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WHAT DO CHILDREN KNOW WITHOUT LEARNING?

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INTRODUCTION

This study investigated children's knowledge of parasitic gap constructions, as in (1).

- (1) That is the giraffe that Cookie Monster patted t_i before kissing e_i .¹

In (1), t_i is the usual trace of movement, the "real gap", and e_i , which is coindexed to it, is the parasitic gap. Whereas movement out of an adverbial clause is not possible, in cases like this, the parasitic gap is licensed by the real gap. Most adult English-speakers find sentence (1) grammatical. The degree of grammaticality of parasitic gap constructions tends to vary depending on properties of the sentence. For some

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1. Throughout the rest of this paper, we will suppress the subscripting, except where necessary for exposition.

speakers, (2), with a tensed adverbial clause, is worse than (1).

- (2) That is the giraffe that Cookie Monster patted t before Grover kissed e.

For some speakers (including the first author), parasitic gap constructions like (3), where the gaps are in prepositional phrases, are completely ungrammatical.

- (3) This is the girl that Grover gave a picture of e to t.

In many accounts of parasitic gap constructions, such as Chomsky (1982), sentences like (3) are considered to have the same status as sentences like (1). (This corresponds to the intuition of the second author.)

Parasitic gap constructions seem to be subject to an anti-c-command condition (Taraldsen, 1981) according to which the parasitic gap must not be c-commanded by the real gap, ruling out sentences like (4).

- (4) *That is the bear that t hit Grover before looking at e.

Since the parasitic gap is a variable, the anti-c-command constraint could be considered to be a subcase of Binding Principle C.²

2. Actually, sentence (4) is additionally ruled out by the fact that PRO (which is controlled by *t*) also c-commands *e*. If the anti-c-command requirement is a case of Principle C, then this sentence contains two Principle C violations. If the adverbial clause were tensed, with PRO replaced by an overt NP subject, then only the anti-c-command condition would be violated.

Chomsky (1986) argues that parasitic gap constructions must consist of two chains, since the parasitic gap obeys Subjacency. (However, note that in sentences like "It is the type of book that [no one who has read *e*] would give *t* to his mother", Subjacency seems to be violated). He suggests that the construction involves chain composition. The anti-c-command condition would then be derived slightly differently (either by Principle C holding of chain composition, or as a subcase of the Chain Condition on maximal A-chains). Chomsky also discusses the possibility of replacing the anti-c-command requirement (which has been challenged empirically) with Subjacency (applying to chain composition).

Another condition on parasitic gaps is that they must be licensed by a variable; they cannot be licensed by an NP-trace, as illustrated by the ungrammaticality of (5).

- (5) *Grover got hit t before Cookie Monster talked to e.

In this case, the parasitic gap would no longer be bound by an operator and would therefore be an illicit empty category (a variable with no operator, an object *pro* (not licensed in English), a trace of illicit NP-movement, or a governed PRO).

A further question concerning these constructions is whether resumptive pronouns can occur in either of the gap positions. For most English-speakers, replacing the real gap by a resumptive pronoun, as in (6), results in the same ungrammatical status as sentences like (7), in which a resumptive pronoun is in a position that a trace could easily occupy.

- (6) That's the girl that the dog kissed her before knocking e down.
(7) That's the girl that Grover kissed her.

For some speakers, a resumptive pronoun sounds much better in the position of the parasitic gap, as in (8).

- (8) That's the cookie that Cookie Monster dropped t before eating it.

This is presumably because resumptive pronouns are marginally possible in most dialects of English in sites from which extraction is precluded (in this case, an adverbial clause). Interestingly, for some speakers (including the second author) the construction with resumptive pronouns occupying both the real gap and the parasitic gap positions, as in (9), is worse than (8), but better than (6).

- (9) That's the girl that Grover kissed her before patting her.

