Children's Misinterpretation of OS-relatives
The VP-attachment Analysis*

Mari Takahashi

I. Introduction

Each of the sentences below contains a restrictive relative clause which has a gap in the subject position and whose antecedent is either the object of the matrix sentence ((1) a.) or the object of the preposition in the matrix VP ((1) b.).

(1) a. The dog hits the cat that kisses the pig. (OS-A)
b. The dog stands on the cat that kisses the pig. (OS-B)

Such sentences have been called 'OS relatives' in the language acquisition literature. We shall further classify them into type A OS relative ((1) a.) and type B OS relative ((1) b.).

Many previous experimental studies, such as Sheldon (1974), Tavakolian (1978), Solan and Roeper (1978), and Otsu (1981) report that young English speaking children commit similar errors in interpreting OS relatives. That is, they interpret the subject of the matrix sentence to be coreferential with the missing subject of the relative clause. Solan and Roeper (1978) claim that this is the result of a structural misanalysis of the construction, in which the relative clause is attached to the root S node. This 'S-attachment' theory has generally been accepted to be the explanation for children's misinterpretation of OS relatives. In opposition to this view, we will argue in this paper that this phenomenon is best explained by our 'VP-attachment' theory.

II. Assumptions

There are a number of assumptions behind our argument. We assume that children who have begun to acquire OS relatives already possess the knowledge of items listed in (2).

(2) ① structure dependency of grammar
② strict subcategorization frames of lexical items
③ $\overline{X}$-theory
④ modifiers are Chomsky-adjoined to their heads
⑤ no tangle constraint (Solan and Roeper (1978)):
Branches of a syntactic tree may not cross.
⑥ c-command constraint on control (CCC) (Goodluck (1978)):
A controller must c-command[1] the empty category[2].
⑦ minimal distance principle (MDP) (Goodluck (1978)):[3]
Select the NP as the controller when the number of intervening nodes between the NP and the empty category is lesser than in the case of all other possible controllers.

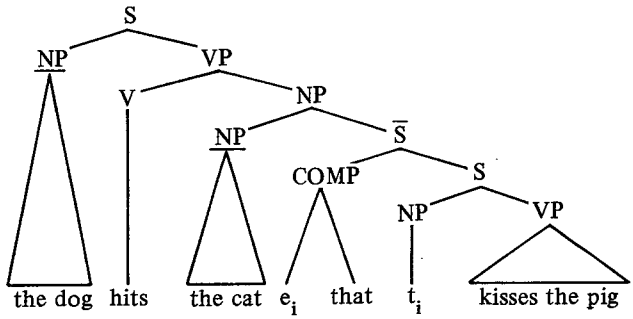
We are assuming that children obey the c-command constraint on control (henceforth CCC) even when they make some structural misanalysis of a construction. When there is more than one possible controller for the empty category, one of them will be chosen by the minimal distance principle (henceforth MDP).

We do not have enough space to state the reason behind each of these assumptions. Let us just point out that except for (2) ②, the knowledge of items in (2) cannot be attributed to instruction by adults or induction on the part of the children in the process of first language acquisition. It can be reduced from this that they are part of the UG, the innate endowment which makes the acquisition of human language possible.[4] If they are innate, chances are that children can use them from a very early stage of language development. We believe that the acquisition of relative clauses and other complex constructions would not be possible without these information.

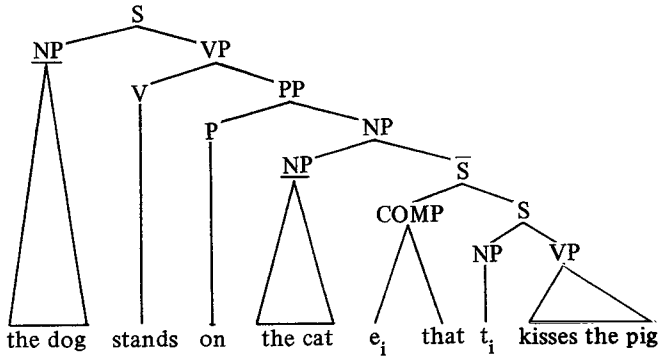
III. Prediction for the Controller Selection

The two types of OS relatives are usually assigned the following structures in adult grammar.[5]

(3) a. OS-A:



b. OS-B:

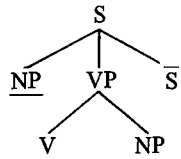


Observe in (3) that the relative clauses ($\bar{S}$) are Chomsky-adjoined to the NPs they modify. We will call this the 'NP-attachment' analysis. In (3) a., both of the two NPs in the matrix sentence c-command the empty category (e_i) in COMP. Therefore, both of them are possible controllers of e_i by the CCC. The object NP, however, c-commands e_i more directly than the subject NP. Therefore, the MDP selects the object NP as the controller of e_i. This means that t_i in the empty subject position of the relative clause, which is the trace of e_i, will also be coreferential with the object NP. The controller of e_i in (3) b. would be selected in the same manner. Thus, if the adult NP-attachment analysis is mastered, the matrix object in the case of OS-A and the object of the preposition in the matrix VP in the case of OS-B, would be interpreted to be coreferential with the empty subject of the relative clause. This will be referred to as the 'object control' interpretation.

