a book
about Gummy bear. Hmmm. It's very interesting."

(Situation 2)
Here is Gummy Bear and Here is Wonder Woman.
And, here is a book about Gummy Bear and here is a book about
Grover.
They go to school. Gummy Bear found a big book
in a classroom. "Oh, no. It's embarrassing. I do
not want to read the book about me." And Gummy Bear turned around.
"Oh, here is a book about Grover. I think I will rather read
a book about Grover."
But Wonder Woman said, "I don't think so. I want to read a book
about Gummy bear. Hmmm. It's very interesting."

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