Languages and dialects of English (like that of the first author) in which resumptive pronouns are freely allowed, even in cases like (7), are of more interest regarding parasitic gaps. The question is whether a resumptive pronoun can license a parasitic gap. If not, a sentence like (6) would be ungrammatical even in

a dialect that otherwise allows resumptive pronouns. Chomsky (1982) predicts that a resumptive pronoun could not license a parasitic gap. Chomsky analyzes resumptive pronouns as base-generated pronominals that are interpreted as variables at LF, when they are coindexed with an operator. Since he argues that the parasitic gap must be coindexed with a variable at S-structure (p. 44), the structure with a parasitic gap coindexed with a resumptive pronoun would be illicit, since the resumptive pronoun is not a variable at S-structure. Engdahl (1985) gives data from Swedish that falsify Chomsky's prediction. She suggests that resumptive pronouns in Swedish are variables (phonetically realized traces), and can therefore license parasitic gaps. Whether a resumptive pronoun can license a parasitic gap would then depend on its S-structure status (pronominal or variable) in a particular language. Sells (1986) cites additional data, from Hebrew, showing that resumptive pronouns can, in some languages which freely use them, license parasitic gaps. The first author finds (6) completely grammatical, which indicates that dialects of English with free use of resumptive pronouns allow them to license parasitic gaps.

Although parasitic gap constructions are extremely rare in language use, people have intuitions about them. These constructions are often used as illustrations in arguing for the claim that much of linguistic knowledge must be innate. It is claimed that, given the ephemeral nature of the data, children must not have to hear the particular construction in order to know about its grammatical properties. For this reason, it is of interest to examine the status of parasitic gap constructions in the grammars of young children. The innateness claim together with the Continuity Hypothesis (claiming that children's grammars are always possible adult grammars (Pinker, 1984)) makes the prediction that children's grammars should not differ from those of adults with respect to parasitic gaps. In our study, we investigated the parasitic gap constructions in (1) and (3), as well as the constructions with resumptive pronouns, in children aged 3;8 to 5;6. We also included a group of adults in our study. We think that in any work on children's grammars, it is important to conduct the same study on adults to verify that the assumptions being made about adult behavior are correct. In this way, the children's and adults' behavior can be compared. In the examination of parasitic gap constructions, the inclusion of an adult group is especially important,

since not many adults have been asked about such sentences, and dialectal variation is known to exist.

METHOD

We used two methods for assessing the status of parasitic gap constructions in subjects' grammars. In the first, subjects had to answer questions and in the second, they had to judge the grammaticality of sentences. Because of the complexity of the sentences we were using, we also gave the subjects a pretest.

The Question Task: One experimenter, the story-teller, staged an event, using small toys as props. A rhinoceros puppet named Nelly, who was controlled by the second experimenter, watched the event with the subject. We told the subject that Nelly liked the stories but had a bad memory. Immediately after each story, Nelly asked the subject something about the story that she had forgotten. The subject had to help her by answering her question. Before the story-teller staged each event, she named the props and the actions that would be involved. She always used the gerundive nominal forms of the verbs to avoid distinguishing between intransitive and transitive verbs. In the target items, Nelly's question was always ambiguous; the verb of the adverbial clause could either be transitive with a parasitic gap object or intransitive (with an implied object). An example is given in (10).

- (10) Story-Teller: This is a story about a hungry camel and some French fries and a hotdog. There's gonna be some smelling and some eating in this story.
 [Camel smells hotdog and French fries; then eats hotdog.]
 Nelly: What did the camel smell t before eating (e)?

With the parasitic gap interpretation, the question is asking which thing the camel smelled and then ate. The answer would be just "the hotdog" (since the camel did not eat the French fries). With the interpretation where "eat" is intransitive, the question asks what the camel smelled. The answer is "the hotdog and the French fries". Both answers are correct, since the question is ambiguous and both interpretations fit the story. Therefore, if subjects do not interpret the question as a parasitic gap construction, no interesting conclusions can be drawn (except possibly in conjunction with their grammaticality judgments).

If they do give the parasitic gap response, on the other hand, this suggests that the construction is possible in their grammars.

