

Table 4.3

Sentence types used to test children's knowledge of binding principles and local coreference in VP ellipsis structures

Sentence types	Principle
Conzo covered him with sunblock and Snuffy did too	B/Local coreference in both conjuncts
Batman cleaned him and every turtle did too	B
Bert covered himself with sand and Snuffy did too	B control
Spiderman tickled himself and every horse did too	B control
Mr. Dog brushed his teeth and every dinosaur did too	B control
Bert lassoeed him and the Tin Man did too	Local coreference in first conjunct
Hawkman fanned himself and the baby boy did too	A, strict
The kiwi bird cleaned Flash Gordon and he did too	C

The target structures and the relevant constraints reviewed in this section are summarized in table 4.3.

4.4 Procedures

Nineteen children participated in the experiment. They ranged in age from 4;0 to 5;1, with a mean age of 4;8.¹³ Two further children were excluded. These two children had difficulty making appropriate judgments in the first session, which comprised training and the trials checking children's knowledge of recovery of elided VPs. The children who participated in the experiment were all native speakers of English. All were enrolled at child care centers in Arlington, Massachusetts, or Storrs, Connecticut.

Each child subject was tested individually, either in a quiet corner of the classroom or in a room adjoining or near the classroom. Children were not invited to play the game until they had interacted with the experimenters in the classroom several times and were comfortable with them. The experiment took four sessions to complete, and each session lasted approximately half an hour. If the child had difficulty paying attention for that long, the session was, on occasion, split into two parts.¹⁴

A session comprised 12 to 14 separate stories. In the first session, children were trained how to play the game and were tested on items that checked their knowledge of the VP ellipsis structure. Training items were matrix sentences unrelated to VP ellipsis (e.g., *The Ghostbuster dressed*

Table 4.5
Child subject data for VP ellipsis control sentence types

Subject Age	Number of acceptances per number of trials																		
	ST 4;10	TS 4;11	MP 5;1	EX 4;10	BT 4;0	LT 5;1	PC 4;8	OX 4;5	LX 5;0	TF 4;4	EI 4;9	ED 4;2	OS 4;11	NT 4;6	KQ 4;7	JZ 5;0	MT 4;7	TT 4;7	BE 4;3
<i>VP ellipsis control</i>																			
<i>sentence types</i>																			
The caveman	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
kissed the dinosaur and Fozzie Bear																			
did too (grammatical)																			
The caveman kissed the dinosaur and Fozzie Bear	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2	0/2
did too (ungrammatical)																			
Ariel touched the creature and every girl did too (grammatical)	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2
Ariel touched the creature and every girl did too (ungrammatical)	0/2	1/2	1/2	0/2	1/2	0/2	0/2	0/2	1/2	0/2	0/2	1/2	1/2	1/2	1/2	0/2	0/2	0/2	0/2

Robin). During training (but not after), children were corrected if they made an error. In the second, third, and fourth sessions, the stories designed to test binding principles in VP ellipsis structures were introduced. The stories in each session were presented in random order. The sessions were audiotaped on a portable professional-quality Sony Walkman tape recorder. Children's explanations of why the puppet got the trial wrong were transcribed for analysis.

In each session, children's judgments of the test sentences were scored as "Yes" or "No." Percentages of acceptances for particular items were calculated for the group as a whole, and individually. Tables 4.4–4.6 provide the individual subject data for the child subjects.

Six adults who were undergraduate students at MIT or at other universities in the Boston area also were tested. The adults were tested using the truth value judgment task and the same experimental items that were presented to the children. The only difference was that the adults were not tested individually. The experimenter acted out the stories, and the adults wrote their "Yes" or "No" responses on paper, instead of interacting individually with a puppet. Tables 4.7–4.9 give the individual subject data for the adult subjects.

