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Phillips, Pauline

University of Calgary

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THE ACQUISITION OF CONTROL

Pauline Phillips

INTRODUCTION

This paper will report on some research that was undertaken to investigate the acquisition of control; that is, the way in which children formulate rules to interpret the subject of embedded infinitival clauses. The study had two major goals. One was to determine whether or not there are stages in the acquisition of control and to propose certain principles which would account for these stages. A second goal was to examine the acquisition of control in connection with the predictions made by the Theory of Markedness.

In most languages of the world the indirect object of a transitive verb is the controller of the complement subject. The following English sentence illustrates the unmarked rule.

(1) John_i gave Bill_j the book PRO_j to read.

In (1), in accordance with the Theory of Government and Binding (Chomsky 1981), PRO corresponds to a null or phonetically unrealized pronoun. Interpretive rules coindex PRO with the NP that is its antecedent, in this case Bill, the indirect object. Bill is called the controller of PRO.

In English the verb promise is considered marked because it represents an exception to the general rule that the indirect object is the controller of PRO, as is shown in (2).

(2) John_i promised Bill PRO_j to go.

In (2) John_i, the subject, and not the indirect object, Bill, is the controller of PRO. Similarly, in order to clauses with an indirect object in the main clause also represent an exception.

(3) John_i gave Bob a present in order PRO_j to please his friend.

In (3) John_i, the subject, is the controller of PRO rather than Bob, the indirect object. According to the theory of markedness (Chomsky 1982:8) the prediction is that control will be acquired later in sentences which contain the verb promise (followed by an

infinitival clause) and in order to clauses than in sentences in which the indirect object is the controller of PRO.

PREVIOUS STUDIES

Chomsky (1969)

There have been a number of studies on the child's comprehension of complement clauses. The earliest study was done by Carol Chomsky (1969), who examined sentences like (4) and (5).

(4) John told Bill_i [PRO_i to leave].

(5) John persuaded Bill_i [PRO_i to leave].

In both of these sentences Bill is the controller of PRO. Chomsky proposed that children initially use the general rule for English paraphrased in (6).

- (6) The Minimum Distance Principle (MDP)
The implicit subject of the complement verb (i.e. PRO) corresponds to the NP most closely preceding it. (Chomsky 1969:10)

Sentences with the verb promise constitute a counterexample to the MDP since the closest NP is NOT the controller of PRO.

(7) John promised Bill_i [PRO_i to leave].

Chomsky hypothesized that sentences (4) and (5) would be learned first and (7) would be learned later. Her predictions were subsequently confirmed in her experiments.

Maratsos (1974)

Michael Maratsos (1974) also conducted an important study on how preschool children understand missing complement subjects. He proposed that rather than basing their responses on the MDP, children may be aware of the Semantic Role Principle (SRP).

- (8) The Semantic Role Principle
PRO is controlled by the goal NP in the matrix clause. (Maratsos 1974:701)

Consider (9).

(9) John told Bill_i PRO_i to leave.

In (9) Bill is the goal of the order--that is, he is the person toward whom the order is directed. John is the source--the actor from whom the order originates. For most verbs of speaking, such as tell, advise, require, beg, order, command, persuade, it is

the goal of the speaking action that is the controller of PRO. Promise is the exception to this generalization--the source of the promise supplies the complement subject reference and not the goal.

Maratsos used passive sentences such as (10) to test the use of the SRP as opposed to the MDP.

(10) John_i was told by Bill PRO_i to leave.

In (10), the MDP would predict that Bill would be interpreted as the controller of PRO. In contrast, The SRP would predict John would be identified as the controller since it expresses the goal.

Maratsos concludes that the results from his experiment clearly favor the SRP rather than the MDP. Children appear to formulate rules to interpret PRO in terms of semantic relations such as goal rather than on a straight linear order principle which is the basis for the MDP.

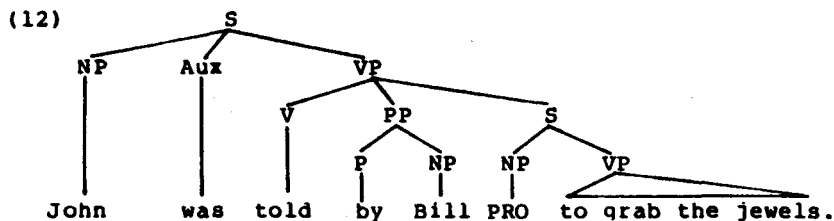
Goodluck (1981)

Helen Goodluck (1981) has suggested that there may be another explanation for Maratsos' results. She proposes that children know the C-Command Constraint on Control (see(11)) and that they do not base their interpretation on semantic roles such as goal.

(11) The C-Command Constraint on Control¹

A controller must c-command PRO.