We included two types of control items to insure that the parasitic gap response ("hotdog") was not due to factors other than a parasitic gap interpretation of the question. The first control checked whether the subject generally gives exhaustive answers to questions. If one is asked what the camel smelled in (10) (the intransitive verb interpretation), one could theoretically answer with just a subset of the objects ("the hotdog" or "the French fries"), instead of giving an exhaustive answer. To check for this, we included items like (11).

- (11) [Grover kisses lion and bear.]
Nelly: Who did Grover kiss?

As long as subjects generally gave exhaustive answers to these control items ("the lion and the bear"), we could assume that the answer "hotdog" to (10) was also exhaustive and, therefore, reflected the parasitic gap interpretation.

The other type of control item we used had an adverbial clause that unambiguously contained no gap; the answer related only to the first (matrix) verb. This was to insure that subjects had not developed a pattern of always giving the object of the final verb as an answer, without attending to the beginning of the sentences. An example is given in (12).

- (12) [Bert pushes house and boat, then climbs ladder.]
Nelly: What did Bert push t before climbing up the ladder?

Grammaticality Judgments: In order to get a second measure of the status of parasitic gap constructions like (1) and to include more construction types, we also directly asked subjects for judgments of grammaticality. We first gave some explanation and practice on judgments. (This type of methodology is discussed in McDaniel and Cairns, in press). We told the subjects that we were asking various people what they thought about certain sentences of English, because we wanted to find out more about language. We said that they should tell us whether the sentences sounded like English or whether they sounded funny. We told them that the easiest way to answer these questions would be to act as if we did not know English

very well and they were helping us learn English. Both the practice session and the actual one proceeded in the following way. We first staged an event with the props, describing what was happening at the same time (without using the constructions in question). We then asked whether a certain sentence would be the right way to say what happened in English. After the first few practice sentences, we did not ask subjects to correct the ungrammatical sentences. At this point, we also stopped giving them feedback on their responses.

The Pretest: Many of the sentences we used in our study, such as (1), contained both a relative clause and an adverbial clause with a PRO subject. Before we could use children as subjects, we had to insure that they could correctly interpret relative clauses. Whereas some researchers (Sheldon, 1974; Tavakolian, 1981) have found children having difficulty with relative clauses, more recent work (Crain, McKee, and Emiliani, 1990; Goodluck and Tavakolian, 1982; Hamburger and Crain, 1984) has shown that their performance can be greatly improved if the tasks are modified. In this study, it was important that subjects easily understood relative clause constructions. We, therefore, had them act out one OS relative clause (the type on which children have been reported to make the consistent error of making the matrix subject perform the action of the relative clause). We followed Hamburger and Crain (1984) in attempting to meet felicity conditions for relative clauses.

Another property of many of the sentences we were using was the adverbial clause construction with a PRO subject. For most adults, PRO is controlled by the subject of the matrix clause in such cases. (For some adults, PRO can be controlled by either the subject or the object.) In (13), for example, as in (1), the one doing the kissing must be Cookie Monster.

- (13) Cookie Monster patted the giraffe before PRO kissing the dog.

It has been shown, however, that in some children's grammars, PRO must be controlled by the object, so that in (13), the giraffe would have to be doing the kissing. For other children, PRO appears to have arbitrary reference. For them, (13) could be interpreted as meaning that anyone, including a character not mentioned in the sentence, does the kissing. (For discussion of these grammar types, see

Goodluck, 1981; Hsu, Cairns, and Fiengo, 1985; McDaniel, Cairns, and Hsu, forthcoming). In comparing our child subjects' responses on parasitic gap constructions to those of the adults, we did not want to introduce the possibly confounding factor of grammar type with respect to control. In addition, the question task could not be conducted with a child whose grammar had obligatory object control, since the questions would be nonsensical and would no longer fit the story. We therefore wanted to exclude children with non-adult grammar types.³

In order to determine the subjects' grammar type with respect to control, we gave them two sentences to act out that contained PRO in an adverbial clause. Once the subject had enacted the sentence, we asked whether other enactments were also possible. Prior to this task, we did the same thing with one very simple sentence to insure that the subject was willing to give both a "yes" response to an alternative enactment and a "no" response to an impossible one.