4.5 Overview of the Experimental Findings

The overall results for the 19 children who participated in the study are summarized in table 4.10. The table shows the percentage of "Yes" responses given to each of the experimental items, calculated for the group of 19 subjects as a whole. The interpretation being tested for each structure is glossed below it in smaller type. For those target sentences testing a constraint such as the parallelism constraint or a binding principle, the "Yes" response reflected an ungrammatical interpretation, so the number of "Yes" responses was expected to be small. An x in the column headed "Grammatical" indicates that a "yes" response reflects an ungrammatical interpretation. For items designed as controls, the "Yes" response was generally grammatical, so the number of "Yes" responses was expected to be large. A √ in the column headed "Grammatical" indicates that a "Yes" response reflects a grammatical interpretation.

The table confirms that the results were clear-cut. As a group, children tended to either accept or reject the sentences. Of the 17 sentence types, 8 were accepted at a rate of 22% or less; 4 were accepted at a rate of 82% or more. This result would be extremely improbable on any kind of random

guessing model such as a binomial model where most of the percentages cluster around the mean response probability. The distribution of percentages of acceptance is strongly bimodal, with the modes close to 0% and 100%. Many of the cases that do not have a (near) 100% rate of acceptance or rejection are grammatically ambiguous for the child, so that either a "Yes" or a "No" is appropriate (see the discussion of, e.g., *Bert brushed him* in chapter 3). The results show that children are responding according to determinate patterns, based on their grammatical competence. This is the expected pattern of results given the modular architecture of the language faculty.

Before turning to details of the experimental findings from children, we should mention the results from the 6 adult subjects. The adults behaved nearly perfectly (see tables 4.7–4.9). This indicated to us that our experimental method did not introduce distortions that might have affected the results with children. In the sections that follow, the adults' responses are discussed only when they shed light on children's behavior.

In each of the following sections, we first present the overall results for the experimental items. We then present results based on dividing the children into two groups: those who make adultlike judgments with respect to local coreference and those who do not. Specifically, we test whether the behavior of the two groups differs on various conditions as predicted in chapter 3. The individual subject data for the 19 children are presented in tables 4.4–4.6.

4.6 Results for Principle B and Local Coreference in Matrix Sentences

In this section, we discuss the results of items testing Principle B, items testing children's acceptance of a local coreference interpretation, and the control items. These results are summarized in table 4.11.

Notably, results from the items testing Principle B and local coreference interpretations conformed to the results reported by Chien and Wexler (1990) and replicated since by other researchers. Children were found to adhere to Principle B. That is, on the trials that unambiguously tested knowledge of Principle B, the ones in which the pronoun had a quantificational NP as antecedent, children did not allow a bound variable interpretation. Specifically, children allowed items like *Every reindeer brushed him* to have a bound variable interpretation only 8% of the time. On the trials that were ambiguous between a test of Principle B and a test of allowing a local coreference interpretation, the ones in which the pronoun

Table 4.6
Child subject data for binding in VP ellipsis: target and control sentence types

Subject	Number of acceptances per number of trials																			
	ST 4;10	TS 4;11	MP 5;1	EX 4;10	BT 4;0	LT 5;1	PC 4;8	OX 4;5	LX 5;0	TF 4;4	EI 4;9	ED 4;2	OS 4;11	NT 4;6	KQ 4;7	JZ 5;0	MT 4;7	TT 4;7	BE 4;3	
<i>Binding in VP ellipsis: target and control sentence types</i>																				
Gonzo covered him with sunblock and Snuffy did too	0/4	2/4	0/4	2/4	2/4	1/4	0/4	1/4	2/4	0/4	0/4	2/4	1/4	2/4	2/4	0/4	0/4	0/4	0/4	0/4
Batman cleaned him and every turtle did too	4/4	2/4	1/4	0/4	1/4	0/4	0/2	1/4	0/4	0/4	0/4	0/4	1/4	0/2	0/4	0/4	0/4	0/4	0/4	0/4
Bert covered himself with sand and Snuffy did too	4/4	4/4	4/4	4/4	4/4	4/4	2/2	4/4	4/4	4/4	4/4	4/4	4/4	2/2	4/4	4/4	4/4	4/4	4/4	2/4
Spiderman tickled himself and every horse did too	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	0/2
Mr. Dog brushed his teeth and every dinosaur did too	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/2	2/2	1/2	0/2	2/2	2/2	2/2	1/2	2/2	2/2	2/2	2/2	0/2