The C-Command Constraint accounts for the fact that Bill is not a possible controller in the following example.



Bill does not c-command PRO since the first branching node (PP) above it does not dominate the complement clause.

Goodluck designed two experiments to investigate the presence of C-Command Constraint on Control in children's grammar. She included sentences which contain a passive by-phrase as in

(13) as well as sentences which included an in order to clause as in (14) and (15).

(13) John_i was told by Bill_j PRO_i to grab the jewels.

(14) Daisy_i hits Pluto PRO_i to put on the watch.

(15) Daisy_i stands near Pluto PRO_i to do a somersault.

Goodluck claims that her predictions are validated by the results. When there was a direct object in the matrix verb phrase as in (14), object control was overgeneralized but when the NP in the matrix VP was the object of a locative PP as in (15) or a passive by-phrase as in (13), the children opted for subject control.

Unfortunately for Goodluck's proposal, there are some well known counterexamples to the C-Command Constraint on Control. Sentences in which PRO is controlled by the indirect object represent one obvious exception as can be shown in (16).

(16) Bert gave a bike to Ernie PRO to ride.

In this sentence Ernie is the controller of PRO even though it is embedded in a PP and hence does not c-command the infinitival clause.

Another type of counterexample involves cases such as (17).

(17) He $\left\{ \begin{array}{l} \text{pleaded with} \\ \text{yelled at} \\ \text{shouted to} \\ \text{counted on} \end{array} \right\}$ the boys_i [PRO_i to leave].

Goodluck (1981:161) mentions a counterexample similar to the above (rely on), but unfortunately does not discuss how such forms fit into her theory.

The final counterexample has to do with the by-phrase in passive structures. O'Grady (1982) has noted that in the passives of in order to clauses the agentive phrase can be the controller of PRO. He gives the following examples.

(18) a. The mansion was built by John_i [(in order) PRO_i to impress the neighbors].

b. The money for the hospital was donated by John_i (in order) [PRO_i to placate the local medical association].

Thus there appear to be some serious problems with Goodluck's proposal.

Tavakolian (1978)

Susan Tavakolian (1978) also designed an experiment to test children's understanding of sentences with verbal complements. She proposed that when children are uncertain about the structure of a multiple clause sentence, they attempt to parse it as though it consisted of conjoined simple sentences. Under Tavakolian's explanation, a sentence such as (19) would be interpreted as (20).

(19) The lion tells the pig to stand on the horse.

(20) [The lion tells the pig] and [the lion stands on the horse].

This interpretation is a result of a strategy used by children called the Conjoined Clause Analysis which is defined in (21).

(21) The Conjoined Clause Analysis
The missing subject of the second conjunct corresponds to the subject of the first conjunct.

Tavakolian designed an experiment in which she studied children's responses to the complements of tell and promise.

(22) The horse tells the pig_i PRO_i to bump into the sheep.

(23) The horse_i promises the pig PRO_i to bump into the sheep.

From her results, Tavakolian identifies three stages of development in the child's comprehension of verbal complements. In Stage I children use the Conjoined Clause Analysis in which the subject of the second clause is considered to be coreferential with the subject of the first clause. Children interpret promise sentences correctly because the Conjoined Clause Analysis provides the correct interpretation. In Stage II the child correctly interprets tell complements but incorrectly interprets promise complements. At this stage children identify a semantically based class of verbs whose members (including tell) have indirect object control. However, they do not identify promise, which is a member of this general semantic class of verbs of speaking, as an exception to the general control rule. In the final stage the child has an essentially adult grammar.

Though it appears that a linear principle such as the MDP is operating in the choice of the complement subject, especially at Stage II, Tavakolian proposes that children learn the lexical features of the verb which determines the complement subject chosen. If the MDP were a productive strategy, it would be expected that the child would overgeneralize from (24) to (25) at some stage.

(24) The lion tells the pig_i[PRO_i to stand on the horse].

(25) The lion_i jumps over the pig [PRO_i to stand on the horse]

If children do not overgeneralize the MDP to sentences such as (25), then it is possible that they are using a strategy which is the result of their knowledge of the properties of the individual lexical items. Thus it is possible that children come to know that some verbs (for example, tell but not jump) take infinitival complements, that the goal is the controller, and so on.

To test her hypothesis that children are using their knowledge of the lexical properties of the matrix verb instead of the MDP, Tavakolian designed an experiment which included in order to clauses with a PP in the matrix clause as in (25) above. An adult response would interpret the subject as the controller of the in order to clause and 89% of the sentences were interpreted in this way by the children. These results indicate that children do not overgeneralize the MDP to sentences containing an in order to clause. Children who gave an indirect object control response to the sentences in which tell was the matrix verb in Experiment 1, gave a subject control response to the sentences in Experiment 2.