3. A child with obligatory object control would presumably interpret the question in (10), repeated here, as meaning that the thing that the camel smelled ate something.

(i) Nelly: What did the camel smell t_i before PRO_i eating (e_i)?

(At least, this is what would be predicted; sentences with a trace in object position have not been used in investigations of control in children's grammars.)

Although the question task could not be conducted with such children, their judgments would be highly interesting. This grammar type has often been analyzed as having the adverbial clause attached to the VP, like a complement. If this is correct, such children should find parasitic gap constructions like (1) ungrammatical, since, for them, the anti-c-command condition would be violated. We would not have been able to investigate this issue in this study, since we found no children with this grammar type.

It would be possible to conduct the question task on children with the grammar type in which PRO has arbitrary reference. Due to the context in which the question is asked, they would interpret the referent of PRO as intended (i.e., as the subject of the matrix). We did find three children with this grammar type and conducted the entire experiment with them, although we excluded them from consideration in the results. We discuss their data in Appendix A.

SUBJECTS

The subjects were 13 children aged 3;8 to 5;6, with a mean age of 4;10, and 13 adults. Five other children were excluded because they did not pass the pretest. (More will be said about the pretest in the Results section.) The child subjects were of mixed socio-economic backgrounds and attended preschools in Amherst, Massachusetts. The adult subjects were non-linguists from the same area.

MATERIALS AND DESIGN

The study was conducted on two separate days for most of the subjects. (One child subject and all the adult subjects completed the study in one session, with a break between the two parts.) The first part consisted of the pretest, the question task, and practice on giving judgments; the second part consisted of giving judgments on the sentences of interest. The first part lasted approximately 30 minutes; and the second part, 10 to 15 minutes. For all of the tasks, a variety of toys were used as props, including Sesame Street characters, plastic food items, and vehicles.

The Pretest: The first part of the pretest assessed the subjects' grammar type with respect to control. It included one practice sentence followed by two sentences containing control structures. The subject had to act out each sentence and then judge whether other enactments would also fit the sentence. The fourth sentence, which the subjects simply had to act out, tested their ability to interpret relative clauses. These sentences are given in Appendix B.

The Question Task: The task contained 17 items, consisting of eight target items, four tokens of the first type of control item (insuring that answers were exhaustive), one token of the second type of control item (insuring that subjects were attending to the entire sentence), and four filler items. In two of the control items and in two of the target items, the exhaustive answer consisted of three objects; in the other control and target items, the exhaustive answer consisted of two objects. The embedded verbs of the target sentences, which had to be optionally intransitive, were "eat", "paint", "cook", and "clean" (two tokens of each). The subordinator was "before" in all of the target items. The fillers consisted of one-clause questions of various types: two yes-no questions, a "where" question, and a "how" question. No two target items appeared in a row. All of the

items are given in Appendix B in the order in which they were presented.

The Judgments: All of the sentences presented to subjects for judgment are given in Table 1 in the order in which they were presented.⁴

- | | |
|-------|---|
| (i) | The lion water is drinking. |
| (ii) | The zebra fell down. |
| (iii) | The animals is drinking water. |
| (iv) | This is the camel that is jumping. |
| (v) | Grover Gumby is patting. |
| (vi) | That is the strawberry that Goofy is eating a banana and. |
| (vii) | This is the camel that Cookie Monster is patting. |
| ----- | |
| (14) | Ms. Piggy the elephant is petting. |
| (15) | This is the giraffe that Lucy is riding on. |
| (16) | Grover is talking to. |
| (17) | That is the camel that Grover hit Cookie Monster before licking. |
| (7) | That's the girl that Grover kissed her. |
| (1) | That is the giraffe that Cookie Monster patted before kissing. |
| (4) | That is the bear that hit Grover before looking at. |
| (6) | That's the girl that the dog kissed her before knocking down. |
| (18) | The elephant is climbing up the steps. / The elephant climbing is the steps up. |
| (5) | Grover got hit before Cookie Monster talked to. |
| (8) | That's the cookie that Cookie Monster dropped before eating it. |
| (9) | That's the girl that Grover kissed her before patting her. |
| (3) | This is the girl that Grover gave a picture of to. |

