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THE EFFECT OF INFORMATION ABOUT SENTENCE REFERENTS ON CHILDREN'S OBSERVATIONAL LEARNING OF A SYNTACTIC RULE

City University of New York PH.D. 1982

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THE EFFECT OF INFORMATION ABOUT SENTENCE REFERENTS ON CHILDREN'S OBSERVATIONAL LEARNING OF A SYNTACTIC RULE

by

SUSAN SPIES MORGULAS

A dissertation submitted to the Graduate Faculty in Educational Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, the City University of New York.

1982

This manuscript has been read and accepted for the Graduate Faculty in Educational Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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March 31, 1982
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Supervisory Committee

The City University of New York

To my husband

Jerrold

Abstract

The Effect of Information about Sentence Referents on Children's Observational Learning of a Syntactic Rule

by

Susan Spies Morgulas

Adviser: Professor Barry J. Zimmerman

The present research focused on examining the effectiveness of verbal modeling in promoting comprehension of a syntactic rule. The primary purpose of the study was to test the hypothesis that receiving information about the content of modeled passive sentences helps children to understand the meaning of those sentences and to induce the syntactic rule governing them. The second purpose was to replicate Brown's (1976) finding that modeling supplemented with concrete enactive referents leads to syntactic rule learning.

Nursery school children were pretested for comprehension of reversible passives. Children failing to demonstrate comprehension skill were randomly assigned to one of four experimental conditions or to a no-modeling control condition. Children in the experimental conditions received modeling treatment. They heard passive sentences embedded in a novel story which contained no extra-syntactic clues to sentence meaning.

Before modeling, children in the relevant information conditions listened to descriptions of the dispositions and probable behavior of the grammatical agents and objects of the modeled sentences. Youngsters in the irrelevant information conditions heard information about the story characters but irrelevant to the actions described by the model.

Modeling with enactment subjects watched the model use toys to demonstrate the actions named in the modeled sentences. The presence or absence of enactment was factorially varied with the two types of prior information. One posttest assessed children's understanding of the story sentences. Two additional posttests measured transfer of learning.

The data were analyzed in a multivariate analysis of covariance with pretest score as the covariate. A series of comparisons between children in the modeling conditions and the no-modeling controls was also made. The pattern of results leads to the conclusion that the combination of prior relevant information and enactment, and not either variable alone, constituted the crucial factor in syntactic rule learning. The results are discussed in terms both of the sub-processes held by social learning theory to be activated during learning by observation and of the social learning research on language skills. Implications for education are also discussed.

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To my children who, for years, have shared my time and attention with my graduate work.

To my mother, who was always there when I needed her.

In memory of my father, for his pride in my work.

To my husband, for his love and understanding.

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CHAPTER I

Introduction

Educators have become increasingly concerned about the apparent decline in children's literacy. The national decrease in scores on standardized tests of reading comprehension has received much publicity. Remedial reading and writing courses for high school and college students proliferate. Parents, educators and psychologists cite such reasons for poor performance on reading and writing tasks as excessive viewing of television and deficiencies in early childhood and elementary school programs. There is no consensus concerning the extent to which these or any other factors contribute to the problem. However, many educators and psychologists do agree that competence in oral language is the foundation on which the secondary skills of reading and writing are built (Frost, 1968). In this view, processing written text requires that children first understand well-formed speech. And to communicate effectively in writing, children must first learn to speak clearly and precisely. A good grasp of grammar is a primary requirement.

How then do children gain control of the grammar of their native language? It is this question to which the present study is addressed. Grammar consists of two subareas, morphology and syntax. The present paper focuses on syntax, the set of rules governing the relation among words within a sentence.

Since the mid-1960s, numerous social learning studies have demonstrated that verbal modeling of syntactic structures can exert a powerful influence on the form and complexity of children's language. This research has shown that hearing an adult model repeatedly use a given syntactic structure strongly affects the frequency with which

that structure subsequently appears in the child's speech. Only recently, however, have researchers begun to ask whether children learn new language rules through modeling. This research has been directed as determining how modeling affects new learning both in the receptive and productive modes. Evidence from social learning studies will be reviewed. Observational studies of child language and parent-child interactions will be discussed where relevant. Answers to the following two questions will be sought: 1) Do children learn to produce new syntactic structures by imitating the speech of adult models? 2) Does verbal modeling teach children to comprehend new syntactic structures?

CHAPTER II

Literature Review

The Social Learning View of Imitation

Some students of child language (e.g., McNeill, 1970; Ervin, 1964; Fraser, Bellugi, & Brown, 1963) have argued that imitation does not play a major role in the acquisition of grammar (c.f., Bloom, Hood, & Lightbown, 1974). This view is based on findings from developmental psycholinguistic studies in which imitation was narrowly defined as a matching of both the form and the content of a model's speech. Discussions of these studies can be found elsewhere (Sherman, 1971; Whitehurst & Vasta, 1975; Brown, 1979; Rosenthal & Zimmerman, 1978). However, the chief psycholinguistic objection to imitation as an acquisition strategy bears repetition because it provides the background for understanding an important distinction between two types of imitation.

Typically, psycholinguists noted that children acquire the ability to create sentences which have never been modeled for them. Therefore, it must be true that the product of language learning is a set of rules for composing new sentences and not a set of previously heard utterances which the child comes to repeat. Bandura (Bandura & Harris, 1966) argued that the psycholinguistic view rested on the erroneous assumption that verbal modeling results only in exact copying of the model's speech or "mimicry." According to Bandura, however, modeling does not teach the observer to reproduce discrete responses to specific stimuli. Instead, modeling imparts abstract, symbolic information about modeled events. Specifically, the model's actions may be considered to be examples of a "superordinate or generic rule" (Zimmerman & Rosenthal, 1974, p. 29) or of a "principle for generating novel combinations of responses" (Bandura

& Harris, 1966, p. 351). In the social learning view, modeling leads the observer to induce the rule exemplified by the model's demonstrations. Social learning theory conceptualizes observational rule learning as being regulated by four subprocesses. These are: a) attentional processes which control the perception of modeled events, b) retentional processes by which modeling episodes are represented and stored in memory, c) motor reproduction processes which include the motor skills necessary to imitate observed demonstrations, and d) motivational processes which determine whether or not the observer chooses to enact what has been learned (Bandura, 1977). According to Bandura, it is attentional and retentional processes which primarily govern the acquisition of new rules, whereas motor reproduction and motivational factors affect the probability that a new response will be overtly performed.

Support for the view that modeling leads to rule learning is provided by studies in such areas as moral judgments, conservation and concept and discrimination learning (Bandura, 1977; Zimmerman & Rosenthal, 1974). In these studies, it was found that when children were given different stimuli than the model, their post-training behavior conformed to the same principle as governed the model's actions. This result has been obtained on posttests administered in other than the experimental setting and in the model's absence. It is important to note that rule learning does not necessarily involve the child's ability to state a rule. Rather, it is inferred that a child has learned the rule from the observation that the child applies the rule in his actions.

In the case of syntactic rule learning, the modeling stimuli consist of a set of sentences of a specific type. Evidence that

children induce the syntactic rule governing a model's speech comes from studies in which children imitated the form but not the content of the modeled sentences. Whitehurst (Whitehurst & Novak, 1973; Whitehurst & Vasta, 1975) has referred to this type of imitation as "selective imitation." Selective imitation is a crucial concept because it permits a distinction between exact duplication of modeled sentences and sentences which are imitative only in terms of their structure. Selective imitation thus avoids the major psycholinguistic objection to imitation as a strategy for acquiring syntax.

Early Social Learning Studies of Syntax Modification

The first attempt to modify the syntax of children's speech was made by Bandura and Harris (1966). The investigators sought to influence children's use of sentences containing prepositional phrases and sentences in the passive voice. In the first experimental or baseline phase, the second grade subjects made up sentences in response to 20 common nouns which were printed on separate cards. The baseline measures were the number of passive sentences and the number of prepositional phrases which the children spontaneously produced. The treatment phase followed immediately afterward. During treatment, all subjects received a new set of 20 stimulus words. Those youngsters in the modeling conditions heard the model use 13 sentences of one target type. Then the child and model took turns, in five-trial blocks, at composing sentences. After a break, the same procedures were repeated with the second sentence type. The order in which children received passives and prepositional phrases was counterbalanced.

Children in the reinforcement conditions were told that some sentences would earn stars which could later be exchanged for a present. The children were told to figure out which kinds of sentences merited stars. Children who received a "problem-solving set" were also instructed to try to figure out which sentences earned stars and were encouraged to earn as many stars as possible but were not promised a present. There were five conditions. Subjects in the control group did not receive modeling but did continue to generate sentences to stimulus words. The other conditions were modeling, reinforcement plus set, modeling plus reinforcement and modeling plus reinforcement plus set.

Bandura and Harris (1966) found that prepositional phrases occurred more frequently than passives during baseline and showed a greater increase after modeling. For prepositional phrases, the modeling plus reinforcement plus set and the reinforcement plus set conditions proved to be most effective. Children produced passive sentences only slightly more frequently during treatment than during baseline. An increase in passives was observed only in the modeling plus reinforcement plus set condition.

In commenting on the role of modeling, Bandura and Harris (1966) noted that reinforcement alone proved ineffective with infrequently occurring syntactic forms; since many children never produced passives during baseline, there was no response to reinforce. Modeling, however, helped children discriminate the appropriate syntax. The investigators observed that modeling seemed to play a different role in modifying response which occurred frequently during baseline. Reinforcement plus set increased the rate at which children produced prepositional

phrases. However, unless children also received modeling, they tended to continue producing prepositional phrases when it was no longer appropriate. Bandura and Harris proposed that when a particular response is well-established, modeling cues may encourage "flexibly adaptive behavior."

The Bandura and Harris (1966) study did not reveal that modeling, in the absence of reinforcement and instructions, influenced syntax. Nor did the investigators measure generalization, although anecdotal evidence of selective imitation was obtained. The study did demonstrate that verbal modeling in combination with other variables can affect the rate at which children produce particular sentence types.