Bert lassoed him and the Tin Man did too	0/4	4/4	3/4	2/4	3/4	1/4	0/2	2/4	3/4	0/4	0/4	4/4	2/2	2/4	4/4	0/4	0/4	1/4	0/4
Hawkman fanned himself and the baby boy did too	2/2	2/2	1/2	0/2	2/2	1/2	-	2/2	2/2	2/2	1/2	2/2	-	2/2	2/2	1/2	0/2	0/2	0/2
The kiwi bird cleaned Flash Gordon and he did too	2/4	4/4	3/4	1/4	3/4	2/4	2/2	3/4	3/4	3/4	0/4	3/4	0/2	3/4	3/4	2/4	2/4	1/4	2/4

Table 4.7
Adult subject data for binding control sentence types

Subject	Number of acceptances per number of trials					
	JM	MI	JW	LZ	ES	JS
<i>Binding control sentence types</i>						
Every reindeer brushed him	0/4	0/4	0/4	0/4	0/4	0/4
Bert brushed him	0/4	0/4	0/4	2/4	0/4	0/4
Every reindeer brushed himself	2/2	2/2	2/2	2/2	2/2	2/2
Every Cabbage Patch boy said	2/2	2/2	1/2	2/2	2/2	2/2
Superman likes him						
He dusted the skeleton	0/2	0/2	0/2	0/2	0/2	0/2

Table 4.8
Adult subject data for VP ellipsis control sentence types

Subject	Number of acceptances per number of trials					
	JM	MI	JW	LZ	ES	JS
<i>VP ellipsis control sentence types</i>						
The caveman kissed the dinosaur and Fozzie Bear did too (grammatical)	2/2	2/2	2/2	2/2	2/2	2/2
The caveman kissed the dinosaur and Fozzie Bear did too (ungrammatical)	0/2	0/2	0/2	0/2	0/2	0/2
Ariel touched the creature and every girl did too (grammatical)	2/2	2/2	2/2	2/2	2/2	2/2
Ariel touched the creature and every girl did too (ungrammatical)	0/2	0/2	0/2	0/2	0/2	0/2
<i>Parallelism</i>						
The Incredible Hulk brushed his hair and every Troll did too	0/2	0/2	0/2	0/2	0/2	0/2
The lizard man lifted him and the ugly guy did too	0/2	0/2	0/2	0/2	0/2	0/2

Table 4.9

Adult subject data for binding in VP ellipsis: target and control sentence types

Subject	Number of acceptances per number of trials					
	JM	MI	JW	LZ	ES	JS
<i>Binding in VP ellipsis: target and control sentence types</i>						
Gonzo covered him with sunblock and Snuffy did too	0/4	0/4	0/4	0/4	0/4	0/4
Batman cleaned him and every turtle did too	0/4	0/4	0/4	0/4	0/4	0/4
Bert covered himself with sand and Snuffy did too	4/4	4/4	4/4	4/4	4/4	4/4
Spiderman tickled himself and every horse did too	2/2	2/2	2/2	2/2	2/2	2/2
Mr. Dog brushed his teeth and every dinosaur did too	2/2	2/2	2/2	0/2	2/2	2/2
Bert lassoed him and the Tin Man did too	0/4	0/4	0/4	0/4	0/4	0/4
Hawkman fanned himself and the baby boy did too	0/2	0/2	0/2	1/2	1/2	0/2
The kiwi bird cleaned Flash Gordon and he did too	3/4	4/4	2/4	3/4	4/4	4/4

had a referential NP antecedent, many children allowed a nonadult local coreference interpretation on some trials, giving an overall acceptance rate of 58%.