Table 1
Sentences Presented for Judgement

At the end of the first day, we first introduced

4. In Table 1, we keep the same numbers to refer to the sentences that we used in the above discussion. For this reason, the numbering in the table is out of order.

subjects to the concept of grammaticality and then gave them seven sentences to judge for practice. These sentences, identified by Roman numerals, are listed at the top of Table 1. Two of the grammatical sentences were relative clauses, (iv) and (vii). The ungrammatical sentences consisted of two word order violations ((i) and (v)), one agreement error ((iii)), and one violation of the Coordinate Structure Constraint in a relative clause construction ((vi)). The sentences given for judgment in the second part were sentences (1), (4), (5), (7), (6), (8), (9), and (3), discussed above, and five fillers. The session began with four fillers: a word order violation ((14)), a grammatical relative clause ((15)), an ungrammatical sentence missing an object of a preposition ((16)), and a violation of the Temporal Island Constraint ((17)). Another filler, (18), was given toward the end of the session and had two versions. If the subject had rejected the two preceding sentences, the grammatical version was given; otherwise the ungrammatical version, with scrambled word order, was presented.

RESULTS

The Pretest: Recall that five children failed the pretest. Two of them failed the relative clause part. (One was sick and we found out later that the other had been diagnosed as language-disordered.) The other three passed the relative clause part, but appeared to have grammar types in which PRO has arbitrary reference. We did conduct the experiment on these three children, and we discuss their data in Appendix A. The 13 children that passed the pretest all had grammar types in which the controller of PRO in sentences containing an adverbial clause must be the matrix subject. Similarly, for 12 of the 13 adults, the subject of the matrix was the only possible controller; and for one adult, the object could also control PRO.

The Question Task: The results of the question task are given in Table 2.

	TARGET	CONTROL ITEMS	
	Parasitic Gaps	TYPE 1 exhaustive	TYPE 2 correct
Children (N=13)	63	96	92
Adults (N=13)	25	100	100

Table 2
Question Task
% responses

Column 1 shows the percentage of parasitic gap responses for the children and the adults; column 2 shows the percentage of exhaustive responses on the first type of control item; and column 3 shows the percentage of correct responses on the second type of control item. Since the figures in columns 2 and 3 are high, it can be assumed that the parasitic gap responses on the target items were not artifacts due to non-exhaustive responses or inattentiveness to the first part of the questions.

Most of the individual children gave a high number of parasitic gap responses, and only two did not produce any. The non-parasitic gap responses mostly corresponded to the other possible interpretation of the question, with the embedded verb intransitive. Only six of the children's responses were incomplete, in that they appeared to be an inexhaustive answer to the non-parasitic gap interpretation of the question (e.g., "French fries" as an answer in (10)).

The adults gave many fewer parasitic gap responses than the children, only two adults giving primarily such responses.⁵ Most of their responses corresponded to the other possible interpretation of the question; 14 were incomplete (inexhaustive

5. We believe that the low number of parasitic gap responses in the adults can be explained by their attempting to answer in full sentences. The full sentence response to the parasitic gap interpretation of the question is awkward, as illustrated in (i), which would be the answer to (10).

(i) The camel smelled the hotdog before eating the hotdog.

answers to this interpretation).

Judgments: None of the subjects had difficulty giving judgments. By the third practice sentence, all of the subjects showed that they understood what we were asking of them, and no further feedback was necessary. The judgments of all of the sentences from the second session (except one filler⁶), as well as the violation of the Coordinate Structure Constraint from the practice session, are given in Table 3.