Carroll, Rosenthal and Brysch (1972) studied changes in verb tense, sentence structure and word use. No reinforcement was given and the design of the Bandura and Harris (1966) study was expanded to include a generalization posttest. During baseline, third and fourth graders composed sentences to describe a series of pictures. In the training phase, children heard the model make up sentences in response to the same pictures as were used during baseline. Subjects were instructed to figure out the way in which the model's sentences were the same as one another. A no-modeling control group was included.

The type of sentence modeled (active sentences with verbs in the present, past or future progressive tense) was a within-subjects variable. During the imitation phase which followed modeling, children responded to the original set of training cards. Half the trained children received prompts before the imitation phase. In the generalization phase, new pictures were presented. Children's responses were scored for correct imitation of three aspects of the sentence: tense, structure and words.

Modeling increased the frequency of each type of response and generalization to new stimulus materials was observed. The strongest generalization effect occurred with the more familiar present and imperfect verb forms than with the future progressive tense which had been frequently produced during baseline. There was no decrease in subjects' use of either the present or past progressive tense from imitation to generalization and for these two familiar verb forms, prompts were not necessary. For the future tense, prompted groups outscored unprompted ones and "correct" responses declined from the imitation to the generalization phase. A comparison of modeled sentences and subjects' responses showed that exact copying was rare.

In both the Bandura and Harris (1966) and the Carroll et al. (1972) studies, stronger procedures were needed to elicit imitation of sentence types which occurred rarely during baseline than to elicit more common constructions. The two studies also differed in important ways. Children in the Carroll et al. study were one to two years older than the Bandura and Harris subjects and heard only one type of sentence (although three verb tenses were modeled). Whether because of these differences or for some other reason, modeling without reinforcement proved to much more effective in the Carroll et al. study than in the earlier one.

Rosenthal and Whitebook (1970) sought to compare the relative efficacy of instructions to imitate and reinforcement. Third and fourth grade children participated in the study. Modeled sentences were of the noun subject - verb - noun object type. During the imitation phase which followed baseline, all children except control subjects were assigned either to an incentive condition or to an

instruction condition. The incentive consisted of the promise of a dime for dong a "good job." Instructions directed children to listen to the modeled sentences in order to copy them later on. Each response received scores for tense, sentence structure and content.

The control group, which did not participate in the imitation phase, was surpassed by both experimental groups on the generalization test. During the imitation phase, children in the incentive condition received higher content scores than did no-incentive subjects. Apart from this one measure, no other differences among experimental groups were found during either imitation or generalization.

An investigation conducted by Rosenthal and Carroll (1972) departed in several respects from previous studies. Rosenthal and Carroll examined a complex sentence type containing the pluperfect tense (e.g., "Because the team had defeated the rivals, the fans celebrated the victory.") and exposed groups of children rather than individual subjects to modeling. In contrast to earlier studies, children were required to make written rather than oral responses.

The investigators compared the influence of "strong" instructions to pay attention to the modeled sentences with "weak" instructions. Also studied were the effects of offering inventives and the time at which the incentive was offered (either before or after modeling).

During baseline, children were shown a long list of alphabetized words and told to write 12 sentences which contained words from the list. Children in the treatment conditions heard the model say 12 sentences and watched him write each one on the blackboard. Then the sentences were erased and the children were again asked to write their own sentences using words on the original list.

Children in the modeling groups produced significanlty more complex sentences and pluperfect verbs than did controls. On both measures, children who received strong instructions outperformed those who received weak instructions. The most interesting result was that the promise of reward, regardless of whether it was made before or after modeling, failed to affect imitation.

Harris and Hassemer (1972) noted that adults rarely asked children to approach sentence construction as a formal problem-solving task. Therefore, in order to conform to naturalistic conditions, the investigators did not give children either instructions to imitate or reinforcement for imitating. Second and fourth grade boys and girls served as subjects. At each grade level, one-third of the children spoke only English and the rest were competent enough in Spanish to answer simple questions. Half the Spanish-speaking children heard Spanish sentences and half heard English sentences.

The study consisted of a baseline and an imitation phase. In the latter, model and subjects alternated in producing sentences, with the model's sentences varying in terms of complexity and length. The order in which children heard simple and complex sentences was counterbalanced. Simple sentences consisted of a single subject-verb-object string or a subject-verb-predicate string. Complex sentences contained two independent clauses or one independent and one dependent clause.

Children used longer and more complex sentences in the complex sentence condition than in either the baseline or the simple sentence condition. Children in the complex-first order used longer and more complex sentences than thos in the simple-first order. Older children's

sentences were longer than those of the younger children, but no difference in structural complexity between the two age groups were found. Regardless of the language modeled, modeling had as strong an effect on bilingual children as on monolingual children.

The Harris and Hassemer (1972) study was apparently the first to demonstrate that modeling, unaccompanied by either instructions to imitate or rewards, affects the length and complexity of children's speech. This result was obtained with children who responded to different stimuli than did the model.

One group of studies demonstrated the effect of modeling on the types of questions children ask. Although these studies did not aim specifically at modifying the use of a particular syntactic structure, affecting changes in question type may result in altering the linguistic form of children's utterances.

Rosenthal, Zimmerman, and Durning (1970) studied four categories of questions: nominal-physical, functional, judgmental and causal. Each question category was represented by a different linguistic pattern. Relative to baseline, all question classes increased markedly after modeling and generalized to new stimuli. Concentrating only on causal questions, Henderson and Garcia (1973) were also able to modify the information-seeking behavior of six-year-old Mexican-American children.

Rosenthal and Zimmerman (1972) sought to answer questions raised by the Rosenthal et al. (1970) study. The investigators examined the effects of various types of instructions on children's adoption of modeled value judgment questions. Mapping instructions, in which children were told how the model's questions were similar to one

another, proved to be the most effective type of instructions. Regardless of variation, children in all the modeling groups surpassed their baseline scores and exceeded the control group scores.

In summary, the results of experimental studies clearly demonstrated the power of modeling as a technique for modifying the syntax of children's speech. The social learning studies showed that children imitated modeled sentences in a selective fashion. Children exposed to modeling generated sentences which matched the structural aspects but not the exact wording of the model's utterances.

Selective Imitation of New Syntactic Forms

The earliest social learning studies showed that verbal modeling affected performance in the sense that it increased the frequency with which children used specific syntactic forms in their speech. However, the research left a crucial question unanswered: Precisely what did children learn from the modeling experience? Did children learn something new about grammar or did they simply gather that the model considered a particular type of verbal behavior (with which they were already familiar) to be appropriate? To understand the difficulties involved in interpreting the research findings, two experimental situations should be considered. In the first, some children used the target sentence type during baseline and increased its use after modeling (e.g., Carroll, et al., 1972). These children may have learned that the experimental situation called for the use of a structure which was already within their productive repertoires. However, it is clear that modeling did not teach these subjects a new syntactic rule.

In the second situation, some children received baseline scores of zero and afterwards selectively imitated the model (e.g., Bandura & Harris, 1966). Did these children learn to produce a new structure? The answer is by no means obvious. Most studies investigated the performance of elementary school children who may well have been familiar with the target sentence structure even though they did not spontaneously produce it during baseline. Morgulas and Zimmerman (1979) argued that baseline measures may simply have failed to elicit infrequently used sentence types like the passive. When pretreatment measurement is inadequate, the meaning of a zero baseline score is unclear. Even if it is assumed that new learning has occurred, the nature of that learning needs to be specified. Did the child learn to produce a previously comprehended structure or did he learn both to comprehend and to produce a new linguistic form?

There is one group of studies in which baseline scores of zero can be interpreted as a true measure of children's prior familiarity with linguistic rules. These are studies in which novel syntactic structures were modeled.

Modeling of novel syntactic rules. In a series of related studies (Odom, Liebert, & Hill, 1968; Odom, Hill, & Huff, 1969; Vasta & Liebert, 1973), groups of 5-, 8- and 14-year-olds heard a model utter sentences containing grammatically correct prepositional phrases ("old rule" sentences). Other children heard incorrect or "new rule" sentences of the form "The boy went the house to." The investigators found that in both new rule and old rule conditions, the youngest children produced more grammatically correct preopositional sentences after modeling than during baseline. Older children were more successful

than younger ones in imitating the syntactically incorrect new rule sentences. Since older subjects outscored younger ones on new rule sentences, the investigators concluded that prior familiarity with English word order and problem-solving skills enhanced children's ability to learn the new rule.

These results seem to suggest that modeling is ineffective in teaching young children to use new linguistic rules in their speech. However, the experimental situation required children to produce sentences which ran directly counter to their previous language experience. It seems unlikely that such a situation would arise in the normal environment of language learning. Furthermore, as Rosenthal and Zimmerman (1978) pointed out, the 5-year-olds may have concluded that the model was trying to trick them and thus may have viewed their experimental task differently than did the older children.

Malouf and Dodd (1972) avoided the problem of young children's suspicions about the model's intentions by teaching children a linguistic rule which did not conflict with prior learning. The investigators sought to teach first graders to use English adjectives to describe a cartoon creature. The experimental task was to learn the correct order for combining different types of adjectives (those describing the creature's antennae, body and limbs). Children were randomly assigned to three experimental conditions and one control condition. All the children saw a series of pictures of the cartoon creature. Children in the expansion condition were asked to describe each picture as it was presented. Immediately after the child responded, he heard a modeled phrase consisting of the appropriate adjectives in the correct order. In the imitation condition, each child first

heard the model's description and was then asked to try to describe the picture himself. Modeling only subjects saw the pictures and heard the modeled phrases but made no response during training. Control children were shown the pictures but did not listen to the standard descriptions.

Compared with modeling only subjects, children in the imitation and expansion conditions made fewer errors on the test trials for production of the word order rule and learned the rule in fewer trials. All the children who heard the modeled word order rule produced more syntactically correct descriptions of the cartoon creature than did no-modeling control subjects.