In conclusion, Tavakolian proposes that her study has presented evidence to support the hypothesis that children initially analyze complex sentences as conjoined simple sentences and interpret the missing subject of the second sentence as coreferential with the subject of the first clause. Another important suggestion that has emerged from this study is that children may not be using the MDP to interpret complement subjects but instead may be accessing their knowledge of the lexical-semantic entries of the matrix verb.

SOME NEW EXPERIMENTS

One area in which there has been little or no research to this point involves the acquisition of control in different types of infinitival complement clauses. In this study I investigated the acquisition of control in three types of embedded clauses -- purpose clauses, in order to clauses and complement clauses. Before describing the experiment itself, I will outline the characteristics of these three types of infinitival clauses.

Purpose Clauses and In Order To Clauses

The syntax and semantics of English purpose clauses have been described by Robert Faraci (1974) and Emmon Bach (1982). An example of a sentence containing a purpose clause is given in (26).

(26) I_i bought a book [PRO_i to give ____ to my children.]

The infinitival clause exhibits two gaps. There is a gap in the subject position of the infinitival clause which corresponds to PRO and there is a gap in the object position. The second gap does not have to occur in the direct object position. In (27), for example, it occurs after a preposition.

(27) I bought Harry a hammer to hit nails with ____.

Purpose clauses can be distinguished from in order to clauses in a number of ways. Firstly, in order to clauses do not exhibit a 'non-subject' gap, as shown in the following sentences.

(28) He bought a piano [(in order) PRO to please his grandmother].

(29) *He bought Mary a piano [(in order) PRO to please ____.]

Secondly, in order to clauses can be preposed while purpose clauses cannot.

(30) [(In order) PRO to please his grandmother] he bought a piano.

(31) *[PRO to give to my children], I bought a book.

This contrast stems from the fact that in order to clauses are thought to be attached to the higher S whereas purpose clauses are generated as complements inside the VP. It has been argued that only phrases outside the VP can be preposed to the beginning of the sentence (Chomsky 1965:102).

Thirdly, purpose clauses are future oriented with respect to the time of the matrix clause. This is not necessarily the case with in order to clauses, as the following sentences illustrate.

(32) I bought it [(in order) PRO to use up my money].

(33) I bought it [PRO to give ____ to my sister].

In (32) the time of buying and using up the money are identical. In (33) the time of giving occurs after the time of buying.

Faraci (1974:36) notes that the purpose clause is associated much more closely with the matrix VP than is the case with an in order to clause. A purpose clause defines the function of the matrix object whereas an in order to clause defines the reason for the subject's action. Thus in (32) the in order to clause defines the subject's reason for the purchase, while in (33) the purpose clause indicates what is going to be done with the object. When both an in order to clause and a purpose clause

occur in the same sentence, the purpose clause must always precede the in order to clause.

- (34) John bought a present [PRO to give to Bill] [in order to please his friend].

A final syntactic property of purpose clauses which I would like to address relates to the restrictions on the choice of the matrix verb. Both Emmon Bach (1982:38) and Robert Faraci (1974:35) have identified five types of verbs that are compatible with purpose clauses. These include:

- I. Have, be (in the sense of 'in a place, on hand, available, at one's disposal'). For example:

(35) He is a hard person [PRO to talk to ____].
(36) I have a book [PRO to read ____].
- II. Transitive verbs involving continuance or change in the state of affairs.

(37) We keep a fire extinguisher [PRO to use ____ in case of fire].
- III. Verbs of choice and use.

(38) John chose an orange [PRO to eat ____].
- IV. Predicates of transaction such as give, buy, sell, take, steal, borrow and lend.
- V. Verbs of creation such as build, construct, devise, and make.

The next point which must be addressed relates to how PRO is interpreted in purpose clauses and in order to clauses. In purpose clauses, the controller corresponds to the matrix indirect object, if there is one, and to the matrix subject otherwise. In order to clauses are always subject controlled. This follows from the fact that in order to clauses are semantically much more closely related to the nature of the subject's action. This is evident in (39).

- (39) Ernie chose a chair near Bert in order [PRO to talk to his friend].

Complement Clauses

Another type of infinitival clause was included in the study, namely complements of argument verbs and complements of prepositional verbs, which I will call complement clauses. Control in complement clauses is determined by the properties of the matrix verb.

Argument verbs, sometimes called 'verbs of speaking' or 'communication verbs', are those which allow a subject or an indirect object to assign control. Thus verbs like tell and persuade assign the indirect object NP as the controller of PRO whereas a verb such as promise, in contrast, assigns the subject as controller.

Quite a different class of control verbs (which I will call prepositional verbs) are exemplified in (40).

- (40) He $\left. \begin{array}{l} \text{pleaded with} \\ \text{shouted to} \\ \text{counted on} \\ \text{yelled at} \end{array} \right\}$ the boys_i; [PRO_i to leave].