Sent	ADULTS (N=13)			CHILDREN (N=13)		
	GOOD	BAD	NOT SURE	GOOD	BAD	NOT SURE
(vi)	0	13	0	0	13	0
(14)	0	13	0	0	13	0
(15)	13	0	0	13	0	0
(16)	0	13	0	0	13	0
(17)	0	12	1	0	13	0
(7)	0	13	0	2	10	1
(1)	13	0	0	12	1	0
(4)	0	13	0	3	8	2
(6)	0	12	1	5	7	1
(5)	0	13	0	3	8	2
(8)	8	4	1	12	1	0
(9)	0	12	1	6	4	3
(3)	5	6	2	4	8	1

Table 3
Judgments

The judgments are categorized into three types: good (grammatical), bad (ungrammatical), and not sure. We use "not sure" to characterize any judgment that was not certain. This incorporates what would generally be referred to as "marginal" and "highly marginal", as well as "I don't know" responses.⁷

6. We omit sentence (18), since, as discussed above, it was not given in the same version for all the subjects. The judgments on the sentence were all as expected.

7. When a subject showed uncertainty, we redid the sentence (using different lexical items) at the end of the session. In most cases, subjects showed the same uncertainty. In cases where they did change their response, we report this second response instead of the initial one only if they seemed very certain and it
(continued...)

All of the subjects accepted the relative clause construction in (15) and rejected the Coordinate Structure violation ((vi)) and the ungrammatical fillers ((14) and (16)). All of the children and all but one adult subject also rejected the Temporal Island violation ((17)).

In general, the responses of the adults and the children were similar. With the exception of one child, they all accepted the basic parasitic gap construction in (1). It should be noted that the child who rejected it did give parasitic gap responses on the question task on seven out of the eight target items. The two parasitic gap constructions that violate constraints, (4) and (5), were not accepted by any of the adults and accepted by only three of the children. The three children were not the same ones for the two cases. In the case of (4), age may have been a factor, although this cannot be determined with so few subjects. Two of the three children who accepted this sentence were among the youngest of our subjects, aged 3;8 and 4;2. However, the third child was aged 5;5, and another young subject, aged 3;9, rejected the sentence. The three children who accepted sentence (5) were aged 3;8 (the same subject who accepted (4)), 4;9, and 5;2. The construction with a parasitic gap in a prepositional phrase, (3), was rejected by over half the subjects (including the child who rejected (1)).

All of the adults rejected the simple relative clause with a resumptive pronoun ((7)), but three of the children, aged 4;2, 5;1, and 5;6, accepted it. These three children also accepted the other three sentences with resumptive pronouns, (6), (8), and (9). Sentence (6) was given better status than (7) by our subjects; one adult was unsure about this sentence and five additional children (one of whom was unsure about (7)) accepted it. The adults responded the same way to sentence (9), with a resumptive pronoun in both clauses, as they did to sentence (6). The children found sentence (9) somewhat better, with one additional child accepting it and two more becoming unsure. Sentence (8), with the resumptive pronoun in the adverbial clause, was given the best status of the

7. (...continued)

was in the same direction as their first response (e.g., if the first response was "not very good" and the second response was "bad", we report the response as "bad"). There were only three clear "I don't know" responses, given by two of the children.

resumptive pronoun sentences, with eight adults and 12 children accepting it.

DISCUSSION

The Basic Parasitic Gap Sentence ((1)): If our subjects are representative of English-speakers, our results show that this construction is widely accepted. Even the child who rejected the sentence showed in the question task that he will spontaneously interpret sentences in this way.⁸

From the point of view of acquisition, the important finding is that almost all of the children accepted this parasitic gap construction. This is exactly what is expected if children do not have to hear every construction before they know about their grammatical properties.

Constraints on Parasitic Gap Constructions ((4) and (5)): Our study also shows that, as the theory predicts, children know the constraints on parasitic gap constructions. It is possible that the three children who accepted (4) would not show knowledge of Principle C in other constructions.⁹ We cannot determine this from our study, since it did not include such sentences. This is an interesting question for future research, since it would also shed light on the issue of whether the constraint ruling out (4) is, in fact, a subcase of Principle C.

The Questionable Parasitic Gap Construction ((3)): In many discussions of parasitic gaps, (3) is considered to have the same status as (1). Assuming that our subjects are representative of English-speakers, our results show that for many speakers, this is not the case. Of the 13 adults who accepted sentence (1), only

8. We know one adult who, like this child, rejects all sentences with parasitic gaps. When presented with items from our question task, however, she interpreted the questions as containing parasitic gaps.