The results obtained by Malouf and Dodd (1972) seem to point tc two conclusions. First, modeling alone appears to be a relatively weak procedure for teaching new language rules. Second, modeling combined with the opportunity to imitate and receive accuracy feedback, can lead to new use of a syntactic form. However, the extent to which the results of this study apply to language learning outside of the laboratory is open to question. Normal first graders are undoubtedly familiar with rules for ordering adjectives in English. The subjects in the Malouf and Dodd (1972) study may have used this knowledge to learn the experimental word order in ways which are different from their acquisition of new syntactic structures in their native language. In summary, it remains to be specified how learning an artificial syntactic rule relates to the processes involved in acquiring the syntax of a first language.

Operant training studies. The problem of pretreatment measurement is partially alleviated in single-subject studies of retarded or

speech-deficient children. Baseline production socres of zero can be interpreted with greater confidence when a child is known to have a history of deviant language behavior than when the child is developing normally.

In a number of studies (see Sherman, 1971), operant procedures, consisting of a combination of modeling, reinforcement and training in exact imitation, have been employed to teach atypical children to use grammatically correct sentences. For example, Wheeler and Sultzer (1970) trained an 8-year-old boy to use simple active sentences containing a subject, verb and object. Prior to training, the child had never been heard to use a complete sentence of this type. Baseline scores for initial and middle components of the sentence were zero, but increased to 72% and 80% respectively by the end of the first training period.

Both the child's pre-experimental behavior and the results of a reversal procedure supported the conclusion that new learning had occurred. However, the nature of that learning cannot be specified because comprehension of the target sentence type was not measured. Before training, was the child able to understand subject-verb-object sentences without actually producing them himself?

A second problem which arises in interpreting the results of operant studies concerns the combination of variables employed. As Sherman (1971) pointed out, operant researchers typically do not attempt to separate the effects of modeling, reinforcement and imitation training. Therefore, the extent to which modeling makes an independent contribution to learning cannot be determined.

Imitation training versus modeling and a theoretical problem. Can pure versal modeling, in the absence of reinforcement and training in exact imitation, teach children to use new syntactic forms in their speech? Whitehurst and Novak (1973) discussed the theoretical implications of this question. The investigators noted that although modeling and subsequent selective imitation appear to be analogous to parent-child interactions in the home, studies using pure modeling did not yield evidence of new syntactic learning. In contrast, the "imitation training" procedures employed in operant studies appear to have taught children to apply new syntactic rules in their speech. In these studies, children were reinforced for exact imitation, then selectively imitated on transfer tests with new stimuli (e.g., Fygetakis & Gray, 1970; Garcia, 1974; Stevens-Long & Rasmussen, 1974). According to Whitehurst and Novak (1973), the problem is that imitation training bears little resemblance to what is known about parental teaching techniques.

Whitehurst and Novak (1973) compared imitation training and modeling. The investigators sought to determine whether the two techniques would promote selective imitation of sentences containing frequently occurring phrases (prepositional and infinitive) and of sentences with less common phrase types (appositive and participial). Four children, ranging in age from 3 years, 5 months to 4 years, 7 months were pretested for spontaneous production of these syntactic structures. Prepositional and infinitive phrases were generated frequently during baseline. In contrast, only one child produced a participial phrase and none composed sentences with appositive phrases.

Modeling led to selective imitation but only for two children and then only for phrases which were produced at pretest. In the case of all four children, imitation training proved to be effective in eliciting selective imitation of infinitive and prepositional phrases. Furthermore, imitation training resulted for three children in selective imitation of the infrequent phrase types. Whitehurst and Novak (1973) concluded that "modeling is most likely to have an effect on sentence structures already within a child's repertoire" (p. 344).

The CIP hypothesis. In a theoretical paper, Whitehurst and Vasta (1975) explored the possibility that pure modeling might teach children to apply new syntactic rules in their speech. The authors observed that children can learn to comprehend language without being able to speak (Lenneberg, 1962). Furthermore, very young children often make nonverbal responses to parental questions or requests (e.g., pointing to or fetching an object) and then receive reinforcement. Thus Whitehurst and Vasta proposed that learning to use a given structure occurs in a three-stage process: comprehension, then selective imitation and finally spontaneous production (CIP). Notice that this process does not refer to stages of child development, but rather to the order in which a child acquires any given syntactic rule. Whitehurst and Vasta hypothesized that modeling even without reinforcement leads to selective imitation of a syntactic form if comprehension has already been established. The authors conceptualized comprehension as the matching of an utterance with the situations, events and relations to which it refers.

Whitehurst and his associates conducted two studies designed to evaluate the CIP hypothesis. Whitehurst, Ironsmith, and Goldfein (1974) planned a three-phase experiment. Four-and 5-year-old children were to be exposed to modeling twice, once before comprehension training and once afterwards. Comprehension training consisted of reinforcing children for pointing to the correct pictures in response to modeled sentences. It was anticipated that the children would not be able to selectively imitate passive sentences until after they had received comprehension training. However, unexpected circumstances necessitated a change in the research plan. The second modeling phase was omitted because children in the experimental group selectively imitated during the first modeling phase. Furthermore, it was found that children in the modeling condition scored higher on the comprehension posttest than did the no-modeling controls. Since the children received modeling before the comprehension test, their scores may have been affected by the treatment. Therefore, it could not be determined from the results of the Whitehurst et al. study whether or not comprehension necessarily precedes selective imitation.

Whitehurst (1977) sought to demonstrate that 4-year-olds would not selectively imitate direct object-indirect object sentences (e.g., "The boy gave the girl the toy.") without first receiving comprehension training. Again, however, modeling without reinforcement did produce selective imitation in phase I of the study and consequently, Whitehurst altered the experimental design. In a single-subject design, children were taught to comprehend an incorrect rule for direct object-indirect object sentences

and, in alternate phases, learned the correct rule. During comprehension training, children were given probe trials for selective imitation.

Whitehurst found that children selectively imitated the type of sentence (correct or incorrect) which they were trained to comprehend. This result appears to indicate that comprehension of a syntactic form affects the probability that it will be selectively imitated. However, Whitehurst's findings are difficult to interpret because of the unusual nature of the experimental task. As the investigator suggested, children may not have imitated the incorrect sentences without comprehension training only because they failed to notice the model's use of an anomalous form. Comprehension training may have been necessary simply to draw children's attention to the reversal.

Morgulas and Zimmerman (1979) argued that in previous studies of selective imitation, children's pretreatment linguistic skills were not adequately assessed. The investigators examined children's use of reversible passive sentences and sought to improve pretreatment measurement in two ways. First, the pretest for spontaneous production of passives used drawings which depicted the three referents of a reversible passive sentence: the recipient of the action, the action and the actor. In previous studies, children had been shown pictures of a single person, animal or object. These types of stimuli are not as likely as action drawings to elicit an infrequently used sentence type like the passive. In addition, the production pretest included a procedure which directed children's attention to the recipient of the action and thus encouraged children to begin their sentences by naming the recipient and following up with a passive construction. This procedure, a variant of one reported by Turner and Rommetveit

(1967), involved the experimenter's pointing to the recipient of the action as each drawing was presented. The second departure from previous studies was the inclusion before the modeling treatment of a comprehension pretest.

On the basis of their comprehension pretest scores, 71 4- and 5-year-olds were designated as low, intermediate or high comprehenders. Half of those in each comprehension group were randomly assigned either to a modeling or to no-modeling control conditions. All children then received the pretest for spontaneous production of passives and the 14 who scored above zero were excluded from further participation in the study. Each child in the experimental condition heard a model use passive sentences to describe a series of action drawings which were similar in type to those used on the pretest but different in content. Then the child and the model took turns making up sentences in response to the pictures. The child and model responded to different stimuli. Control subjects composed sentences for the same pictures as children in the experimental group but did not hear the model. The model did not instruct children to use passives or give reinforcement for any responses. A sentence was scored as correct if three criteria were satisfied: 1) that both the recipient and the agent were mentioned, 2) that the sentence was in the passive voice and 3) that the sentence accurately described the relationship between the recipient and the actor.

Results supported predictions derived from the CIP hypothesis. Within the modeling group, there was a significant positive relationship between comprehension pretest scores and selective imitation of passive sentences. In contrast, no relationship between comprehension

pretest scores and posttest use of passives by control subjects was found. Posttest production of passives in the control condition was almost zero.

It had been anticipated that trained children to the high comprehension group would perform significantly better on the posttest than high comprehension controls. This hypothesis was supported. No predictions had been made concerning intermediate comprehenders, but trained children in this group also scored higher on the posttest than their counterparts in the control group. Finally, the CIP formulation had led to the hypothesis that low comprehenders who were exposed to modeling would not achieve significantly higher posttest scores than low comprehension controls. Contrary to prediction, however, the experimental group did outscore no-modeling subjects.

A second unexpected finding emerged. The percentage of "imitators" (children who correctly imitated the model at least once) did not vary with comprehension group membership. High comprehenders selectively imitated more passives than intermediate and low comprehenders. Furthermore, 91% of their posttest responses in the passive voice were correct. Within the low group, almost three-quarters of the posttest passives were incorrect. Every one of the incorrect passives involved a reversal of the relationship between actor and agent as it was shown in the stimulus picture. It would appear, therefore, that low comprehenders were as responsive to modeling cues as high comprehenders but that low comprehension limited the amount of correct (selective)imitation which occurred.

The results of the Morgulas and Zimmerman (1979) study raise several questions. First, some of the low comprehenders in the modeling group correctly imitated passive sentences. Did the modeling treatment enhance the ability of these children to comprehend passives? The results of a study reported by Brown (1976) suggest a negative answer. However, no definite conclusions can be drawn because a comprehension posttest was not administered.

A second question arises from consideration of the low comprehenders' sensitivity to modeling cues. Would a stronger treatment than the one employed have elicited from the low comprehenders a substantial amount of selective imitation? Since a stronger treatment would necessarily be one which increased comprehension, the two questions are interrelated. In formulating the CIP hypothesis, Whitehurst and Vasta (1975) assumed that comprehension must be established before exposure to modeling if selective imitation is to occur. The authors did not discuss the possibility that modeling might simultaneously lead to comprehension and selective imitation.