In this example an NP embedded in a PP serves as the controller even though it is not a syntactic argument (subject or indirect object) or the verb.

O'Grady (1985) has made an interesting proposal to deal with the sentences in (40). He has noted that the controller for PRO must be a thematic dependent of the matrix verb. A thematic dependent is defined as follows:

- (41) An NP is a thematic dependent of the word which assigns it a thematic role (e.g. agent, patient, goal, etc.).

Subjects and objects are prototypical thematic dependents of a verb. Thus run assigns the agent role to its subject while hit would mark its subject as agent and the object as patient. NPs which appear as objects of a preposition are typically thematic dependents of that preposition. In the following sentence, near assigns a thematic role of 'location' to its object.

- (42) Harry sat near the window.

However, some prepositions do not determine the thematic role of the NP which they govern. Consider sentence (43).

- (43) Harry pleaded with the boys.

The NP the boys in (43) does not receive an instrumental role that is usually assigned by with but instead, the role of 'addressee', which must come from a verb of speaking. Thus O'Grady claims that it is the verb plead and not the preposition which assigns a thematic role to the NP the boys in (43). This proposal seems to apply to all of the sentences in (40) since the NP the boys receives its role from the verb. This, in turn, predicts that these NPs should be able to function as controller of PRO. This is just what happens in (40).

Prepositional verbs were included in my study to see whether or not the children subconsciously know that a thematic dependent

of the verb following a preposition is a possible controller of PRO.

CONTROL AND THE THEORY OF MARKEDNESS

In the introduction, I mentioned that in current linguistic theory there are some structures that are considered to be unmarked and some which are marked. Rules which conform to the general principles of the language are considered unmarked and rules which go against the general trend are considered marked and hence exceptional. There are two structures which appear to be marked in the sentences which will be used in this experiment. The first one was noted by Carol Chomsky (1969:4). She proposed that sentences with the verb promise represent an exception to the general pattern of the language in that, as opposed to the majority of verbs of speaking (such as tell) which take a subject and an indirect object, the subject is the controller of PRO.

Another structure which I consider marked is the following.

(44) Ernie_i gave his robot to Bert [in order PRO_i to please his friend].

In (44) the matrix sentence has a subject and an indirect object, both of which are thematic dependents of the verb. In the unmarked case, the indirect object would be the controller of PRO as in the following purpose clause.

(45) Ernie gave a book to Bert_i [PRO_i to read].

In (44), however, the subject is the controller. In the unmarked case (45), the goal is the controller of PRO while in (44) the source (Ernie) is the controller.

The prediction with respect to sentences with promise and in order to complements such as (44) is that since they represent the marked case, they will be acquired later.

THE EXPERIMENT

The Sentence Types

Five types of purpose clauses were used in the experiment, three of which required the subject of the matrix sentence to be the controller of PRO (I to III below) and two of which exhibited indirect object control (IV and V below).

(46) Type I: Active matrix sentence with a post-verbal prepositional phrase.

Bert_i put a book near Grover [PRO_i to read
_____ later].

(47) Type II: Active matrix sentence with a post-verbal genitive NP preceding the infinitival clause.

Grover_i grabbed Ernie's ball [PRO_i to play with ____].

(48) Type III: Passive matrix sentence followed by a purpose clause.

Bert_i was given the robot by Grover [PRO_i to look at ____ later].

(49) Type IV: Active matrix sentence that included a direct object and an external indirect object (an indirect object introduced by the preposition to).

Ernie gave Garfield to Bert_i [PRO_i to play with ____ later].

(50) Type V: Active matrix sentence with an internal indirect object (an indirect object without the preposition to).

Mary gave Barbie_i Snoopy [PRO_i to play with ____ later].

Two types of subject control in order to clauses were also included among the test sentences.

(51) Type VI: Active matrix sentence with an external indirect object.

Bert_i gave his robot to Ernie [in order PRO_i to please his friend].

(52) Type VII: Active matrix sentence with a post-verbal locative PP.

Ernie_i used a crayon beside Grover [in order PRO_i to draw a picture].

Type VI sentences contrast with Type IV purpose clauses in which the external indirect object is the controller of PRO. In Type VII sentences, the NP in the prepositional phrase is not a potential controller at all, presumably because it is not a thematic dependent of the verb.

Finally, the test sentences included complement clauses with two types of matrix verbs. Type VIII sentences had a prepositional verb in the matrix sentence.

- (53) Type VIII: Active matrix sentence with a prepositional verb.

In contrast Type IX sentences had an argument verb, with both a subject and an indirect object NP in the matrix clause. In these sentences, control is determined by the lexical properties of the matrix verb.

- (54) Type IX: Active matrix sentence with one of the following argument verbs.

