

1981

## The Acquisition of Embedded Sentences and the NIC

Marianne Phinney

*Smith College / University of Massachusetts, Amherst*

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### Recommended Citation

Phinney, Marianne (1981) "The Acquisition of Embedded Sentences and the NIC," *North East Linguistics Society*: Vol. 11 , Article 19.

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## THE ACQUISITION OF EMBEDDED SENTENCES AND THE NIC

MARIANNE PHINNEY

SMITH COLLEGE/  
UNIVERSITY OF MASSACHUSETTS, AMHERST1. Introduction

In this paper I will be considering two problems in language acquisition: the development of embedded complement sentences, and one aspect of WH movement from embedded complements. The kinds of complex sentences I am concerned with are the standard tensed and infinitival complements shown in (1) and (2). I am excluding conjoined sentences and other kinds of subordinate clauses, such as when or if clauses, which need not be embedded under VP.

1. John thinks that he is a movie star.
2. Bill preferred for Harlan to build a space ship.

In examining these constructions, I am making some crucial assumptions about the relationship of linguistic theory to acquisition theory. I am assuming that detailed hypotheses about the nature of Core Grammar, the use of markedness, and analyses of the adult grammar of a particular language can and should be used to make predictions about the language acquisition process. In turn, acquisition data can be used to provide evidence concerning specific theoretical hypotheses.

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2. The problem

In this study, there are essentially two questions being asked: 1) What is the structural development of embedded sentential complements? and 2) How do children learn certain rules constraining WH Movement out of embedded clauses?

In answering the first question, I am primarily concerned with the incorporation of  $S/\bar{S}$  and COMP in the child's grammar. There are two possibilities to consider. The first is to assume that both  $S$  and  $\bar{S}$  are available in Core Grammar as potential complement structures. Given this assumption, it is also reasonable to assume that one might be the unmarked case for complements. Which one is unmarked is theory-dependent. If the theory assumes that  $\bar{S}$  is the unmarked case for all sentential structures, with a null COMP when necessary, then  $\bar{S}$  should be the unmarked case for acquisition as well. This leads to the necessity of requiring null COMPs in the earliest stages of the child's grammar, as well as predicting that  $\bar{S}$ -dependent constraints would be observed from the earliest possible stages. On the other hand, if the theory assumes that all Core Grammar structures must be instantiated by available data, then  $S$  might be available as a complement structure. If there are languages which use only  $S$  as a complement, an argument can be made for the unmarked status of  $S$  on the basis of learnability. If there are such languages, and  $\bar{S}$  were the unmarked case, a child learning a language which had only  $S$  would have no way of determining that  $\bar{S}$  is not used. There would be no evidence against the use of COMP; the child might assume that COMP is null most of the time. If  $S$  is the unmarked case, however, there will be ample evidence for  $\bar{S}$  and COMP in those languages which use them, falsifying the initial assumption of  $S$ .<sup>1</sup>

Given these two possibilities of  $S$  or  $\bar{S}$  as the unmarked case, two different predictions can be made about the development of these structures, assuming that a lexically filled COMP is a clear indication of  $\bar{S}$ . If  $\bar{S}$  is the unmarked case, one would expect to see evidence for COMP as soon as embedded sentential complements have been incorporated into the child's grammar. If  $S$  is the unmarked case, then developmental data should show the use of sentential complements without COMP first, then the development of lexical complementizers, possibly on an item by item basis, linked to individual matrix verbs.

The second question concerns the following paradigm:

3. a. Who<sub>i</sub> did Peter know  $\left[ \begin{array}{c} \bar{S} \\ S \end{array} \left[ \text{the dog bit } e_i \right] \right]$   
 b. Who<sub>i</sub> did Peter know  $\left[ \begin{array}{c} \bar{S} \\ S \end{array} \text{that } \left[ \text{the dog bit } e_i \right] \right]$
4. a. Who<sub>i</sub> did Maria think  $\left[ \begin{array}{c} \bar{S} \\ S \end{array} \left[ e_i \text{ saved the day} \right] \right]$   
 b. \*Who<sub>i</sub> did Maria think  $\left[ \begin{array}{c} \bar{S} \\ S \end{array} \text{that } \left[ e_i \text{ saved the day} \right] \right]$

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The sentences in (3) have a gap in the object position; the sentences in (4) have a gap in the subject position. Unlike (3b), however, (4b) is ungrammatical. This is unexpected on the basis of purely distributional criteria.