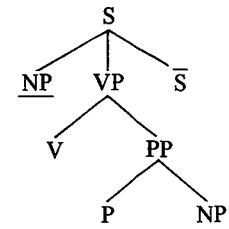
Children's consistent misinterpretation of OS relatives indicates that they have not yet mastered the NP-attachment analysis. As mentioned

above, the generally accepted view has been that they misanalyze the relative clause to be attached to the root S node. By this S-attachment theory, children's structural analysis of OS relatives will be as follows.

(4) a. OS-A:



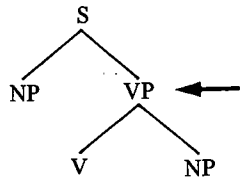
b. OS-B:



We can see in (4) a. and b. that the matrix subject is the only NP that can c-command items in the relative clause ($\overline{S}$). Therefore, the S-attachment theory predicts subject control interpretation for both OS-A and OS-B.

There is one other place to which the relative clause could be attached, namely, the matrix VP node.

(5)

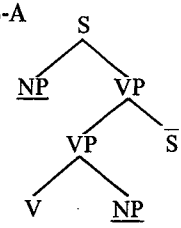


We claim that this is indeed what the children who misinterpret OS relatives are doing. On the assumption that children's knowledge of the subcategorization frame of the matrix verb would lead them to conclude that the relative clause is a modifier, hence must be Chomsky-adjoined to its head[6], we shall formulate out 'VP-attachment' theory as follows:

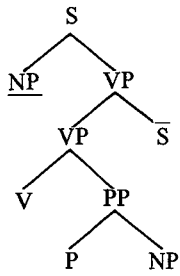
(6) Young English speaking children misanalyze the relative clause in OS relatives to be Chomsky-adjoined to the matrix VP node for a period before they master the correct NP-attachment analysis.

The structure assigned to the two types of OS relatives by the VP-attachment theory would be as in (7).

(7) a. OS-A



b. OS-B:



In (7) a., both the matrix subject and object c-command items dominated by $\overline{S}$. Therefore, both of them are possible controllers of the empty category in the relative clause. Here, the MDP cannot choose between them, for the number of nodes intervening between the two NPs and the $\overline{S}$ is the same. Thus, the VP-attachment theory permits both subject control and object control for OS-A. In (7) b., the matrix subject is the only NP that can c-command items dominated by $\overline{S}$. Therefore, subject control is predicted for OS-B.

The predictions of the three theories are summarized in Table 1.

Table 1 Controller Selection of the Three Theories

	S-attachment	VP-attachment	NP-attachment (adult)
OS-A	a. subject control	c. subject control object control	e. object control
OS-B	b. subject control	d. subject control	f. object control

In order to find out which of these three theories best describes young children's competence, both OS-A and OS-B must be included in the body of test sentences. Furthermore, it is necessary to examine which NP is interpreted to be coreferential with the empty subject of the relative clause separately for OS-A and OS-B. And this data is required for each individual subject. None of the researches up to date has taken all these points into consideration. Consequently, the array of experimental results reported is somewhat elusive.

IV. S-attachment vs. VP-attachment

In this section, we will take up two previous experiments whose results have been considered to be supporting evidence for the S-attachment theory. We will show that the VP-attachment theory offers a better explanation for their results.

4-1 Tavakolian (1978)

Tavakolian administered toy-manipulation[7] experiments to 24 children ranging in age from 3 to 5 years. Samples of her OS relative test sentences are given in (8).

(8) a. The lion hits the duck that knocks down the pig. (OS-A)
b. The lion stands on the duck that bumps into the pig. (OS-B)

The matrix verbs were varied among the eight listed below.

(9) ① hit, kiss (→OS-A)
② knock down, stand on, bump into
walk around, jump over, ?[8] (→OS-B)

The results she obtained are given in Table 2. Table 2 shows that in 63 percent of the total number of responses, the matrix subject was interpreted to be coreferential with the missing subject of the relative clause.