Barbie persuaded Mary_i [PRO_i to come].

Ernie told Bert_i [PRO_i to run].

Ernie_i promised Grover [PRO_i to leave].

Interspersed throughout the comprehension task were four sentences such as (55) which tested the child's understanding of the simple passive.

- (55) The truck was pushed by the car.

In addition, there were three sentences with an internal indirect object construction as illustrated in (56).

- (56) Bert gave Ernie a ball.

One sentence had an external indirect object with the preposition to.

- (57) Bert gave a ball to Ernie.

Children were required to demonstrate their understanding of sentence types (55) to (57) by acting out their meaning. Sentences of this type were included not only to test the child's understanding of the relevant structures, but also to serve as distractors and break the monotony of the comprehension task. It was felt an act-out procedure was appropriate to test these sentences since they were made up of only one clause.

The Subjects and the Procedure

In all, 72 subjects were tested, including 60 children from ages three, four, six, eight and ten years and 12 adults ranging in age from 24 to 73 years. The mean age of the children completing the study was 5;3 and the range was 3;0 to 10;10. All the children were native speakers of English without known learning or language problems. The older children attended an elementary school in Calgary while the younger children were from four Calgary day care centres.

A question-answer format was used to study children's interpretation of PRO in complement sentences. In this task, the children were read a sentence and then asked a question which required identification of the subject of the complement clause. For example, the experimenter would read the following sentence.

(58) Ernie told Bert to run.

Then the following question was asked.

(59) Who will run?

The comprehension task consisted of three tokens of each of the nine sentence types plus four tokens each of the simple passive and the indirect object constructions. A total of 35 sentences, arranged in random order, were used. An attempt was made to select sentences which would provide a minimum of contextual or semantic clues to influence the child's interpretation. In this way, it was hoped that the children would have to rely on their knowledge of syntactic structure to interpret these sentences. The total time for each interview was 15 to 20 minutes.

THE RESULTS

The act-out task to determine if the children understood the internal and external indirect object sentences revealed that all of the children in each age group had acquired both constructions. In the next section I will give the results from the act-out task of the simple passive.

Purpose Clauses

There were five types of purpose clauses used in this study.

Type I: Bert_i put a book near Grover PRO_i to read later.

Type II: Grover_i grabbed Ernie's ball PRO_i to play with later.

Type III: Bert_i was given a robot by Grover PRO_i to look at later.

Type IV: Ernie gave Garfield to Bert_i PRO_i to look at later.

Type V: Mary gave Barbie_i Snoopy PRO_i to look at later.

An analysis of the results reveals that there are five stages of development in the acquisition of Purpose Clauses. The stages are based upon a criterion of 3/3 correct.

Stage I	Mixed Response	21 children Mean age: 4.8 yrs. Range: 3;5-8;11
Stage II	Subject Control (Type II)	5 children Mean age: 5.4 yrs. Range: 3;6-6;7
Stage III	Indirect Object Control (Type IV and V)	15 children Mean age: 5.9 yrs. Range: 3;6-10;10
Stage IV	Indirect Object Control (Type IV and V) and Subject Control (Type II and III)	17 children Mean age: 9.4 yrs. Range: 8;6-10;10
Stage V	All five types correct	0 children

In Stage I, none of the children attained criterion on any sentence type. Five children in Stage II recognized that a genitive NP is not eligible to act as controller of PRO. Some of the children in Stage III attained criterion in the sentences with the external indirect object (6 children), some on the internal indirect object (5 children) and some on both types (4 children). Children in Stage IV attained criterion in four out of the five sentence types. None of the children in the study reached Stage V in which they were able to interpret all of the Purpose Clauses correctly.

The following table gives the percentage of correct responses to the five types of Purpose Clauses as well as the Simple Passive. The act-out task of the Simple Passive was not given to the adults.

Table 1

Age	3	4	6	8	10	Adult
Type I	42	39	39	45	28	70
Type II	36	50	58	81	86	97
Type III	31	50	58	78	81	95
Simple Passive	52	58	88	96	98	-
Type IV	53	64	70	92	94	97
Type V	44	61	53	89	100	100

The results from the Type I and Type III sentences are very interesting. Both sentences require subject control and both include a PP in the main clause. Type I sentences contain a locative PP and Type III sentences contain a PP indicating the agent of the passive sentence. The responses to Type II sentences, however, contrast sharply with the responses to Type I sentences in which the average score does not rise above the 50% level in any of the children's age groups. In fact the percentage of subject control responses actually dropped to 28% at age 10. Adults only gave 70% subject control responses.