This is not a new problem. Perlmutter (1971) noticed it, as did Bresnan (1972, 1977). Chomsky and Lasnik (1977) ruled out (4b) with a filter which blocked a trace after a lexically filled COMP, usually referred to as the \*[that t] filter. Recently, the problem has been discussed in some detail within the government-binding framework by Chomsky (1980, in press), Pesetsky (1980), and Taraldsen (1978), for example.

Much of the recent work has tried to eliminate the \* that t filter by incorporating its functions into other, more general constraints, like the Empty Category Principle or the Nominative Island Constraint. Pesetsky's (1980) analysis rules out (4b) by means of the NIC, shown in (5).

5. [ e ] cannot be free in its minimal governing category.  
 NP nom

In this case, the minimal governing category is  $\bar{S}$ . The analysis also assumes a filter to block doubly-filled COMPs, so in (4b), the nominative trace is not bound in  $\bar{S}$ , and the sentence must be ruled out.

It is not my intention here to comment on the details of this analysis. My concern is the use of such an analysis as a part of a theory of language acquisition in a broad sense. The NIC is assumed to be a part of Core Grammar, as a condition on the rules of binding and case-marking. As such, its application in a particular language must be determined by the child from the data available to him. The NIC has been assumed to be unmarked, for the following reason. If the NIC is marked, that is, if the default case is that sentences like (4b) are grammatical, as they are in Spanish and Italian, then a child learning English will never hear the evidence necessary to indicate that the NIC does apply. If the use of the NIC is considered to be the unmarked case, a child learning English will never make errors. A child learning Spanish or Italian will hear abundant evidence which will indicate that the NIC does not apply to null anaphors, or that there are other ways to bind the WH trace in those languages, such as using Agreement (AG) (Chomsky, in press). It should be noted that a filter analysis, or an analysis which relies on Agreement, must make similar assumptions.

If the NIC is unmarked, then one should expect that children will show an awareness that (4b) is a ungrammatical sentence even in the early stages of acquisition. On the other hand, if the use of the NIC is marked, then the expectation would be that sentences like (4b) would be considered to be grammatical at the early stages, and the adult grammar would come in later.<sup>2</sup>

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There are other considerations as well. It is difficult to make claims about the acquisition or instantiation of a constraint without making claims about the child's grammar. For example, if a constraint crucially refers to  $\bar{S}$ , and a child shows evidence of violating the constraint, it may be that the child's grammar does not yet have  $\bar{S}$ . In that case, he is not violating the constraint; the constraint simply has no relevance in his grammar.

In the case of sentences (3) and (4), the child must know certain things about English to interpret them correctly. He must know that English complements are dominated by  $\bar{S}$ , and that  $\bar{S}$  is a minimal governing category for the NIC. He must be able to distinguish between [ $\pm$  Tense] sentences, and know that [ $\pm$  Tense] marks nominative case. In addition, to produce correct responses to sentences like (4b) in this study, he must know the structure of relative clauses in English, and be able to handle extraposed relatives. Ideally, to interpret the results, all of these things should be determined for each subject.

### 3. The experiment

To examine these questions, fifty children ages 3;0 to 6;6 were pretested on their production of sentences with embedded complements like those in (6) and (7).

- 6. a. The bear said that the turtle tickled the horse.
- b. The cow decided the sheep pushed the bear.
- 7. a. The bear loved for the pig to tickle him.
- b. The cow wanted the horse to kiss him.

The children were asked to imitate these sentences, and their responses were scored on the use of the complementizer. The children were then grouped according to their responses, using a cluster analysis. Group I consisted of three-year-olds, mean age 3;7. The primary response of this group was to use a simple sentence, produced by deleting a portion of the test sentence. Group II consisted primarily of four-year-olds, mean age 4;9. The primary response of this group was to repeat a two-clause sentence, omitting both complementizers. Group III consisted of both four and five year olds, mean age 5;0. These children retained that in sentences like (6a), and deleted for in sentences like (7a). They did not insert complementizers into the (b) sentences. Group IV consisted primarily of five-year-olds, with some four and six-year-olds (mean age 5;2). This group repeated both complementizers in the (a) sentences, and inserted that in sentences like (6b). (For a more detailed discussion of these results, see Phinney (1981a, 1981b)).

From these results, it appears that Group I has not yet developed the capacity to produce two-clause sentences where the

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second clause is embedded under the first. Group II can produce two-clause sentences, but no complementizers. Group III can produce sentences with that complementizers, and Group IV uses both that and for. In other words, pursuant to the discussion in the previous section, Group II shows evidence of using only S as a complement, but not  $\bar{S}$  (or is using only null COMPs), Group III is starting to use lexical COMPs, and Group IV is very consistent about using lexical COMPs in  $\bar{S}$ .