Table 2 Distribution of Responses to OS relatives

response type	subject control	object control	others
percentage	63%	19%	18%

As Solan and Roeper (1978) point out, this result can be explained by the S-attachment theory. This theory predicts subject control for both types of OS relatives. (cf. column a. and b. of Table 1) Thus, the 63 percent subject control interpretation may be attributed to S-attachment misanalysis, the 19 percent object control interpretation can be explained to be those of children who have mastered the NP-attachment analysis.

This experimental result, however, can also be explained by the VP-attachment theory. At least 63 percent (5/8) of the test sentences used by Tavakolian were OS-B. (cf. (8)) The prediction of the VP-attachment theory for OS-B was subject control. (cf. column d. of table 1) This goes very well with the results obtained, in which subject control interpretation amounted to 63 percent. The 19 percent object control responses may have been those of children who had mastered the NP-attachment analysis. Or, they may have been the responses of children who were still at the VP-attachment stage to OS-A. Tavakolian's way of processing her data, as far as we can see, does not make this distinction explicit. In either case, the development from VP-attachment to NP-attachment can explain every aspect of her experimental results.

4.2 Solan and Roeper (1978)

Solan and Roeper tested children's comprehension of the following four types of sentences using a toy-manipulation[7] task.

(10) a. OS relative with *put* as the matrix verb (OS-A)
b. OO relative [9] with *put* as the matrix verb
c. OS relative with *push* as the matrix verb (OS-A)
d. OO relative with *push* as the matrix verb

The examples of the test sentences are:

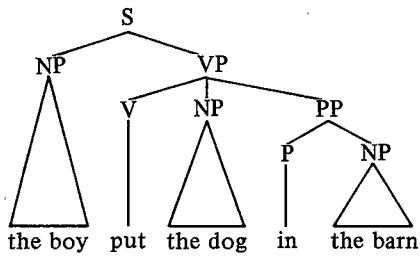
(11) a. The boy put the dog that kicked the horse in the barn.
b. The boy put the dog that the horse kicked in the barn.
c. The boy pushed the dog that kicked the horse.
d. The boy pushed the dog that the horse kicked.

They selected these constructions as test sentences because the difference in the subcategorization frames of *put* and *push* were expected to affect children's responses in an interesting way, which would reveal important aspects of their competence.

(12) a. *put*: +V, [__NP __Locative PP]
b. *push*: +V, [___ NP]

Test subjects were 30 children between 4 and 6 years of age. It was made sure that all these children knew that the verb *put* subcategorized for both an NP and a locative PP. This means that they would assign the following structure to a sentence with *put* as the main verb.

(13)



Note in (13) that the locative PP is a sister of the matrix verb. 20 test sentences were given to each subject. Thus, there were a total of 300 responses to *put* sentences, and 300 responses to *push* sentences. Of these, 53 (18%) of the *put*, and 63 (21%) of the *push* responses were incorrect. Table 3 shows the figures for the two most prominent mistakes.

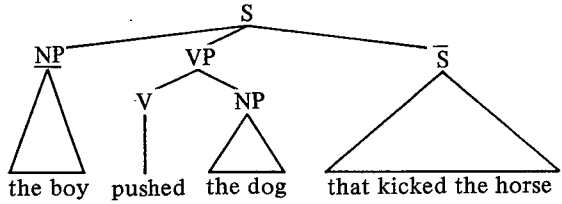
Table 3	subject control misinterpretation	failure to interpret the relative clause
put sentences	0 (0)	42 (14)
push sentences	40 (9)	6 (2)

Numbers in parentheses indicate the number of children responsible for each type of error.

In Table 3, we can see that the 9 children who gave subject control reading to 44 percent (44/90) of the *push* sentences never did so with *put* sentences. They either switched to object control reading or failed to interpret the relative clause altogether, the latter being the more common case.

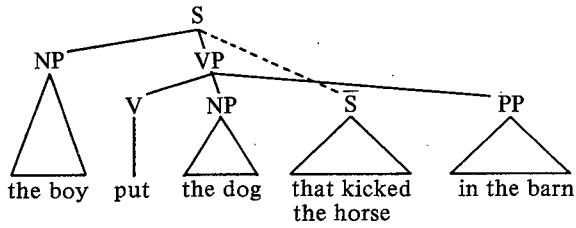
Solan and Roeper explain this phenomenon as follows: These 9 children sometimes analyzed the relative clause to be attached to the root S node. This was the cause of their occasional (44%) subject control interpretation to *push* sentences. See (14) for illustration.

(14) OS-A:



But they could not attach the relative clause to the root S node in the case of *put* sentences, because if they did, they would be violating the no tangle constraint. ((2) ⑤) Observe in (15) that the existence of the PP as a sister of the matrix verb would cause the branches of the tree to cross.