Our experiment replicates Chien and Wexler's (1990) result, but for younger children. In our experiment, the disparity in the acceptance rate for *Every reindeer brushed him* and *Bert brushed him* was very clear for 4-year-old children. In Chien and Wexler's experiment, the disparity was most apparent for 5-year-old children. Children younger than 5 years old were argued to not understand the concept of *every*, as determined by a control item. Our experiment did not separately test children's understanding of the meaning of *every*, but it is clear that children responded the same way adults do to items containing it. We attribute the differing results either to task differences or to the fact that we falsified the sentences with *every* using the general reading of negation (see section 4.2.3).

The transcripts of children's responses to the target sentences make some valuable points. In (45b), we give examples of why children

Table 4.10

Overall experimental findings by group ($N = 19$; interpretation being tested is given in smaller type)

Sentence types	% "Yes"	Grammatical
<i>Binding theory</i>		
Every reindeer brushed him (every reindeer brushed self)	8	x
Bert brushed him (Bert brushed self)	58	x
Every reindeer brushed himself (every reindeer brushed self)	88	✓
Every Cabbage Patch boy said Superman likes him (him = Cabbage Patch boy)	50	✓
He dusted the skeleton (skeleton dusted self)	8	x
<i>Recovery of elided VP and parallelism</i>		
The caveman kissed the dinosaur and Fozzie Bear did too (caveman kissed dinosaur; Fozzie Bear kissed own hand)	0	x
Ariel touched the creature and every girl did too (Ariel touched creature; every girl touched self)	21	x
The Incredible Hulk brushed his hair and every Troll did too (Incredible Hulk brushed rock star's hair; every Troll brushed own hair)	3	x
The lizard man lifted him and the ugly guy did too (lizard man lifted Smurf; ugly guy lifted Mickey Mouse)	21	x
<i>VP ellipsis binding targets and controls</i>		
Gonzo covered him with sunblock and Snuffy did too (Gonzo covered self; Snuffy covered self)	22	x
Batman cleaned him and every turtle did too (Batman cleaned self; every turtle cleaned self)	14	x
Bert covered himself with sand and Snuffy did too (Bert covered self; Snuffy covered self)	100	✓
Spiderman tickled himself and every horse did too (Spiderman tickled self; every horse tickled self)	95	✓
Mr. Dog brushed his teeth and every dinosaur did too (Mr. Dog brushed own teeth; every dinosaur brushed own teeth)	82	✓
Bert lassoed him and the Tin Man did too (Bert lassoed self; Tin Man lassoed Bert)	43	x
Hawkman fanned himself and the baby boy did too (Hawkman fanned self; baby boy fanned Hawkman)	65	?
The kiwi bird cleaned Flash Gordon and he did too (kiwi bird cleaned Flash Gordon; Flash Gordon cleaned self)	54	x

Table 4.11

Results for sentence types used to establish children's knowledge of binding in matrix structures ($N = 19$; interpretation being tested is given in smaller type)

Sentence types	% "Yes"	Grammatical
Every reindeer brushed him (every reindeer brushed self)	8	x
Bert brushed him (Bert brushed self)	58	x
Every reindeer brushed himself (every reindeer brushed self)	88	✓
Every Cabbage Patch boy said Superman likes him (Cabbage Patch boy = him)	50	✓

responded "No" to the sentence *Every reindeer brushed him*. In the story, it wasn't true that every reindeer brushed *him*, Bert; only one of them did. It is clear from children's responses that they were taking the pronoun in the sentence to refer to Bert, and not the reindeer.

(45) a. *Kermit* I know what happened. Every reindeer brushed him.

Child No.

Kermit What really happened?

b. *EI* (4;9) What really happened—only one reindeer brushed him, a little.

JZ (5;0) Only one of them helped him.

TT (4;7) This reindeer brushed back of him.

ED (4;2) These reindeer brushed themselves and this guy brushed him [= Bert].

NT (4;6) Every reindeer brushed himself and one brushed Bert.

The parallel controls testing whether children would allow *Every reindeer brushed himself* in the same context yielded an acceptance rate of 88%, short of the expected 100%. An acceptance rate near 100% was expected because the sentence is unambiguous; the true interpretation is the only interpretation the sentence can have. The reflexive cannot be interpreted as referring deictically to an individual not mentioned in the sentence.