In the Type III sentences there is a gradual increase in the number of subject control responses to 81% at age 10 compared to 28% at age 10 for Type I sentences. In Type III sentences there is a period of confusion followed by a steady increase in the number of subject control responses as children learn the passive structure and how it relates to the infinitival complement. Some reasons for the difference in the acquisition of these two sentences may become clearer after a discussion of the principles which are required for the interpretation of Purpose Clauses.

What are the principles that can account for these stages of development? I propose that to get from Stage I to Stage II, children become aware that only thematic dependents of the verb are eligible as controllers of PRO. Before this, children are answering at random giving responses that include genitive NPs, thematic dependents of a preposition and thematic dependents of the verb. O'Grady (1985:12) has proposed the following principle which appears to be a minimal requirement for the interpretation of PRO.

- (60) The Thematic Dependency Requirement (TDR)
 The antecedent of PRO must be a thematic dependent of the verb.

Once the children are able to identify the thematic dependents of the matrix verb which are eligible as controllers of PRO, knowledge of the Semantic Role Principle (SRP) (cf. (8)) enables them to identify the specific thematic dependent (the goal) as controller. In Stage IV, Type III sentences can be interpreted by using the SRP but the children must have mastered the passive in order to identify the subject as goal. In the final stage children become aware of the fact that the source is the controller in the absence of a thematic dependent which is the goal.

Why are Type I and II sentences, which include subject control purpose clauses, acquired by most children after Type IV and V sentences? One reason for this may be related to the fact that these sentences do not contain a goal NP and to interpret them correctly, it is necessary to choose the source in the absence of a goal. This would explain the acquisition of Type II but why are Type I sentences the last to be acquired? The results are puzzling because children up to age ten sometimes give the NP in a locative PP as the controller of PRO. How can this be explained?

One explanation relates to the pragmatics of the sentence.

(61) Bert put a book near Grover PRO to read later.

It is possible that Bert put a book beside Grover so that he (Bert) could read the book later. It is also possible that Bert put a book beside Grover for Grover to read later. In this interpretation Grover is the goal of the action. Children at age ten seem to be focusing upon the pragmatics of the situation since three children chose this answer in 3/3 tokens and eight children in 2/3 tokens.

In Order To Clauses

The two types of in order to clauses include sentences such as the following:

(62) Type VI: Ernie gave his robot to Grover in order PRO to please his friend.

(63) Type VII: Ernie used a crayon beside Grover in order PRO to draw a picture.

An analysis of the responses to the sentences containing in order to clauses reveals the following developmental sequence.

Stage I	Mixed Responses	34 children Mean Age: 5;5 Range: 3;5-10;10
Stage II	a) Subject Control in Type VII	14 children Mean Age: 7;3 Range: 3;9-10;6
	b) Subject Control in Type VI	5 children Mean Age: 7;3 Range: 3;9-10;6
Stage III	Correct in both Type VI and VII	8 children Mean Age: 9;5 Range: 8;6-10;6

The following table shows the percentage of correct responses for Type VI and VII sentences.

Table 2

Age	3	4	6	8	10	Adult
Type VI	33	50	56	58	53	92
Type VII	53	56	67	83	86	92

The results of these two sentence types reveal that children are capable of making some important distinctions concerning the status of the NPs that are eligible to act as controller. In particular, the responses to Type VI and VII sentences show that children are able to distinguish between two types of NPs that are part of a prepositional phrase: those that are thematic dependents of a preposition and those which are thematic dependents of the verb. In Type VII sentences there is a steady increase in the number of responses in favour of the subject rather than the object of a preposition as controller of PRO. The responses in Type VI sentences which contain an indirect object remain at the 50% level up to age ten. It appears that children are unable to determine which thematic dependent, the subject or the indirect object, is the controller of PRO. This is not the case in Type VII sentences. Once the child has made the distinction between a thematic dependent and a non-thematic dependent of the verb, the choice of controller follows.

The acquisition of in order to clauses appears to require that children know two important principles. They must be aware of the Thematic Dependency Requirement (TDR) in order to determine which NPs are possible controllers of PRO. They must also know an additional principle, the Structural Subject Principle (SSP), which can be stated as follows.

- (64) Structural Subject Principle
PRO is controlled by the subject in sentences containing an in order to clause.

This principle follows from the fact that in order to clauses define the reason for the subject's action instead of the indirect object's action as is the case in the Type IV purpose clauses that include an indirect object.

Complement Clauses

Type VIII sentences include a prepositional verb shown in (65).

- (65) Ernie shouted to Bert PRO to run.

The results of the Type VIII sentences are extremely interesting because the mean scores increase so rapidly. By age four, children are correctly identifying the controller of PRO 75% of the time. It is interesting to note that in other sentence types with a locative PP such as in order to sentences (Type VII), the NP governed by the preposition is not consistently interpreted as controller of PRO. Children appear to be differentiating between NPs which receive their thematic role from the verb and those which receive their thematic role from a preposition. There do not appear to be any particular stages in the acquisition of prepositional verbs.