To examine the problem of the NIC, 84 children ages 3 to 10, including the fifty children who participated in the first study, were presented with questions like those in (8) and (9).

8. a. Who did the lion believe ate the hay?  
 b. Who did the horse know that swam in the pond?
9. a. Who did the bear see the cow kicked?  
 b. Who did the dog believe that the rooster kicked?

Note that (9b) can be ambiguous between a relative clause structure and a sentential complement structure; in other words, the trace of who can be either before the that or after the that. In (8b), there is only one grammatical interpretation, that of a relative clause, shown in (10); however, if the NIC did not apply, it too would be ambiguous with the alternate structure shown in (11).

10. Who<sub>i</sub> did the horse know e<sub>i</sub> [that<sub>i</sub> [e<sub>i</sub> swam in the pond? ] ]  
 $\bar{S}$   $\bar{S}$
11. Who<sub>i</sub> did the horse know [  $\bar{S}$  that [e<sub>i</sub> swam in the pond? ] ]  
 $\bar{S}$   $\bar{S}$

The test materials consisted of short stories which were designed to provide a context for the test questions. Each story had three sentences, and was accompanied by pictures. There was one picture for each sentence in the story, and the pictures were arranged on a card in the form of a comic strip. The stories were read to the child, one at a time. The child was told to look at the pictures to remember the story. After each story, the child was asked the test question. If necessary, the story was repeated once.

The stories were designed to provide a context for both a relative clause and a sentential interpretation for each question. An example is shown in Figure 1.

If the NIC did not apply in the children's grammar, it was expected that (8b) would produce primarily sentential responses, being interpreted as in (11). If the NIC did apply, it was expected that (8b) would produce the correct responses, the relative clause interpretation of (10). Even given the NIC as the unmarked case, it was expected that the responses would not show evidence for it

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until  $\bar{S}$  and COMP were established in the child's grammar as well. Given that the conditions on binding and the rules of case assignment are part of Core Grammar, the crucial phrase structures should be all that is necessary to trigger the NIC.

4. Results

The results of the second test are shown in Figure 2. It is clear that the crucial question, (8b), was not interpreted with the same success as the other three question types. There is no significant difference in the number of correct responses for questions like (8a) and (9). Although for Group I, there is some evidence of having difficulty with the (a) questions, by Group II, all three grammatical sentences are eliciting a high percentage of correct responses.

In the crucial question (8b), the problem of interpretation is evident. In Groups I through IV, the percentage of correct responses (the relative clause reading) does not differ significantly from chance. Only at the level of Grade 2 do the number of correct responses increase to a level significantly above chance ( $t_{13} = 3.64, p < .05$ ). This trend continues through Grade 4; the decrease from Grade 3 to Grade 4 is not significant.

It is useful at this point to recall the predictions concerning the NIC. The prediction was that if the NIC was unmarked, there should be evidence of its application as soon as the necessary structural conditions were met. That is, in Group IV, who show evidence of having learned or acquired  $\bar{S}$  and COMP, should show evidence of applying the constraint. If the NIC is marked, there should be a stage at which the sentential response is very high, giving the structure of (11).

The second prediction is clearly falsified. The sentential response is very low for Groups II - IV. Their most common response other than the correct relative clause response is the simple sentence response, answering a question like "Who swam in the pond?" The simple sentence response is an indication of processing overload; unable to assign a good reading to the two-clause sentence, the subjects ignore the matrix clause. Although there is an increase in sentential responses in Grade 2, it is primarily due to the decrease in simple sentence responses, and the percentage of simple sentence responses is still at or below chance (33%).

The fact that questions like (8b) do not elicit the same kinds of responses as the other questions provides support for an analysis which makes use of a condition like the NIC or the Empty Category Principle, which rules out (8b) on the basis of Core Grammar principles. Note that a more general constraint, like a Tensed Sentence constraint, can be ruled out on the basis of the results from the other questions. They are all tensed sentences, and (9b) uses a complementizer. Yet they all produce a high percentage of

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correct responses from Group II on. It cannot be a constraint against movement from the subject position; that is ruled out on the basis of (8a). It must be a constraint which refers specifically to the structure of (8b). The fact that even at the Group II level, where the subjects do not use COMP, these questions are difficult to interpret suggests that the children are aware that this question is special in some way. The fact that they do not use a sentential response (11), but instead revert to a simple sentence response, suggests that something like the NIC (or \*[that t]) is blocking the WH trace from being assigned to the subject position. However, the lack of correct syntactic structures, specifically,  $\bar{S}$ , COMP, or relative clauses, is interfering with the correct comprehension of the question.