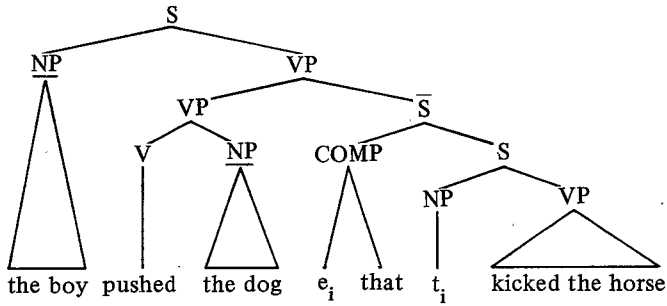
(15)



Solan and Roeper suppose that since the S-attachment of the relative clause would lead to the violation of a rule which children can be assumed to obey, their experimental result can be taken as one of the arguments for the S-attachment analysis in child grammar. This, however, is not necessarily the only analysis that accounts for the above point.

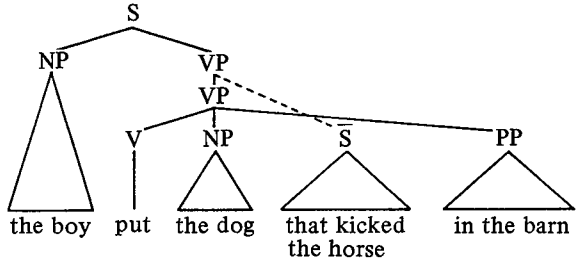
Their experimental result can also be explained by the theory of VP-attachment. The 9 children may have been Chomsky-adjoining the relative clause to the matrix VP node, assigning the following structure to *push* sentences as a result.

(16) OS-A:



In (16), both the subject and the object NPs are possible controllers of e_i, hence its trace t_i. This explains why these constructions were given occasional subject control reading. If these children tried out the same analysis for *put* sentences, they would encounter difficulties with the no tangle constraint. See the tree below for the illustration of this point.

(17)



Here again, the lines in the tree would cross. Therefore, the VP-attachment theory could also explain why the 9 children failed to interpret the relative clauses most of the time in the case of *put* sentences.

It seems to us that the VP-attachment theory is better as an explanation for Solan and Roeper's experimental result. In proposing the S-attachment theory, they had to claim that children who have not mastered the NP-attachment analysis optionally attached the relative clause to the root S node. But it is not clear from their argument why the children who could sometimes attach the relative clause to the NP were unable to do so at other times. The VP-attachment theory, on the other hand, offers quite a natural explanation for this point, since the coexistence of subject control and object control interpretation was the very prediction of this theory. (cf. column c. of Table 1)

V. Conclusion

We have shown in the preceding section that the VP-attachment theory explains children's misinterpretation of OS relatives even more effectively than the S-attachment theory. In concluding this paper, we would like to call your attention to another phenomenon that motivates our preference for the VP-attachment theory.

Goodluck (1978) and Hsu (1981) report that many children give object control reading to sentences such as the following.

(18) a. The lion hits the bear in order PRO to climb up the ladder.
b. The boy hits the girl after PRO jumping over the fence.

In the adult grammar, the adverbials are considered to be attached to the root S node. In this analysis, the matrix subject is the only possible controller of PRO, given the CCC. Children's misinterpretation of these constructions can only be explained if we posit that they are attaching the adverbials to the VP node.

If children's VP-attachment misanalysis does not rest in OS relatives but extends to sentences containing adverbials as well, it may be possible to explain children's behavior uniformly by the following theory:

(19) There is a stage in early language development in which children interpret all sentence final embedded clauses that function as modifiers to be modifying the matrix VP and analyze them to be Chomsky-adjoined to the VP node.

This theory has the scope that the S-attachment analysis of OS relatives does not have. Although we must admit that this idea is rather speculative, we believe that the possibility for the VP-attachment stage is well worth exploring.

NOTES

* The line of research presented in the paper was suggested to me by Taisuke Nishigauchi.

1) For the definition of c-command, cf. Chomsky (1981).
2) Empty category here means either the PRO or the empty element e in the COMP of the relative clause whose status is not yet quite clear.
3) This is our interpretation of Goodluck's (1978).
4) We are adopting Chomsky's model of language acquisition. cf. Chomsky (1965), (1975), and (1980).
5) The framework of grammar description we are adopting is the so-called 'revised extended standard theory' of the generative grammar.
6) This follows from our assumptions, (2) ② and ④.
7) This is a method often used to investigate children's comprehension of sentences. First, the experimenter reads the test sentence to the subject. The subject is then asked to act out the event described in the sentence with toys. The experimenter thereby judges the subject's interpretation of the sentence.
8) Tavakolian (1978) does not report what the remaining one verb had been.
9) OO relatives are those that has a gap in the object position and whose antecedent is the matrix object.

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