Modeling and Comprehension of New Syntactic Forms

Situational clues to meaning. Observational studies reveal that young children and their parents typically converse about people and objects present in the conversational setting and about ongoing events (e.g., Bloom, 1970, 1974; Snow, 1972). Thus parent and child statements are often redundant with respect to their nonlinguistic referents. Several students of child language (e.g., Macnamara, 1972; Bloom, 1974) have suggested, therefore, that appropriate child responses to adult utterances may often be mistaken for comprehension of language forms. The child's responses may reflect

instead an understanding of the relationships involved in present happenings. As Bloom (1974) noted, "In a naturalistic situation, a child might respond to (a grammatical form) when he hears it, but what he understands of the form might be heavily dependent on the situation in which he hears it or on the state of affairs to which it refers" (p. 298).

This analysis suggests that when the child hears a passive sentence (for example) in the context of a referential event, he may understand that the first noun in the sentence refers to the recipient of the action. This type of understanding does not necessarily signify that the child knows the word order rule for passives in the sense that he can correctly identify the actor and the recipient when the sentence is heard out of context.

How do children make the transition from reliance on nonlinguistic context in interpreting language to comprehension of language heard out of the context of referential events? In a theoretical paper, Macnamara (1972) reviewed psycholinguistic studies of language acquisition in infants and young children. On the basis of evidence from this research, Macnamara argued that children use meaning as a clue to learning syntactic rules. According to Macnamara, children infer the meaning of the sentences they hear from the nonlinguistic context. Comprehension of individual sentences paves the way for the abstraction of syntactic rules. As the author suggested:

> ...children initially take the main lexical items in the sentences they hear, determine referents for these items, and then use their knowledge of the referents to decide what the semantic structures intended by the speaker must be...their final task is to note the syntactic devices, such as word order, prepositions, number affixes, etc., which correlate with the semantic structures (Macnamara, 1972, p. 9).

Although not formulated from a social learning position, Macnamar'a analysis comes remarkably close to the social learning view that children induce language rules from modeled exemplars.

Apparently only one study has focused on teaching comprehension of syntactic forms by observation alone. Brown (1976) cited the limited success of modeling in eliciting selective imitation of unfamiliar syntactic structures. The investigator noted that in previous attempts to teach new language rules, sentences had been modeled either out of their referential contexts or else in conjunction with pictorial referents. Brown hypothesized that hearing modeled sentences in the context of concrete referents would lead to comprehension of an unfamiliar syntactic form. Brown (1979) conceptualized the one development of comprehension as "...learning the structure of utterances, and their relationship to semantic referents" (p. 166).

Brown administered a pretest for comprehension of reversible passives to children who ranged in age from 3 years, 5 months to 5 years. Then the investigator randomly assigned children to four conditions. Children in the modeling with enactment condition heard passive sentences embedded in a novel story and watched the model use toys to demonstrate the actions described in the story. In the modeling with pictorial referents condition, children heard the same story but were shown still photographs of the toy characters engaged in the story actions. Modeling alone subjects heard the story but were not given any referential support. Control subjects received the pretest and the posttests but did not hear the story. Two to four days after treatment, children were posttested for comprehension.

None of the posttest items overlapped with the sentences modeled in the story.

Children in the modeling with enactment condition consistently achieved higher posttest scores than did children in the other conditions. The effectiveness of modeling with pictorial referents varied with the mode of the comprehension posttest (enactment or picture recognition). However, the children who saw pictures were never surpassed by control subjects or by those who received modeling alone. The average posttest scores of modeling alone subjects did not differ significantly from those of the control group on either the enactment or picture recognition tests or on a measure combining both scores. On the enactment posttest and on the combined measure, however, children in the modeling alone condition showed some increase in their scores relative to pretest.

Brown noted that any gain at all for modeling alone subjects was surprising in view of previous research findings. The investigator hypothesized that the increase in scores of the modeling alone subjects may have resulted from the meaningfulness of the story context in which passive sentences were heard. Specifically, Brown reasoned that the children's interpretation of a given passive sentence may have been restricted by the information in the immediately preceding active sentence. To test this hypothesis, Brown conducted a supplemental exeriment. One condition was identical to the modeling alone condition of experiment 1. In a second condition, the passive sentences from the story were removed from the story context and interspersed with unrelated active sentences. A no-modeling control group was included. Unexpectedly, the treatments did not differ significantly in terms of their effect on any of the three dependent

measures (picture recognition, enactment or the combined measure). However, as in experiment 1, children who heard the story showed some increase from pretest to posttest on the enactment and combined measures but not on the recognition test.

Taken together, Brown's (1976) two experiments demonstrated that pure modeling, without reinforcement or instructions to point to pictures or to imitate, can teach children to comprehend a new syntactic structure. Modeling accompanied by demonstrations of story actions had a powerful influence on comprehension. In contrast, verbal descriptions of rapidly changing action scenes proved to be a weak substitute for enactment.

The learner's role in interpreting meaning. The use of contextual clues to understand complex linguistic structures is clearly a crucial factor in the language learning of young children. However, reliance on concrete referential events provides a less satisfying explanation of how older children acquire new linguistic forms. Children continue to learn syntactic rules well into the elementary school years (Gowie & Powers, 1978), beyond the time when adults confine conversations with children to talk about the here and now. Furthermore, there are syntactic rules for certain kinds of sentences which do not refer to direct physical actions. The "promise" sentence studied by Chomsky (1969) is one example (e.g., "Mary promised her mother to go to the store."). It seems plausible, therefore, that before a child learns a syntactic rule, he uses clues other than ongoing concrete events to interpret adult utterances. In Brown's (1976) study, the story was apparently such that children with no syntactic knowledge about passives had to infer the meaning

of each one from the immediately preceding event. Brown's results suggest that young children may not profit much from clues in a fast-moving verbal narrative. However, children do have a store of information which may often be useful to them in making sense of what they hear. In the normal environment of language learning, children frequently hear sentences about people, objects and events of which they have some prior knowledge. Recent research suggests that even very young children use such knowledge to decode syntactically complex sentences.

Strohner and Nelson (1974, expt. 1) hypothesized that young children would understand sentences if the events described were probable and therefore consonant with the child's prior experience. It was anticipated that children would perform poorly on improbable sentences. Reliance on a "probable event" strategy was expected to decrease with age. The investigators examined the ability of 3-, 4- and 5-year-old children to comprehend three types of sentences: probable (e.g., "The cat chases the mouse."), neutral (e.g., "The gray cat chases the black cat.") and improbable (e.g., "The mouse chases the cat."). Both active and passive sentences were studied.

Strohner and Nelson found that 3-year-olds were 100% correct on probable sentences, both active and passive. In contrast, 90% of improbable actives and 100% of improbable passives were misunderstood. Three-year-olds received scores of approximately 75% and 25% respectively on neutral actives and neutral passives. Four-year-olds performed at ceiling level on probable and neutral actives and were over 80% correct on probable passives. Their comprehension was somewhat above a chance level on improbable actives (approximately 70% correct)

and reversible passives (67% correct). However, improbable passives were understood only about 15% of the time. Five-year-olds received scores of 80% or more correct on all sentence types except improbable passives. Comprehension of these sentences was only slightly better than chance (approximately 67% correct).

Strohner and Nelson argued that the four-year-olds' performance suggested the occasional use of an "actor-action-object strategy" to interpret neutral passive sentences. In a second experiment (Strohner & Nelson, 1974, expt. 2), the investigators sought to counteract the expectation that the subject of a sentence always precedes the object. The training procedure was based on evidence that both adults and children process passive sentences more easily when the recipient of the action in the nonverbal context, rather than the actor, is the focus of attention.

A total of 100 4-year-olds were pretested for comprehension of neutral passive sentences. The youngsters were matched on pretest score and assigned to four experimental conditions and a control condition so that the groups were equal on pretest comprehension. In the matched passive condition, children were shown action drawings (e.g., a brown cat being chase by a black cat) in such a way that the recipient of the action was uncovered before the actor. As each part of the picture was presented, the experimenter said, "Look at the _____." Then when the entire picture was exposed, the experimenter said a sentence describing the picture ("The brown cat is being chased by the black cat.") and the child was asked to repeat it. If the child's utterance was incorrect, the experimenter supplied the correct version. The mismatched passive condition was similar to

the matched passive condition except that the children saw the actor in the picture before viewing the recipient of the action. A matched active condition and a mismatched active condition, in which only active sentences were used, corresponded in all other respects to the two passive conditions. In each experimental condition, half the sentences were neutral and half were improbable.

With respect to neutral passives, Strohner and Nelson found that the performance of children in the matched passive condition improved from pretest to posttest whereas that of subjects in the mismatched passive condition declined. The difference between the posttest scores of the two groups proved to be highly significant. In contrast, training had no significant effect on comprehension of improbable passive sentences.

The results of the Strohner and Nelson (1974) study suggest that there is a point in the acquisition of passives and subject-verb-object actives when children gain control of word order to the extent that they understand sentences which provide no extra-syntactic clues to meaning (neutral sentences). At that point, their grasp of word order may be disrupted by sentence content which runs counter to experience (improbable sentences). Finally, as the 5-year-olds' ability comprehend improbable actives suggests, knowledge of word order becomes well-established. The Strohner and Nelson findings support the hypothesis that, before children have any control of word order, they use extra-syntactic clues to interpret sentence meaning.

This conclusion is consonant with the findings from a study reported by Powers and Gowie (1977). The investigators examined the effect of children's expectations about people and animals

on the comprehension of active and passive sentences. Expectations were defined as "...the preferred 'match' between agent and action in a linguistic proposition" (Gowie & Powers, 1978, p. 474).