Sixteen of the 19 children were tested on this structure.¹⁵ Of these 16 children, 4 children (OX, JZ, MT, EI) initially responded "No." From their answers to "What really happened?" it appeared that they

responded “No” because the statement *Every reindeer brushed himself* did not completely describe the events of the story.¹⁶ These children said that one of the reindeer had also brushed Bert (in addition to all the reindeer brushing themselves). In explaining what they thought had really happened, these children often used a reflexive, explicitly mentioning that the reindeer had brushed themselves. If a child did use a reflexive, the child’s original response was counted as acceptance of the bound variable interpretation. If the child did not use a reflexive, the original response was counted as a rejection of that interpretation. For example, OX’s original “No” response was counted as “Yes” on the basis of how she explained the story events. The test item was *Every Troll fanned himself*. In the story, it was true that every Troll fanned himself; one Troll also fanned a third character. (The child explains the situation using *wipe* instead of *fan*.)

(46) *Kermit* What about *Every Troll fanned himself*?

OX (4;5) [shakes head]

Kermit That didn’t happen in the story? What did all the Trolls do?

OX They wiped theirselves but only this Troll wiped him a little bit and then wiped his own.

Kermit So if I say *Every Troll fanned himself*, is that right or wrong?

OX Wrong.

An important observation is that in evaluating whether or not a sentence like *Bert brushed him* was true or false, some children quizzed the experimenter about the referent of *him*. This clearly suggests that they were weighing the possible referents before coming to a decision. This kind of considered decision is not predicted by Grodzinsky and Reinhart’s (1993) account. On their account, children end up guessing because they are unable to decide the referent of the pronoun, owing to the processing load imposed by Rule I. Our results suggest that children are not having any difficulty comparing representations. Consider the transcript in (47). In this case, the target sentence was *The buffalo wiped him*. The puppet, Kermit, was trying to get the child to decide on the referent for the pronoun without offering an opinion.

(47) *Kermit* The buffalo wiped him.

OS (4;11) Wiped hisself?

Kermit I think the buffalo wiped him.

OS Him?

Kermit I'm getting mixed up.

Experimenter Tell us one more time.

Kermit I think the buffalo wiped him.

OS Wiped him? The birdie?

Experimenter That's a tough one, isn't it. Do you think that's right or wrong? The buffalo wiped him . . .

OS Right, right.

Experimenter If it's right, what does it mean, then?

OS It means the buffalo wiped hisself and he helped him.

For control items like *Every Cabbage Patch boy said Superman likes him*, in which the pronoun could be interpreted either as a bound variable or as a deictic pronoun, children chose the bound variable interpretation 50% of the time. As mentioned earlier, for grammatically ambiguous items, children may choose a reading and respond at a particular rate depending on the discourse context and other aspects of how the item is presented. The 50% "Yes" rate simply reflects the fact that the sentence is ambiguous for the children. Since children tend to say "Yes" if they can, however, one might wonder why the acceptance rate isn't higher. There are two possibilities. Perhaps this sentence construction evokes a preference for the deictic interpretation, though the reason for this is not clear.¹⁷ Or perhaps the contexts in which these items were presented favored the deictic interpretation of the pronoun.

Putting aside the reason for some children's rejection of the bound variable interpretation, the crucial point is that in cases where the bound variable interpretation is permitted, children accepted it for *Every Cabbage Patch boy said Superman likes him* as often as 50% of the time. This can be compared with sentences in which the bound variable interpretation is ruled out by the grammar, as in *Every reindeer brushed him*, which was accepted only 8% of the time. This result is consistent with our hypothesis that children know Principle B as a matter of grammatical representation and consequently will not allow a quantifier to locally bind a pronoun.

Let us now turn to individual subject data and consider whether our first prediction (formulated in chapter 3) was confirmed.

Prediction 1

Some children will accept a local coreference interpretation of sentences with a referential NP antecedent, such as *Bert brushed him*; others will not.