9. The Continuity Hypothesis predicts that children should show knowledge of Principle C as soon as they have labeled R-expressions in their lexicon, which presumably occurs very early. The findings in the literature are not uniform, but in several recent studies (Crain and McKee, 1985, 1987; Crain and Thornton, 1990; McDaniel, Cairns, and Hsu, 1990) children as young as age 3 have been shown to respect Principle C.

five accepted (3) (six finding it ungrammatical, and two unsure); of the 12 children who accepted (1), only four accepted (3) (seven finding it ungrammatical, and one unsure). Our study rules out two accounts that would attribute the rejection of this sentence under other circumstances to artifacts. One is that it is (for some reason) difficult to find an appropriate context in which such a sentence would be used. Since we supplied the context (Grover giving a picture of a girl to that same girl), this could not explain our results. Second, it might be claimed that people are influenced by rules of prescriptive grammar. Preposition stranding is very obvious in this sentence, since there are two of them. However, this would not explain the responses of our child subjects, who presumably have not yet been exposed to this rule. It should also be noted that none of our adult subjects had any difficulty accepting (15), which contained a stranded preposition. The ungrammaticality of (3) for some speakers is, then, a real phenomenon, in need of an explanation. The existence of two dialects, apparently from a very early age, also must be accounted for.

Resumptive Pronouns ((7), (6), (8), (9)): Our results seem to show that, while children's judgments regarding resumptive pronouns are generally in the same direction as those of adults, children are more likely than adults to accept resumptive pronouns. However, we feel that one should be cautious in drawing this conclusion, due to the small number of subjects and the seemingly wide variation in judgments regarding resumptive pronouns. For example, none of the adult subjects gave the same judgments as those of the first author (that all four sentences are grammatical), and only one adult subject responded like the second author (that (7) and (6) are ungrammatical, (8) is grammatical, and (9) is highly marginal).

Recall that sentence (6) is of particular interest for the parasitic gap phenomenon, since a parasitic gap is licensed by a resumptive pronoun. The two children who accepted resumptive pronouns in the simple construction ((7)) also accepted (6), indicating that a resumptive pronoun can license a parasitic gap.

A Note on the Temporal Island and Coordinate Structure Constraints ((17) and (vi)): The fact that all of the children rejected these two sentences comports with the

Continuity Hypothesis.¹⁰ Since these are constraints on movement (possibly subcases of Subjacency), our results also indicate that relative clauses in the grammars of children of this age involve movement, as in the adult grammar.

It is also of interest that none of our subjects accepted the Temporal Island violation. In recent work in linguistic theory, sentences of this type are often given better status than they were given in the past. In Chomsky (1986), for example, such sentences are considered to be grammatical (weakly ruled out by Subjacency on p. 32, and not ruled out by anything on p. 66, after a modification was made in the theory). Our results on this sentence indicate that it may be preferable to use groups of non-linguists as informants.

CONCLUSION

This study provides more support for the concept of Universal Grammar and the Continuity Hypothesis. As this framework predicts, children have knowledge about parasitic gap constructions, although they may never have heard them. Children also were shown to form relative clauses by movement and to have judgments on resumptive pronouns similar to those of adults (although they may be freer for children, in general). The study also makes the methodological point that a good way of collecting data is to ask groups of children and adults for grammaticality judgments.

10. Goodluck, Foley, and Sedivy (1989), using a type of question task, also found that young children obey the Temporal Island Constraint.

APPENDIX A

Children with Arbitrary Reference for PRO

We excluded three children, aged 5;1, 5;3, and 5;4, who indicated on the pretest that they allowed the reference of PRO to be arbitrary. One of these children said that any of the characters could perform the action of the adverbial clause in the two sentences we gave. The other two children seemed unfamiliar with the construction and had difficulty interpreting it. In attempting to act out the sentences, one of them looked bewildered and asked us who should be performing the action of the adverbial clause. The other child acted out the adverbial clause with all three available characters performing the action in sequence, and did not act out the matrix clause action. Although we did not want to include these three children as subjects in the study, we were interested in their responses and therefore conducted the study with them, considering it as pilot work. As a group, their responses differed from those of the other children and the adults.