To find out what expectations children have, the investigators interviewed kindergarten and first grade children. These children did not participate in the main phase of the study. During the interviews, children were asked questions concerning the probable behavior of pairs of people and animals. Sample questions included: "Would a child warn a policeman or would a policeman warn a child?" "Would a sheep watch a pig or would a pig watch a sheep?" On the basis of children's responses, two types of sentences were constructed, those harmonious with expectation and those contrary to expectation.

Kindergarten and first grade children heard a series of statements, each followed by a question (e.g., "The policeman warned the child. Was the child warned by the policeman?"). In addition to expectation, several other factors were examined. These were age, type of sentence (active or passive) and question voice (same as or different from the statement). Expectation exerted the strongest influence on children's responses. At both grade levels, children gave more correct answers to questions about statements which were harmonious with expectation than to questions about statements which were contrary to expectation. Powers and Gowie (1977) concluded that children use expectations about probable actions to derive meaning from speech.

Gowie and Powers (1978) reported the above-mentioned study and five others in which expectation was manipulated. Children from kindergarten through sixth grade participated in these studies.

Comprehension of passive sentences as well as "promise" and "tell" sentences were investigated. Gowie and Powers found that children at all age levels relied on expectations to understand syntactically difficult sentences. As the investigators observed, "When a structure is simply beyond the grasp of a child, expectation affects comprehension of harmonious sentences only because it allows the child to bypass the syntax entirely and to answer according to what he or she thinks usually happens" (Gowie & Powers, 1978, p. 480).

Summary and Theoretical Issues

According to social learning theory, exposure to modeling of a syntactic form does not lead the learner simply to reproduce the model's sentences at a later time. Instead, the learner is hypothesized to induce the rule governing the model's speech. Such rule learning is inferred from selective imitation (Whitehurst & Vasta, 1975). Selective imitation is said to occur when a child copies the structural aspects but not the content of the modeled sentences.

The first social learning studies of language supported the hypothesis that verbal modeling strongly influences the syntax of children's speech. However, these studies did not yield evidence that modeling, in the absence of reinforcement or training in exact imitation, produces learning of new syntactic rules.

Whitehurst and Vasta (1975) sought to identify conditions in which modeling would teach children to apply new syntactic rules in their speech. The CIP (comprehension-selective imitation-spontaneous production) hypothesis represents those authors' explanation of how acquisition might occur. The CIP hypothesis states that verbal modeling will promote selective imitation of a

new syntactic structure when comprehension of that structure has already been established.

Several tests of the CIP hypothesis have been made. In two experimental studies (Whitehurst, Ironsmith, & Goldfein, 1974; Whitehurst, 1977), the investigators sought to demonstrate that only after comprehension training would modeling elicit selective imitation. However, comprehension of the target syntactic structures was not measured before the modeling treatment. Consequently, the CIP hypothesis that comprehension precedes selective imitation could not be adequately evaluated.

A correlational study conducted by Morgulas and Zimmerman (1979) was also designed to test the CIP hypothesis. The investigators pretested children for comprehension as well as for spontaneous production of reversible passive sentences. The study provided support for the CIP hypothesis but at the same time raised other questions about the relationship between modeling and comprehension. First, if the modeling treatment leads to comprehension, will it simultaneously elicit selective imitation or must comprehension be well established beforehand. When the CIP hypothesis was formulated, Whitehurst and Vasta (1975) suggested that children learn to comprehend speech by receiving feedback or other reinforcement for appropriate nonverbal responses to parents' questions and requests. Whitehurst and Vasta apparently did not consider the context in which adult speech to young children is typically modeled. Consequently, the authors did not discuss the possibility that modeling, even without the opportunity to respond, might lead to comprehension. Evidence that modeling can teach children to comprehend syntactic rules raises

the possibility that comprehension need not be trained in a procedure separate from and before the one used to elicit selective imitation. It may be true that the CIP formulation applies only to a specific case, the one in which the modeling situation contains no extra-syntactic clues to the meaning of the modeled sentences.

The second question raised by the Morgulas and Zimmerman (1979) study is: Under what circumstances does modeling lead to comprehension? In Brown's (1976) study, modeling of reversible passive sentences accompanied by pictorial referents increased the comprehension of children whose pretest scores were above a chance level. Furthermore, modeling in the context of actual demonstrations significantly improved the passive sentence comprehension of children with pretest scores below chance level. Brown's study was apparently the first to demonstrate that when the referents of the modeled sentences are present during training, modeling can result in comprehension of a new syntactic structure. According to social learning theory, neither reinforcement nor overt responding is necessary for rule learning to take place. The results of the Brown study are of considerable theoretical importance because they provide support for the social learning position that syntactic rules can be acquired purely through exposure to verbal modeling.

Because of the theoretical significance of observational language learning, more evidence concerning the effect of modeling on comprehension is needed. Most experimental and naturalistic studies have focused on speech production. For this reason, relatively little is known about the acquisition of comprehension skills. The Brown study revealed the importance of supplementing modeled sentences with demonstrations of the actions they describe. Other variables in

the modeling situation which may influence comprehension should be examined.

Recent research has focused on children's use, in interpreting speech, of their expectations about the probable behavior of people and animals. This research has demonstrated that sentences which are consistent with expectation are more often understood than sentences which are contrary to expectation. Findings from these studies suggest that before a child has the syntactic knowledge to understand a given sentence heard out of the context of its physical referents, the child uses prior knowledge about the referents to comprehend the sentence.

Although research has revealed the effect of expectation on children's comprehension of specific sentences, there have apparently been no investigation of children's use of expectation to learn syntactic rules. Brown's (1976) study indicates that the presence of concrete referents helps children to understand the meaning of modeled sentences and further to induce the rule governing those sentences. Can children also make use of previously acquired information about the referents of sentences to gain control of syntactic rules?

CHAPTER III

Research Questions

The present research investigated the effects of two variables on comprehension of modeled sentences. According to social learning theory, children can learn syntactic rules purely through exposure to verbal modeling and without receiving reinforcement for appropriate responses. However, it appears that in only one study was pure verbal modeling, unaccompanied by reinforcement, employed to teach children to comprehend a specific syntactic structure. In the Brown (1976) study, demonstrations of the actions described in modeled passive sentences promoted comprehension of passives. Recent research cited above suggests that before a child has the syntactic knowledge to understand sentences heard out of the context of their referents, the child uses prior knowledge about the referents to interpret the sentences. In these studies, it was found that comprehension is enhanced when information in the sentence is consistent with prior knowledge. However, previous investigations have not examined the effect of knowledge about sentence referents on syntactic rule learning. Does exposure to a model who utters sentences containing information which promotes comprehension lead children to induce the syntactic rule governing those sentences? The primary purpose of undertaking the present study was to gather evidence concerning this question.

The degree to which sentence context is consistent with prior knowledge has typically been determined on the basis of the investigator's judgment as to which events are probable and which improbable. A second approach has involved constructing probable and improbable sentences based on children's answers to interview questions. In the present study,

modeled sentences contained no extra-syntactic clues to meaning. Before modeling, children received information about the referents of the modeled sentences. This procedure was designed to foster experimental control over children's prior knowledge. In the prior relevant information conditions, children heard descriptions of the dispositions and probable behavior of the grammatical agents and objects of the modeled sentences. The performance of children in these conditions was compared with that of children who were given prior information which was not relevant to the actions described by the model. A no-modeling control group was also included.

The second purpose of the present research was to provide a partial replication of Brown's (1976) findings by examining the effect on comprehension of the physical context in which sentences are modeled. Children in the enactment conditions heard passive sentences and at the same time watched the model use dolls to demonstrate the actions described. The presence or absence of physical context was factorially varied with the two types of prior information.

All children were pretested for comprehension of reversible passive sentences. One posttest assessed comprehension of the sentences heard during the modeling treatment. To determine whether or not modeling promoted syntactic rule learning, two posttests on new passive sentences were also given. The first, considered to be a "lenient" transfer test, measured generalization of learning to sentences which contained the same grammatical agents and objects as the modeled sentences but which used different verbs. The final posttest, which consisted of sentences similar to those on the pretest except that

different verbs were employed, was considered to be a "stringent" test of transfer.

Hypotheses

The following hypotheses were evaluated.

1) It was predicted that hearing prior relevant information about the grammatical agents and objects of passive sentences would help children interpret sentence meaning and would also help children induce the word order rule for passives. A main effect of prior information was thus anticipated. On each posttest, children who received relevant information were expected to achieve significantly higher scores than children who were given irrelevant information.

2) It was hypothesized that supplying children with a physical context for modeled passive sentences would aid comprehension of the specific sentences heard and would also lead to understanding of new passive sentences. Thus a main effect of physical context was predicted. Children in the enactment conditions were expected to perform significantly better on each posttest than children in the no-enactment conditions.

3) It was hypothesized that on each posttest, the combined average score of the groups which were exposed to modeling with relevant prior information, enactment or both would significantly exceed the average score of the no-modeling control group. However, in accord with Brown's (1976) results, it was not expected that children who received modeling alone would perform significantly better on any of the posttests than the no-modeling control subjects.

4) It was anticipated that the performance of each modeling group which received prior relevant information, enactment or both supplements would significantly surpass the control group performance. This prediction was made with respect to each posttest.

Neither previous research nor a priori analysis provided a basis for predicting whether or not the interaction between physical context and prior information would be statistically significant. Therefore, no hypothesis concerning the interaction was made.

CHAPTER IV

Method

Subjects

A total of 111 $3\frac{1}{2}$- to 5-year-old children received the comprehension pretest. The children were recruited from three nursery schools and a day care center all located in middle-class neighborhoods in suburban New York. An additional 9 children from these schools began to take part in the study but were dropped because they did not follow the pretest instruction.

Because the focus of the study was *de novo* acquisition of reversible passive sentences, only those children who failed at pretest to demonstrate good passive sentence comprehension were asked to continue. Following Morgulas and Zimmerman (1979), a pretest score of 8 was adopted as the criterion for classification as a "high comprehender" and hence for exclusion from further participation in the study. (See Appendix A for a discussion of the reliability of the comprehension test with regard to classification as a high comprehender).