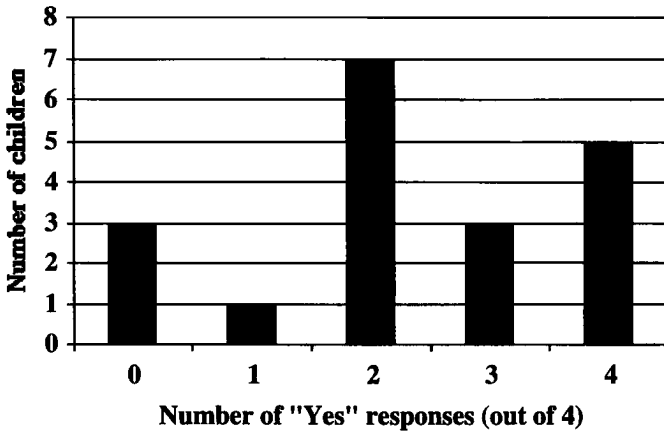


Figure 4.1

Number of acceptances of a local coreference interpretation by children ($N = 19$)

The individual subject data in tables 4.4–4.6 reveal that of the 19 children, 8 children accepted 3/4 or 4/4 trials, 7 children accepted 2/4 trials, 1 child accepted 1/4 trials, and 3 children responded as adults would, accepting 0/4 trials. The histogram of individual responses is shown in figure 4.1.

What can we infer from this response pattern? If children display a single group behavior in their acceptance of the nonadult reading, then this histogram should show a normal (binomial) distribution of responses, with some “balance” point around the mean of 58% “Yes” responses. The scores of individual children should deviate from this balance point with roughly the same frequency in both directions, resulting in the familiar bell-shaped curve associated with normal unimodal distributions. The histogram in figure 4.1 clearly does not fit this pattern. Although the 19 subjects gave “Yes” responses 58% of the time, the histogram reveals a bimodal, and not unimodal, distribution of responses. That is, too many children responded “No” on the majority of trials for a simple binomial model to correctly characterize the children’s responses as a group.

To further assess whether these findings fit the binomial model—that is, to determine whether the responses of the children who consistently said “No” differ significantly from the responses of the children considered as a group—we conducted a goodness-of-fit statistical analysis. The procedure is as follows: The probability of saying “No” is $\text{Pr}(\text{No}) = .42$. This means that the probability of saying “No” on all four trials is $.42^4$, or about .03. Since there are 19 subjects, the binomial model anticipates that

$19 \times .03 = .57$ subjects will respond "No" on all four trials. That is, on the binomial model, not even 1 subject is expected to produce all "No" responses. Yet 3 children actually responded "No" on every trial. Therefore, these children were not responding according to the binomial model; they presumably had adult competence.

Another child accepted the nonadult local coreference interpretation on only one of four trials. If we incorporate this child into our calculations, on the binomial model, the probability that a subject will respond "No" on three or four of the four trials is .1, so about 2 of the 19 children could have been expected to behave in this fashion. Four children do, however. Because only 1 child rejected the illicit interpretation on one out four trials, this child is difficult to classify. It is conceivable that this child had adult competence but was more prone to error than the 3 children who answered "No" on all trials; alternatively, this child may have had the same grammatical competence as the other 15 children but was more successful at the task for some unknown reason.

Unlike the response patterns of these 4 children, those of the other 15 children do appear to be consistent with the binomial model. On this model, the probability that children will give three or four "Yes" responses to the four trials is the probability of giving this response on three trials plus the probability of giving it on all four trials: $\text{Pr}(3 \text{ or } 4 \text{ yes}) = \text{Pr}(4 \text{ yes}) + \text{Pr}(3 \text{ yes}) = .58^4 + (4 \times .42 \times .58^3) = .11 + .34 = .45$. Therefore, it is expected that $19 \times .45 = 8.6$ subjects will say "Yes" on three or four trials.¹⁸ This is about what was observed. Eight children accepted three or four trials of the type where *Bert brushed him* is taken to mean that Bert brushed himself. The remaining 7 children vacillated equally between "Yes" and "No" responses. Thus, these children responded as they would when confronted with any other ambiguous sentence; they picked a reading and responded, with some tendency toward picking the reading that resulted in a "Yes" response. The latter tendency is not related to their grammatical knowledge, however.¹⁹

This statistical analysis shows that the responses given by the 19 children considered as a group do not conform to a normal distribution. The distribution is bimodal, with some children manifesting adult knowledge of Principle B and the pragmatic restrictions on local coreference interpretations.