Group IV presents a problem for a theory which assumes a strong connection between the linguistic theory and the acquisition process. These subjects have shown some competence in using both that and for complementizers. Why don't they show an increase in correct responses, instead of giving almost random responses?

There are two possible explanations. In order to give a correct response to (8b), it is necessary to have the correct structure for extraposed relative clauses. While a second test provided evidence that children in Groups II - IV could produce and interpret headed OS relatives correctly, a recent study by Flynn and Lust (1980) suggests that children do not have the correct embedded structures for relative clauses until the age of 6;6. If that is the case, they will not be able to assign an answer to (8b) until that age, because their grammar will not provide the correct structure.

The second reason concerns the learning of the "minimal governing categories" for the NIC. In order for the NIC to have meaning, the child must have the correct syntactic structure and know that  $\bar{S}$  is the minimal governing category for the NIC. It may well be that children in Group IV have learned  $\bar{S}$  and COMP, but have not yet established that  $\bar{S}$  is relevant for the NIC. If this is the case, the NIC will have little or no meaning. They may know that it is possible to apply it to (8b), but not know if it does apply or in what domain. The answer that indicates no decision is the simple sentence response.

##### 5. Summary

To summarize, the data discussed here provide evidence for a gradual development of the structure for embedded complements, beginning with a bare S or null COMP, followed by the use of that, followed by the use of both for and that and the awareness of COMP as a node, clearly indicating the use of  $\bar{S}$ . There is also evidence that children are aware of the importance of the Nominative Island Constraint in ruling out (8b) at an early stage (Group II). While there is evidence for the use of the constraint from the early stages, the correct interpretation of (8b) does not occur until



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Grade 2, around the age of six and a half to seven years. This coincides with data on relative clause acquisition discussed by Flynn and Lust (1980), and is probably due to the complex nature of the correct interpretation, which requires an extraposed relative clause structure (Phinney 1981b).

In the study discussed here, it was shown that a detailed linguistic hypothesis can lead to specific and subtle predictions about the language acquisition process. In turn, these predictions can be tested and the data used to provide evidence for the direction of linguistic theory. It is important to note that the conditions discussed here are part of Core Grammar; as such, one would expect the constructions which are involved to be acquired quickly, with a minimum of errors. None of the subjects ever assign the expected incorrect interpretation (sentential) to (8b); it is always treated as an anomalous sentence, until the subjects have the linguistic and cognitive capacity to assign the correct interpretation. This early awareness of the ungrammaticality of (8b) is clear support for the proposed linguistic framework and the supposition of a strong connection between the linguistic model and the acquisition device.

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## FOOTNOTES

The research presented here was conducted as part of my doctoral dissertation, presented in Phinney (1981b). I would like to acknowledge the helpful comments of Chuck Clifton, Jill deVilliers, Lyn Frazier, Alec Marantz, Yukio Otsu, David Pesetsky, Tom Roeper, and Edwin Williams. All errors are my own responsibility.

<sup>1</sup>Both of these hypotheses are difficult to verify with empirical data, and the study discussed here does not provide evidence for choosing between them. It is conceivable that carefully designed testing might determine if there is a difference between  $\bar{S}$  with a null COMP and S; however, production or imitation data will not be of help in this issue.

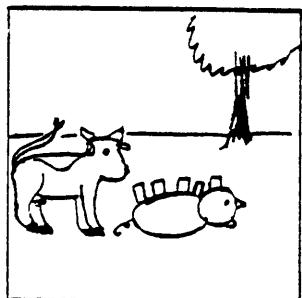
<sup>2</sup>Although there are different accounts of these phenomena, including utilizing Agreement and subsuming the NIC under the Empty Category Principle, it is important to note that the data presented here fit these accounts equally well, and must, if these alternate proposals are to have any validity. To fully evaluate the differences between competing hypotheses, much more detailed testing would be necessary, which is beyond the scope of this study.

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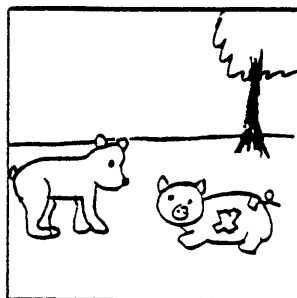
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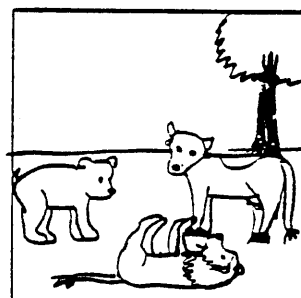
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When the bear was away,  
the cow pushed the pig.