In the initial population, 66 children (59.5%) received pretest scores below 8 and were therefore considered eligible to participate. Of this number, four did not want to continue after the pretest and another two had to be dropped during the course of the modeling treatment because they did not learn the names of the story characters who also appeared on the posttest items. The remaining 60 boys and girls ranged in age from 3 years, 6 months to 5 years, 2 months (M = 4 years, 3 months).

Design

Within each school, children were randomly assigned to four modeling conditions and a no-modeling control condition. Modeling only subjects heard irrelevant information before the story and were not exposed to

enactment. For children in the modeling with enactment group, who also heard irrelevant prior information, modeling was accompanied by demonstrations of the actions in the story sentences. Relevant information about the story preceded modeling for modeling with relevant information subjects, but these children were not given an opportunity to watch the model's demonstration. The modeling with combined treatment group received modeling supplemented with both relevant information and enactment. Thus with respect to the modeling conditions, the design was a 2 (Prior Information Type; relevant, irrelevant) x 2 (Physical Context: enactment, no enactment) factorial.

Characteristics of Verbal Stimuli

The present study was designed to assess the effect of experimenter-provided information on children's passive sentence comprehension. Therefore, comprehension tests and training materials had to be constructed in such a way that children would have no preconceived notions about the behavior of the grammatical agents and objects of the stimulus sentences. Passive sentences which conform to this requirement are referred to throughout the text as "neutral reversible passives." Neutral sentences are those in which the probability that the referred-to event would occur is equal to the probability that the reverse would occur. Examples of passives which might reasonably be categorized as neutral include; "The car was bumped by the truck." "The mother was kissed by the child."

Reversible passive sentences may also be either probable (e.g., "The mouse was chased by the cat.") or improbable (e.g., "The cat was chased by the mouse."). The term "irreversible" is applied throughout the text to passives in which switching the position of the grammatical

agent and object would result in a sentence which was grammatically correct but semantically unacceptable (e.g., "The milk was drunk by the baby."). (See Appendix B for an explanation of the terminology used in the text).

Perhaps the surest way to compose a completely neutral sentence is to use the same noun as both the grammatical agent and grammatical object and to distinguish them by certain types of adjectives such as a color adjective (e.g., "The brown dog was bitten by the black dog."). The original research plan called for the use of this method to construct items for both the comprehension pretest and for the stringent transfer test. However, pilot testing revealed that a substantial number of preschoolers either made mistakes on color names or else had more difficulty remembering sentences with color names than those -- shorter by two words -- without them. Since the comprehension tests were intended to measure syntactic knowledge only, an attempt was made to minimize vocabulary and memory difficulties. Therefore, "the boy" and "the girl" were used as grammatical agents and objects on the pretest and on the stringent transfer test items. To ensure against any possible effect on scores of expectations concerning boys' and girls' behavior, each of the two tests consisted of pairs of sentences containing the same verb (e.g., "The boy was pushed by the girl." and "The girl was pushed by the boy.").

The passive sentences which were modeled during the treatment phase were embedded in a novel story about three characters about whose behavior children should have had no preconceived notions. The story was constructed so that unless children received either the relevant prior information or enactment, they would not be able to

determine which noun in any given passive sentence was the grammatical agent and which was the object. Thus like the test sentences, the passive sentences uttered by the model were also designed to be neutral.

To ensure that this requirement was met, two types of sentences which might have served as context clues were deliberately omitted from the story. The first type was the semantically irreversible passive which is typically understood before the reversible passive (Bever, 1970) and which therefore might have helped children interpret the story sentences. Secondly, any active sentence which might otherwise have preceded a passive sentence and provided a hint as to its meaning was also avoided.

All important story events were related in the passive voice. During pilot testing, three adults were asked to judge whether or not the story contained extra-syntactic clues to the meaning of individual passive sentences. When such a clue was detected, the appropriate change was made. All three judges agreed that children with poor passive sentence comprehension would need to rely on the experimenter-provided information in order to understand the final version of the story.

Training Materials

The verbal stimuli for all modeling subjects consisted of 24 neutral reversible passive sentences woven into a story. (Appendix E contains the complete text of the story). To introduce children to the story characters, a picture of each was shown. The pictures, black line drawings on 5 x 7 white cards, depicted the story characters as expressionless and in a standing position.

Prior information about the story, related in the active voice, was of two types. Relevant information told about the dispositions and typical behavior of the story characters. For example, one character was described as "mean" and "always getting into trouble." Children were told that a second character always "tries to make friends" with others. Irrelevant prior information primarily described the characters' clothing but did not mention their dispositions or usual behavior. The two types of prior information were the same length. (The text of both types of prior information can be found in Appendix D).

Dolls were used as story referents in the enactment conditions. The faces and clothing of the dolls were altered so that they looked like the drawings used in the posttests.

Comprehension Tests

Both the comprehension pretest and the three posttests each consisted of a 10-item picture recognition task designed to measure understanding of reversible passive sentences. All sentences were in the past tense and all grammatical agents and objects were animate. Different sentences and pictures were used on each test.

The pretest assessed comprehension of neutral reversible passives. Five pairs of pictures, black line drawings on 5 x 7 white cards, served as response choices for the 10 pretest items. The child saw each pair of pictures twice. On one trial with a pair, one of the pictures (e.g., a boy pushing a girl on a swing) corresponded to the experimenter-model's sentence ("The girl was pushed by the boy."). On the next trial with the same pair, the other picture was the correct choice for the test sentence ("The boy was pushed by the

girl."). All subjects received the test items in the same order, which was chosen randomly with the constraint that the two sentences for a pair of pictures not be presented back to back.

The first two posttests were also made up of neutral reversible passives inasmuch as both the grammatical agent and the grammatical object of the sentence was a character from the story. The first posttest contained sentences heard during the modeling treatment. The second posttest consisted of new sentences about the story characters engaged in actions different from those in the story but consistent with the characters' typical behavior. Because children could use the experimenter-provided relevant information to interpret posttest 2 sentences, this measure was considered to be a lenient test of syntactic rule learning. Ten different sentences, each accompanied by a pair of pictures, were used on the first and second posttests. The pictures were of the same type as the pretest response choices.

Like the pretest items, the grammatical agents and objects of sentences on the third posttest were "the boy" and "the girl." And as on the pretest, five pairs of sentences (e.g., "The girl was carried by the boy." "The boy was carried by the girl.") and five picture pairs served as stimuli. However, entirely different verbs than those on the pretest were used on posttest 3. Since posttest 3 items did not mention the story characters and employed different verbs than those on the first two posttests, posttest 3 was designated a stringent transfer of learning test. (Appendix F contains the pretest and posttest sentences and shows sample response choices).

Procedures

The experimenter-model took each child individually to a quiet room or area in the school for tests and treatment. The comprehension pretest was described to the child as a game with pictures. The experimenter-model said:

> We're going to play a game with these pictures. (Holds up pack of pretest response choices). The way we play the game is that I show you two pictures. While you're looking at the pictures, I'm going to tell you about one of them. You have to point to the one I'm talking about. O.K.? Let's try a few for practice. Remember to look at both pictures and listen very carefully. Then point. Don't point until I tell you which one. O.K., ready?

Then the child received three practice items to make sure that he or she understood what to do. Practice items were in the active voice and were not scored. Children who did not follow the directions for the practice items were excluded from further participation in the study.

The correct choice for half the pretest items appeared on the left and for the other half on the right. The two response choices for each sentence were shown to the child simultaneously. The experimenter-model recorded each child's response without giving feedback but did occasionally encourage the child by nodding or smiling before reading a new test sentence. Each correct response received a score of one. Incorrect responses were scored as zero.

The modeling session took place at least one week after pretesting. Again the experimenter-model worked with each child individually. Children in all conditions were told:

> Today I'm going to tell you a story and afterwards we're going to play some games with pictures. While I tell you the story, try to listen very carefully. O.K., are you ready?

It was necessary for all subjects, including the no-modeling controls, to learn the names of the story characters since they were the grammatical agents and objects of all the sentences on the first two posttests. Therefore, all children heard a brief passage in which the story characters were mentioned. At the same time, a drawing of each character was shown. (The passage and the drawings appear in Appendix C). Then the experimenter-model said, "Before I tell you the story, I want to make sure that you remember everybody in it." The experimenter-model laid the pictures of the three story characters in front of the child and pointing to each picture in turn asked, "Can you tell me who this is?" or "What is the name of this one?" If the child gave the correct name, the experimenter-model said, "very good" or "that's right." If the child named all three pictures correctly, the experimenter-model shuffled the cards, placed them before the child in a new order and again asked for the characters' names. This procedure was repeated one more time. If a child did not say the correct name, the experimenter-model supplied it and the child was given another chance. Children who did not learn the names after being told them three times were dropped from the study.

After the memory task, the experimenter-model removed the pictures and said, "Good, now you're ready to hear the story." Then, depending on treatment condition, modeling subjects heard either relevant or irrelevant information and without a break, the story itself. In the enactment conditions only, the experimenter-model used dolls to demonstrate the actions described in each passive sentence. No-modeling control subjects heard the irrelevant information but not the story. Controls also received the same

posttests as did the children in the modeling conditions.

Immediately following the story, modeling subjects were given the first and second posttests. These posttests were administered to the control group right after the irrelevant information. Posttest procedures were the same as those followed during pretesting.

Pilot testing indicated that the children would need a break after the first two posttests. Therefore, at that point, the experimenter-model said, "I have a few more pictures to show you but I think you should take a little break first." The child was then given an opportunity to stand up and stretch and to jump up and down for a minute or two before continuing with the third posttest.

CHAPTER V

Results

The data were analyzed to assess treatment effects on two aspects of children's performance: 1) comprehension of the reversible passive sentences heard during the modeling treatment and, 2) syntactic rule learning. The independent variables were verbal modeling, prior information type, physical context and the interaction of the latter two factors. There were three dependent measures. Posttest 1 measured comprehension of the same passive sentences uttered by the model. Posttest 2 consisted of a lenient test of transfer and posttest 3 was a stringent transfer test.