Further statistical analyses of the predictions advanced in chapter 3 were conducted. For these analyses, children were divided into two groups. Group 1 includes the 3 children who responded like adults and accepted no local coreference interpretations and the 1 child who accepted

Table 4.12

Percentage acceptance of local coreference interpretation for matrix sentences by groups 1 ($n = 4$) and 2 ($n = 15$)

Sentence type	Group 1	Group 2
Bert brushed him (Bert brushed self)	6 (1/16)	72 (43/60)

the local coreference interpretation on only one out of four trials. Group 2 includes the remaining 15 children, who allowed local coreference interpretations on at least two of the four trials. The different response patterns by the two groups to sentences like *Bert brushed him* are shown in table 4.12.

In considering other experimental items, we will be interested in whether the difference in the behavior of the two groups persists or not. That is, we will ask whether group 1 children continue to respond “like adults” and whether group 2 children continue to respond in a nonadult manner. Put another way, we will be asking whether or not there are types of sentences for which group 1 children change their behavior, accepting a local coreference interpretation. Similarly, we will be asking whether or not group 2 children change their behavior and start to respond in an adultlike fashion. These changes in group behavior will be examined statistically using McNemar’s test for the significance of changes. In some cases, the use of statistics is inappropriate, owing to the small number of children in group 1.

In assessing changes in children’s linguistic behavior, we adopted a stringent criterion for considering them to have made a significant change from their earlier pattern of responses. The criterion on the posttest phases of the experiment was adultlike responses on every trial. For example, suppose a child accepted the local coreference interpretation of a structure like *Bert brushed him* on three out of four trials, and—on the posttest phase—accepted an illicit interpretation of some other sentence type on only one out of four trials. This child would not be considered to have undergone a significant change in behavior; he or she did not respond perfectly on the posttest phase.

Let us turn now to prediction 2.

Prediction 2

All children will adhere to Principle B in sentences with a quantificational antecedent, such as *Every reindeer brushed him*.

Table 4.13

Percentage acceptance of Principle B sentences with quantificational NP antecedent by groups 1 ($n = 4$) and 2 ($n = 15$)

Sentence type	Group 1	Group 2
Every reindeer brushed him (every reindeer brushed self)	0 (0/16)	7 (4/56)

Table 4.14

Percentage acceptance of sentences testing recovery of elided VPs and the parallelism constraint ($N = 19$)

Sentence types	% "Yes"	Grammatical
<i>Recovery of elided VP</i>		
The caveman kissed the dinosaur and Fozzie Bear did too (caveman kissed dinosaur; Fozzie Bear kissed own hand)	0	x
Ariel touched the creature and every girl did too (Ariel touched creature; every girl touched self)	21	x
<i>Structural parallelism</i>		
The Incredible Hulk brushed his hair and every Troll did too (Incredible Hulk brushed rock star's hair; every Troll brushed own hair)	3	x
<i>Referential parallelism</i>		
The lizard man lifted him and the ugly guy did too (lizard man lifted Smurf; ugly guy lifted Mickey Mouse)	21	x

Expected results: Children in both groups should produce adultlike responses to the four test sentences with quantificational antecedents. As a consequence, the behavior of group 2 children should exhibit a significant change (but that of group 1 children should exhibit no change).

Table 4.13 reports the percentage of acceptance of the bound variable reading for sentences like *Every reindeer brushed him*. As the table indicates, both groups robustly rejected this illicit interpretation of the test sentences. All 4 children in group 1 rejected it, as did 12 of the 15 children in group 2 who had accepted local coreference interpretations in sentences with a referential antecedent. The remaining 3 children made some number of errors. The change in responses for the children in group 2 was highly significant ($\chi^2 = 10.08$; $p < .005$).