The sentences with argument verbs include two types. The sentences with persuade and tell involve indirect object control whereas sentences with promise exhibit subject control. In these sentences control is determined by the lexical properties of the matrix verb. The results of the study essentially replicate the results of other studies that have been done on these verbs. An analysis of the data reveals the following stages.

Stage I	Mixed Responses	16 children Mean age: 4;7 Range: 3;5-6;0
Stage II	Tell/Persuade correct Promise incorrect	13 children Mean age: 5;9 Range: 3;0-6;3
Stage III	Tell/Persuade correct Promise correct	25 children Mean age: 8;8 Range: 3;0-10;8

As was the case in the other infinitival clauses, children need to become aware of the TDR to move from Stage I to Stage II. In addition, they require the lexical principle which specifies that in verbs of speaking, the indirect object is the controller. In Stage III, children interpret sentences with promise correctly

because they have acquired the idiosyncratic lexical information which specifies that the subject is the controller in this instance.

THIS STUDY'S RELATIONSHIP TO PREVIOUS STUDIES

The Minimum Distance Principle

According to the MDP, children assume that the implicit subject of the complement verb is the first NP preceding it. The results from the sentence types in this study reveal that the use of the MDP is inadequate to explain children's responses. First of all, as has been noted in the case of purpose clauses such as (66), some children correctly identified the internal indirect object as controller.

(66) Bert gave Ernie_i Garfield PRO_i to play with ____.

These children would not be using the MDP since the direct object would be the closest NP. Secondly, if children were using the MDP, they would respond to sentences such as (67) by choosing the object of the preposition in the matrix clause as a possible controller.

(67) Ernie_i chose a chair near Bert PRO_i to talk to his friend.

Though children sometimes chose this answer, they did not do it consistently as the MDP predicts. Instead, their answers were random until they established which NPs could serve as controllers. This strategy requires that the child has identified a principle that involves much more than just linear order.

Semantic Role Principle

Maratsos (1974) has proposed that children may base their responses on the SRP. The SRP states that PRO is controlled by the goal NP in the matrix clause. This proposal gives the correct results for both active and passive purpose clauses as in (68) and (69).

(68) Mary gave a cupcake to Barbie_i PRO_i to eat.

(69) Bert_i was given the robot by Grover PRO_i to look at.

It is also the case that when there is not a goal, the source is the controller as in (70).

(70) Bert_i put a book near Grover PRO_i to read later.

In the adult grammar Bert is controller in (70). The problem is that some of the children seem to consider Grover to be the goal

in (70). This is interesting in the light of Maratsos' proposal since, if Grover names the goal, it would be the controller of PRO according to the SRP.

The goal is also the controller in sentences which contain a complement clause.

(71) Ernie told Bert_i PRO_i to run.

(72) Ernie shouted to Bert_i PRO_i to run.

The exception, of course, as noted by Maratsos, is promise. In this case, there is a goal but the source is the controller. In this study in order to clauses which contain an indirect object in the matrix clause represent another counterexample to the SRP. As is the case with promise, there is a goal but the source is the controller.

The SRP in this study has emerged as a very important principle, not only in the interpretation of PRO following a verb of speaking, but also in the interpretation of PRO in other types of infinitival clauses.

Conjoined Clause Analysis

The results of Tavakolian's (1978) study indicated that younger children's responses to complement clauses may be based upon a structural strategy called the Conjoined Clause Analysis in which children interpret the subject of the second conjunct as being coreferential with the subject in the first. In Tavakolian's study some of the 3-year-olds chose the matrix subject as controller more often than the matrix object. She proposes that this response type precedes the stage in which the children use the MDP and give more object than subject responses to interpret complement clauses.

The percentage of subject responses for the sentence types in my study for the 3-year-olds are as follows.

Type I: 42%	Type IV: 30%	Type VII: 53%
Type II: 36%	Type V: 41%	Type VIII: 39%
Type III: 31%	Type VI: 33%	Type IX: 42%

As the above figures show, none of the sentence types show a preference for subject control. Some of these results seem to indicate that the indirect object or the closest NP was chosen more often but this is not the case either since, at this age, about 10 to 15% of the responses involved the choice of an actor not named in the sentence or complete failures to respond. Thus, the results for the 3-year-olds in this study show no clear preference for the subject or indirect object as controller. Pinker (1984:242) has noted that Tavakolian's data do not even support her interpretation. Her 3-year-old children were simply

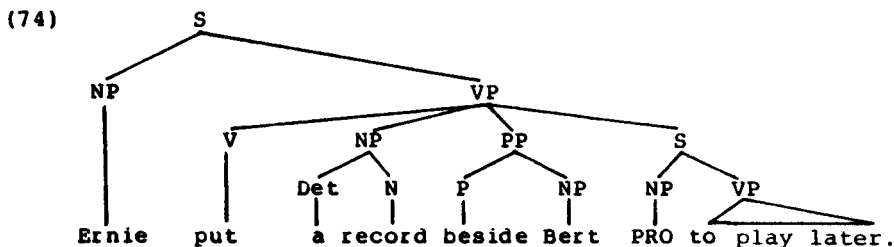
performing at a level near chance for both tell and promise sentences: They were not consistently choosing the matrix subject as controller.