Table 1 presents the pretest and posttest means and standard deviations for each experimental group. As Table 1 indicates, the pretest average for all subjects was 5, a chance level score which reflects a virtual lack of passive sentence comprehension.

Correlations between sex and scores on each of the three posttests were computed. Sex was not related either to posttest 2, r = .08, or to posttest 3 scores, r = .06. However, since the correlation between sex and posttest 1, although low, proved to be significant (r = .22, p = .04), a 2 x 2 x 2 (prior information type x physical context x sex) analysis of variance was performed on the posttest 1 scores. Neither the main effect of sex nor the interaction between sex and the other two variables attained statistical significance. Consequently, the data for boys and girls were combined in testing the hypotheses of principal interest.

TABLE 1

Experimental Group Means and Standard Deviations

for Passive Sentence Comprehension

Group[a]	Pretest	Posttest 1	Posttest 2	Posttest 3
Modeling only	5.00 (2.04)[b]	5.67 (1.07)	5.08 (1.56)	5.83 (1.80)
Modeling with relevant information	4.92 (1.98)	5.67 (2.42)	6.00 (1.86)	5.75 (1.36)
Modeling with enactment	5.08 (1.73)	6.59 (2.61)	6.67 (2.15)	6.33 (2.99)
Modeling with combined treatment	5.17 (1.85)	8.00 (1.60)	6.50 (2.54)	8.33 (2.39)
No-modeling controls	4.83 (1.59)	5.17 (1.19)	4.67 (1.50)	5.42 (2.19)
	5.00 (1.79)	6.22 (2.08)	5.78 (2.05)	6.33 (2.38)

Note. Maximum score = 10.

[a]n = 12 for each group.

[b]Numbers in parentheses are standard deviations.

The Analysis of Covariance

General procedure. The data were analyzed in a multivariate analysis of covariance (ANCOVA) with comprehension pretest score as the covariate. The significance tests, which used the greatest root criterion, were based on Roy's union-intersection principle (Harris, 1975).

Roy's approach involves making an overall test of each experimental hypothesis (e.g., the test of a main effect, an interaction or a contrast between groups) by determining whether or not the experimental groups differ in terms of their means on a single transformed dependent variable. This variable, the discriminant function, is a weighted linear combination of the (three) dependent measures. The discriminant function is the best possible transformed variable which can be defined in the sense that it produces a larger univariate *F* ratio than any other linear combination of the dependent variables. In the analysis, this maximal *F* ratio is compared to a critical value which is selected so as to insure that Type I errors will occur with a probability of at most α (Tatsuoka, 1971; Harris, 1975).

If the maximal *F* ratio fails to reach significance, it should be concluded that the experimental groups are equal not only on the discriminant function, but also on all other combinations of the dependent measures and on each one separately. In contrast, if the null hypothesis is rejected, then at least one *post hoc* comparison among the groups will prove to be significant. Specifically, group differences on the discriminant function will significantly exceed zero. Once the null hypothesis is rejected, comparisons among the means on any single dependent measure or combination of dependent measures may be

may be performed. (For a discussion of Roy's principle, the reader is referred to Harris, 1975). In the present study, the overall test of each hypothesis and the tests involving the individual posttests were all carried out at the conventional .05 level of significance. Results which were significant at an even lower level will be specifically reported as such.

Preliminary tests. ANCOVA is properly performed only when the lines representing the regression of the dependent variable on the covariate are parallel across the experimental groups (Tatsuoka, 1971). This section reports the results of the test of this "assumption of equal slopes." The next sections describe 1) the 2 x 2 factorial analysis and 2) the set of comparisons between the treatment groups and the no-modeling control group.

In the preliminary stage of the analysis, the following model was used: $\underline{y} = \underline{B}_0 + \underline{B}_1 X_1 + \underline{B}_2 X_2 + \underline{B}_3 X_3 + \underline{B}_4 X_2 X_3 + \underline{B}_5 C + \underline{B}_6 X_1 C + \underline{B}_7 X_2 C + \underline{B}_8 X_2 X_3 C + \underline{B}_9 X_2 X_3 C + \underline{e}$

The model represents the dependent variables as a weighted linear combination of the independent variables. $\underline{B}_0$ is a constant. Each $\underline{B}_i$ is a vector consisting of the three regression weights for each dependent variable. In the equation, X_1 represents membership in the modeling conditions and X_2 and X_3 represent membership in the groups which received relevant prior information and enactment respectively. C is the covariate, comprehension pretest score, and $\underline{e}$ is a vector of error scores.

None of the interactions between pretest score and the treatment variables reached statistical significance, all $\underline{p} < .10$. Therefore, the interaction terms, $\underline{B}_6$, $\underline{B}_7$, $\underline{B}_8$ and $\underline{B}_9$ were dropped from the model.

The factorial analysis. To compare the effectiveness of providing different types of information to children who heard modeled passive sentences, a 2 x 2 (prior information type x physical context) ANCOVA was performed. As inspection of Table 1 suggests, the predicted main effect of prior information type (Hypothesis 1) did not emerge, T^2 (3, 56) = 3.80. Children who received relevant prior information did not score significantly higher on the three posttests than did children who received irrelevant prior information. In contrast, physical context exerted a strong influence on children's passive sentence comprehension, T^2 (3, 56) = 12.88, $p < .02$. *Post hoc* tests revealed that on the discriminant function and on posttest 1, children in the enactment conditions performed significantly better than those in the no-enactment conditions. However, the performance of enactment and no-enactment subjects did not differ on either posttest 2 or posttest 3. Thus the data provide partial support for Hypothesis 2.

Although no predictions concerning the interaction had been made, ANCOVA disclosed that it narrowly missed the conventional level of significance, T^2 (3, 56) = 8.63, $p = .06$. The pattern of scores shown in Table 1 reflects this finding. Children in the modeling with combined treatment group achieved considerably higher scores on both posttest 1 (M = 8.00) and posttest 3 (M = 8.33) than did children in the modeling with enactment condition, (Ms = 6.58 and 6.33 on posttests 1 and 3 respectively). In contrast, the average scores of children in the two no-enactment conditions were quite similar to each other.

Control group comparisons. To evaluate the effects of the modeling treatments, a series of comparisons was made between children in the modeling conditions and the no-modeling controls. It has been predicted that the average posttest score of the control subjects would be surpassed by the combined average of the three groups which received modeling with prior relevant information, enactment or both kinds of supplement (Hypothesis 3). This overall hypothesis was supported, T^2 (3, 56) = 11.19, p = .02. Post hoc testing uncovered a significant difference between modeling and no-modeling subjects on the discriminant function but not, however, on any individual posttest. Also, in accord with Hypothesis 3, children who received modeling only, without either prior relevant information or enactment, did not achieve significantly higher mean posttest scores than control children, T^2 (3, 56) < 1.

The performance of the controls was compared with that of children in each group in which modeling was supplemented with prior relevant information, enactment or both. The modeling with combined treatment group outscored control subjects and the difference was highly significant, T^2 (3, 56) = 20.72, $p < .001$. Post hoc tests showed that the mean score of children who received the combined treatment was significantly superior to the control group mean on the discriminant function and on posttests 1 and 3. Thus except for posttest 2, the performance of the combined treatment group conformed with Hypothesis 4. The performance of neither the modeling with relevant information group nor the modeling with enactment group supported this hypothesis. Although children in both groups scored better on all the posttests than did the control children (see Table 1), in neither the former case, T^2 (3, 56) = 3.38, nor in the latter, T^2 (3, 56) = 7.01, did the difference attain statistical significance.

Subsidiary Analyses

Item analysis. In order to understand the combined treatment group's inferior performance on posttest 2 relative to that on posttests 1 and 3, the responses of the youngsters in this group to the items on all three posttests were analyzed. An index of item difficulty, the percentage of children in the group who responded incorrectly, was obtained.

Four posttest 2 items were failed by 42% to 58% of the youngsters who received the combined treatment. None of the items on either posttest 1 or posttest 3 was failed by such a large percentage of the children in this group. On posttests 1 and 3, the failure rate ranged from 0% to 33%.

To determine whether or not the four difficult posttest 2 items consistently posed a problem for the same children, individual performance was examined. Variations in item difficulty apparently did not affect the performance of seven children in the combined treatment group. These youngsters included five who scored within the high comprehension range (8 or above) on all three posttests and two children who failed to earn a score of 8 on any of the posttests. However, there were four children who achieved the high comprehension level on posttests 1 and 3 but not on posttest 2. Were it not for their failures on the difficult items, three of these children would have scored within the high comprehension range on posttest 2. The only posttest 2 items which two of the children missed were the difficult ones, one child having failed all four difficult items and the other child having failed three of them. The third child responded incorrectly to a total of three posttest 2 sentences two

of which were among the difficult ones. The performance of the fourth child was unaccountably poor on posttest 2. This child missed all four difficult items and three additional ones as well.

Age. Because the ages of the nursery school children in the present study spanned a 20-month range, two subsidiary analyses involving age were performed. In the first, the mean age of the high comprehension group was compared with the mean age of those children who received comprehension pretest scores of 7 or below and who therefore participated in the training phase of the study. Of the 43 youngsters in the former group whose birthdays were known, the average age was 53.7 months. The 56 children in the latter group for whom records of age were available averaged 51.6 months. This two month difference proved to be statistically significant, $t\ (97) = 2.2$, $p = .03$.

In the second analysis, the relationship between age and learning was examined. The correlation between age and score on posttest 1 was moderately low but significant ($r = .33$, $p < .01$). Except that the correlations were even lower, similar findings emerged with respect to the relationship between age and posttest 2 ($r = .29$, $p < .02$) and that between age and posttest 3 ($r = .23$, $p < .05$).