McDaniel *et al.* (forthcoming) suggest that this grammar type is the most immature, and analyze it as having the adverbial clause conjoined with, rather than subordinated to, the matrix. If this analysis is correct, such children should find sentences like (1) grammatical, since in their grammars, it would be a case of across-the-board extraction, parallel to (19) (cf. Williams, 1978).

- (19) That is the giraffe that Cookie Monster patted and (Grover) kissed.

In fact, for these children, the sentences on the question task should unambiguously have this across-the-board extraction interpretation (so that they would give only the "parasitic gap" response type). The interpretation with the lower verb intransitive should be impossible for them, since it would consist of extraction out of a conjunct (in violation of the Coordinate Structure Constraint). This prediction was borne out. In the question task, almost all of their responses (92%) corresponded to the across-the-board extraction interpretation, and in the judgment part, two of the children accepted (1) and one was unsure.

These children would also be predicted to reject sentences (4) and (5). Sentence (4) would be a

coordinate structure in which extraction was not parallel, as in (20).

- (20) *This is the bear that t hit Grover and Bert
kissed t.

Sentence (5) should be analyzed by these children as missing an object, parallel to (16). These children should also reject the Temporal Island violation, (17), which for them would be a case of extraction from a conjunct, parallel to (vi). One of the three children basically responded as predicted; he rejected (4) and (vi), and was unsure about (5). The other two children, however, accepted all three of these sentences. In fact, they accepted every sentence presented to them that contained an adverbial clause. It cannot be said that they were unable to give judgments, since they rejected other sentences, including (vi) and (16). One of them also rejected the simple resumptive pronoun sentence, (7). These two children were the ones who, on the pretest, seemed unfamiliar with the adverbial clause construction. We suggest that it was due to this unfamiliarity that they judged every sentence containing this construction as good.

Due to the small number of children, not much can be concluded from these results. With more subjects, the parasitic gap constructions could shed light on analyses of children's grammar types with respect to control (see note 3).

APPENDIX B

Sentences Used in Pretest and Question Task

Pre-test

The camel is jumping.

[Camel jumps; bear jumps]

The camel hit the lion before jumping over the fence.

[Camel, lion, or bear jumps]

Grover pats Cookie Monster before climbing up the steps.

[Grover, Cookie Monster, or Bert climbs steps]

Grover kisses the camel that is eating the strawberry.

Question Task: "In this story, X is going to be doing some Y-ing."

[Grover kisses baby lion & baby bear]

Who did Grover kiss?

[Camel smells hot dog, french fries then eats hot dog]

What did the camel smell before eating?

[Bears riding in boat]

Did the bears do three somersaults in the water?

[Dinosaur touches house, table and steps then paints house]

What did the dinosaur touch before painting?

[Gumby, Grover and Goofy ride upside down on Pokey]

Who rode upside down on Pokey?

[Big Bird hits carrot & pepper, then puts carrot in pot]

What did Big Bird hit before cooking?

[Grover hides baby in pool]

Where did Grover hide the baby.

[Giraffe jumps on mat & ladder then cleans mat]

What did the giraffe jump on before cleaning.

[Pokey licks Ms. Piggy, baby and Pluto]

Who did Pokey lick?

[Gumby kicks banana & pear, then eats banana]

What did Gumby kick before eating?

[Lucy dances for lion family]

Did Lucy dance on top of a baby lion?

[Witch runs into gate, table & pool, then paints gate]

What did the Witch run into before painting?

[Minnie Mouse tickles baby & big dog]

Who did Minnie Mouse tickle?

[Bert pushes boat and house, then climbs ladder]

What did Bert push before climbing up the ladder?

[Goofy throws tomato & corn, then cooks tomato]

What did Goofy throw before cooking?

[Girl rides bike backwards]

How did the girl ride the bike?

[Big Bird turns around stove and table, then cleans stove]

What did Big Bird turn around before cleaning?

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