C-Command Constraint on Control

Helen Goodluck (1981) has suggested that children know the C-Command Constraint on Control, repeated in (73).

(73) A controller must c-command the missing subject position.

The C-Command Constraint on Control accounts for the fact that Bert is not the controller of the complement clause in the following example.



Since Bert is part of a prepositional phrase it does not c-command PRO and therefore cannot serve as controller according to (73).

In the present study, children in all age groups sometimes chose Bert as controller in the Type I purpose clauses exemplified by (74). The reason for this seems to be that the children are attending to the pragmatics of the sentence rather than the C-Command Constraint on Control.

Results from the other sentence types which contain a PP in the matrix clause, such as the passive and the in order to clauses, also undermine the C-Command Requirement. While the object of a preposition as controller is not the preferred response in these cases, it was found that until children have acquired the TDR, their responses are extremely varied. At the very least, this suggests that the C-Command Constraint is not present from birth as an inborn principle.

THE RELEVANCE OF THIS STUDY TO MARKEDNESS THEORY

A crucial component of most current theories of language acquisition is the theory of markedness. The unmarked rule is considered to be the one that will be more likely to occur in a language and the first to be hypothesized by the language

learner. A marked rule, in contrast, is harder to acquire and will only be posited in response to considerable evidence that it is necessary (White 1982:102).

In the present study, there were two structures which were identified as being in the marked category. These include (75) and (76).

(75) Ernie_i gave his robot to Bert in order PRO_i to please his friend. (Type VI)

(76) Bert_i promised Grover PRO_i to leave. (Type IX)

Both sentences exhibit subject control which is extremely rare in the world's languages when there is an indirect object in the matrix clause (Pinker 1984:242). The prediction that these structures belong to the marked category seems to be verified by the results since both of these structures were acquired later than those in the unmarked category.

Why is it the case that these marked forms are acquired later than the unmarked forms? Pinker (1984) has proposed that the marked rules require specific evidence to be formulated. Once this evidence has been encountered, the marked rule will be chosen. This proposal implies that overgeneralization of indirect object control to promise constructions is due to the fact that the child has not heard a sentence with promise followed by an infinitival clause. In support of this proposal, Pinker notes that this construction is extremely rare in adult speech. In a study of parent-to-child speech (Pinker and Hochberg 1984), there was not a single instance of such a construction. Pinker (1984:235) also reports that evidence gathered from undergraduate university students by Tom Wasow (in personal communication to Pinker) indicates that adults may find such constructions ungrammatical.

A second interpretation of markedness is that the marked rule is harder to learn and a learner must encounter more evidence than for the unmarked rule. This proposal is interesting in connection with the in order to clauses. While it is likely that children have heard such structures before, they are rare. Bloom et al (1984) report only 12 instances of in order to sentences compared to 3,800 instances of other complement structures in their corpora of utterances for four children (Pinker 1984:389). Tom Roeper reports (in personal communication to Pinker 1984:389) that the in order to sentences used with children are of the following form.

(77) I drove home (in order) PRO to get my books.

Notice that in this sentence there is only one thematic dependent, the subject, which can serve as the controller of PRO.

In summary, then, it appears that marked forms are rare in everyday speech, but they also need to be heard more often to be acquired. This in turn helps to explain why they are acquired later.

CONCLUSION

In conclusion, I see the acquisition of control not as a result of the awareness of a specific principle as other studies have indicated but rather the understanding of a number of important principles. The Thematic Dependency Requirement appears to be the basic principle for the interpretation of PRO. This principle allows children to distinguish between those NPs which are eligible as controllers of PRO and which are not. Knowledge of the Semantic Role Principle enables children to identify the specific thematic dependent (the goal) as controller. The interpretation of in order to clauses which include an indirect object in the matrix clause requires an awareness of the Structural Subject Principle which designates the subject as controller of PRO. Finally, sentences which include an argument verb require the lexical principle which specifies that in verbs of speaking, the indirect object is the controller unless the matrix verb is promise in which the subject is the controller. Knowledge of these important principles enables the child to interpret PRO correctly.

FOOTNOTES

¹C-command is defined as:

x c-commands y iff the first branching node dominating x dominates y, and x does not dominate y, nor y, x. (Radford 1983:214)

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