When the bear saw  
the pig, he was all  
black and blue.



Today, the cow pushed  
the lion down in front  
of the bear.

Who did the bear see that the cow pushed?

Responses: Simple S - pig and lion  
Sentential - lion  
Relative clause - pig

Figure 1. Sample story and possible responses.

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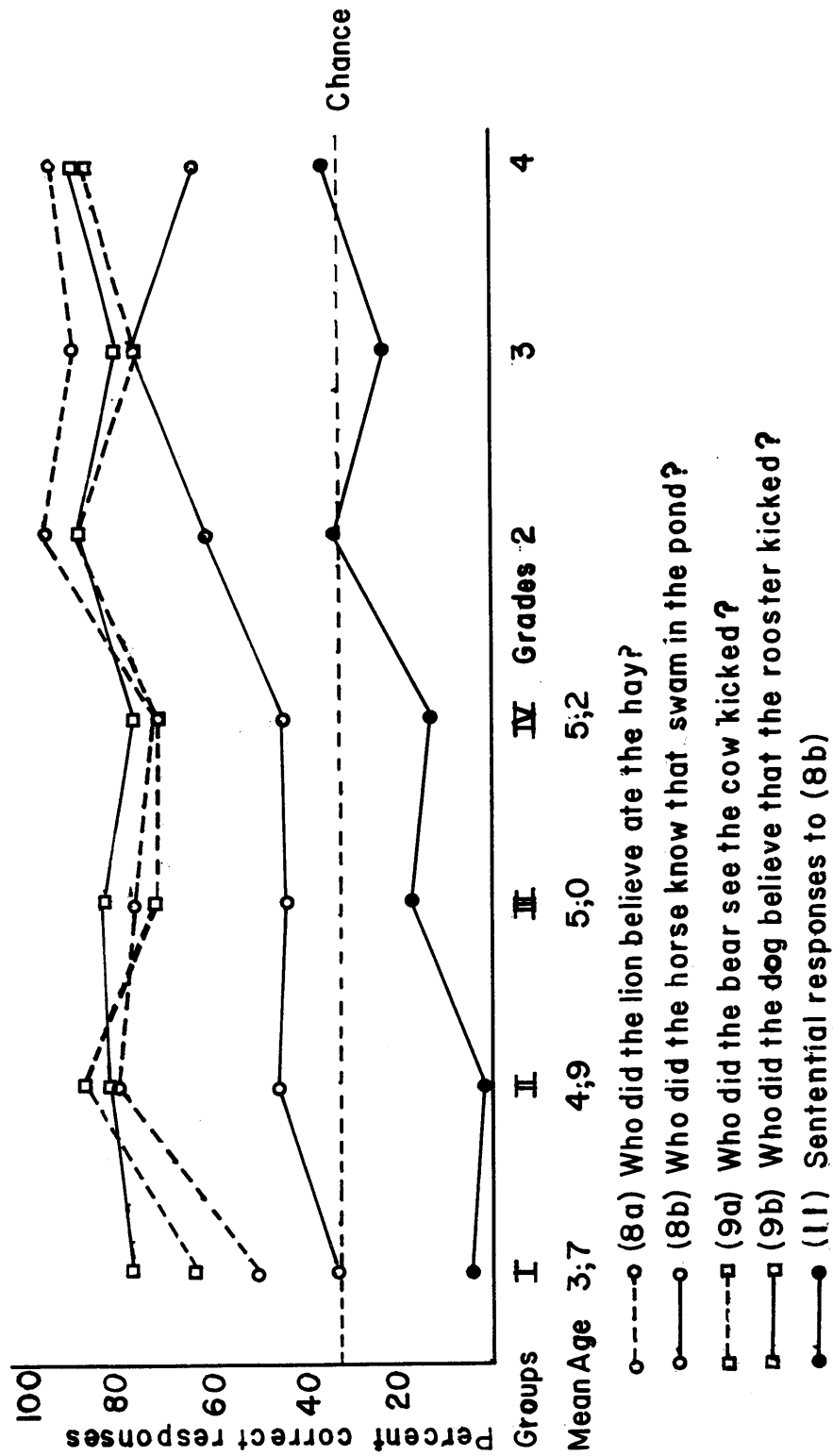


Figure 2. Percentage of correct responses to WH questions and percentage of sentential responses to (8b).