CHAPTER VI

Discussion

In the present study, the influence of two variables on children's comprehension of modeled passive sentences was examined. The results indicate that both prior information about the sentence referents and demonstrations of the actions described in the sentences promote language learning. Passive sentences were presented in the form of a novel story about the actions of three characters. Prior to modeling, children in the relevant information conditions heard descriptions of the typical behavior of the story characters who were the grammatical agents and objects of the passive sentences. In the enactment conditions, children watched the experimenter-model use dolls to enact the sentences. Children in the no-modeling control group did not hear passive sentences. The first posttest assessed children's understanding of the story sentences. Two additional posttests measured transfer of learning.

The pattern of results leads to the conclusion that the combination of prior relevant information and enactment and not either variable alone, constituted the crucial factor in syntactic rule learning. In the factorial analysis, the main effect of physical context, but not of prior information type, proved to be significant and the interaction was marginally so. These findings imply that prior relevant information played a minor role in promoting comprehension. However, the results of the factorial analysis must be considered in conjunction with the set of comparisons between each of the treatment groups and the no-modeling controls. Only the group which received modeling together with both relevant information and

enactment scored significantly higher than the controls, indicating that relevance of information did combine with enactment to promote comprehension.

Like the other groups, the modeling with combined treatment group scored at a chance level on the comprehension pretest. However, only children who received the combined treatment attained that performance level which had been defined at the outset as the criterion of good passive sentence comprehension. The modeling with combined treatment group averaged 80% mastery of posttest 1 passives and continued to display the same high level of comprehension (83%) when confronted with entirely new passives on posttest 3. Thus it can be concluded that modeling supplemented with both relevant prior information and enactment did not merely facilitate comprehension but led to syntactic rule learning. All the other modeling groups achieved higher mean posttest scores than did the no-modeling controls. However, these modeling groups -- including the modeling with enactment group -- failed to surpass the controls to a significant extent or to reach the high comprehension level on any of the posttests.

The present research focused on manipulating children's expectations about how those who were the grammatical agents and objects of the modeled sentences would behave. It has been hypothesized that children would correctly interpret story events told in the passive voice when they were consistent with the children's expectations. It has also been predicted that children who were helped to understand the modeled sentences would induce the syntactic rule governing their word order. To test these hypotheses, it was necessary to force children to rely solely on experimenter-provided

clues -- relevant prior information and enactment -- in interpreting the story. Consequently, neutral reversible passives were modeled in a story from which irreversible passives and actives which might provide context clues had been deliberately excluded. Also avoided in constructing the story were probable reversible passives. Thus children in the relevant information conditions needed to engage in a type of problem-solving. They had to attend to information provided before the story, hold this information in memory during the modeling treatment and use it to make sense of grammatically unfamiliar sentences.

The results of the control group comparisons support the hypothesis that prior information about sentence content did help children to gain control of a complex linguistic form. Contrary to prediction, however, a main effect of prior information type did not materialize. What might account for this result? The treatment may simply not have been strong enough. In particular, the relevant information was given only one time prior to the modeling treatment and children learned about the story characters through verbal descriptions of their typical behavior. Before concluding that children cannot, or do not, use prior relevant information in the absence of enactment, other ways of presenting the information should be evaluated. In the everyday environment of language learning, children form impressions of people and storybook and television characters from repeated exposure to them. Furthermore, expectations about the behavior of others are more often developed by observing their actions than by hearing verbal accounts. Therefore, future investigations should assess the effects of information presented

during several sessions before modeling. Prior information (which does not overlap with the actual content of the modeled sentences) may prove to be more effective when presented visually than when presented verbally. This possibility should also be explored in future research.

A second unexpected and somewhat puzzling finding was the combined treatment group's inferior performance on posttest 2 as compared with their performance on posttests 1 and 3. Only on the second posttest did the mean score of this group fail to exceed that of the no-modeling controls. Analyses of the posttest responses of the youngsters who received the combined treatment pointed to four posttest 2 items as the source of the problem. Inspection of the data further revealed that these items were a stumbling block for four children who scored 80% or higher on both posttests 1 and 3 but fell below the high comprehension level on posttest 2. Apparently because of their greater difficulty, these sentences did not discriminate between those children who displayed good comprehension on posttests 1 and 3 and those who did not.

Thus the question arises, which features of the "difficult" items accounted for their difficulty? These features appear to be lexical rather than syntactic. The four items in question contained the verbs "was smiled at," "was kissed," "was held" and "was treated." These actions were thus more subtle and perhaps less easily interpretable than those named in the other posttest 2 sentences (e.g., "was punched," "was scratched," "was slapped"). It is true that some posttest 1 items (such as those containing the verbs "was waved at" and "was hugged") were similar to the difficult posttest 2 sentences but were not failed by a large percentage of the children. The combination of relevant

information and enactment may have enhanced the comprehension of items which would otherwise have been misinterpreted.

Future research on passive sentence comprehension should include systematic examination of those lexical characteristics which facilitate or hinder understanding in the child who is just beginning to develop comprehension skill. For example, interpreting pictorial representations of sentences involving subtle actions may require closer inspection and a greater ability to inhibit impulsive responding than is typical of most preschoolers (Wright & Vlietstra, 1975).

Age and Passive Sentence Comprehension

Although all the children in the present study attended nursery school, their ages covered a fairly wide (20-month) range. Therefore, the data were analyzed to determine the extent to which age played a role in the acquisition of comprehension skill. Two questions were posed: 1) Were the children who were excluded from the training phases of the study on the basis of their pretest scores older than the children who were retained? 2) Was age related to learning as measured by post-test scores?

Two aspects of the data bear on question 1. First, the average age of the excluded group exceeded that of the included group by two months, a difference which is statistically significant but small. Second, the ages of the excluded children spread across as broad a range as those of the included children. Consequently, the oldest child who participated in the training phase of the study was 18 months older than the youngest high comprehender.

These findings are scarcely surprising in view both of the amply documented growth in language skill throughout the preschool and

elementary school years and of the widely observed variability in language skill within age groups (Higgins, 1976). Like previous research findings, the present data suggest the need for caution in making inferences about comprehension skill on the basis of age alone. In particular, it would seem highly inadvisable to assume that, without intervention, any given child will gain control of a specific syntactic form by an "average" age or even by the time when lack of comprehension skill will place the child at a disadvantage in the classroom.

With respect to the second question which was posed, it was found that correlations between age and scores on each posttest proved to be statistically significant. However, age accounted for only 11%, 8% and 5% respectively of the variance in scores on the first, second and third posttests.

It does seem reasonable that age would be associated to some extent with posttest performance. Training and posttests took place in one block of time and required sustained concentration on the task at hand. Numerous studies (for a review, see Wright & Vlietstra, 1975) have shown that selective attention during cognitive tasks increases with age. Some of the older children in the present sample may have spent more time in nursery school than the younger children and therefore been better able to focus on relevant aspects of the experimental procedures. In future research, it would be worthwhile to ascertain whether or not the age effects found in the present study would obtain if the training and testing period were divided into short, separate units.

Linguistic Strategies

Previous research has focused on the strategies children adopt when they hear grammatically unfamiliar sentences. For example,

Bever (1970) found that when extra-syntactic clues are lacking, there is a stage at which young children interpret passive sentences as if they were actives. According to Bever, his data suggest that children adopt an "order of mention" strategy, thereby incorrectly identifying the grammatical object of the sentence as the subject. Data from the present study bear on Bever's hypothesis.

A child who consistently employs an order of mention strategy should score well below a chance level on the comprehension tests. However, the mean pretest score in the present study was 5. Only seven children scored in the 0-2 range at pretest and only seven more received pretest scores as low as 3.

These data indicate that very few children overgeneralized the subject-verb-object word order of the active sentence. This finding accords with the results of investigations reported by Brown (1976) and by Lempert (1978) who concluded that in her sample of 3-, 4- and 5-year olds, "There was no evidence that the order of mention strategy is prominent in passive sentences comprehension at any age level" (p. 496). However, even though few children rely on an order of mention strategy, those few who do may benefit from instructional methods which not only provide support in interpreting passive sentences, but also explicitly draw attention to the differences between actives and passives. Future studies of passive sentence comprehension should compare the efficacy of such variations in instructional methods.

The Influence of Enactment

The main concern of the present research was the effect of prior knowledge about the content of modeled sentences which were grammatically unfamiliar to children. A subsidiary purpose was to replicate Brown's (1976) findings concerning the information provided by demonstrations

of the actions to which the modeled sentences referred. The results are only partially concordant with Brown's. Brown found that enactment promoted syntactic rule learning, whereas in the present study only those children who received both prior relevant information and enactment achieved a comparably high level of comprehension.

Methodological differences between the two studies may account for the variation in results. Unlike the children in the present study, Brown's subjects heard passive sentences embedded in a story context which contained many clues to the meaning of the modeled passives. In Brown's study, therefore, the effect of enactment may have included the contribution to comprehension of these variables in the story context.

One type of meaning clue was the active sentence which limited the interpretation which children could give to the immediately following passive sentence. As Brown (1976) explained, "...when children heard that 'Hubert was jumped by the horse,' the previous information that Hubert flopped in the street and could not move operated against the interpretation, 'Hubert was jumped by the horse.'" (p. 196). Since the children in all the modeling conditions heard the same story, the effect of the story context, as separate from enactment, was not measured.

In a supplemental experiment to test the hypothesis that story context enhanced learning, Brown compared the performance of a group which was given the original story and a group which heard the story passives interspersed with unrelated sentences in the active voice. The investigator found no significant differences in comprehension among these two groups and a no-modeling control group. Children who received the original story scored only marginally better on one of the comprehension posttests than on the pretest.

Clearly, this result implies that verbal context exerted little influence on comprehension. However, Brown's supplemental experiment does not actually provide an answer to the question of whether or not the effect of enactment was enhanced by the influence of the story context. First, Brown's experimental design did not include an enactment only condition and therefore he could not assess the role of enactment within a verbal context -- like the one in the present study -- from which all meaning clues had been removed. Second, the supplemental experiment was designed to investigate only one of the variables in the story context: active sentences. But the story contained other elements which may have served as clues to the meaning of the reversible passive sentences and combined with enactment to promote learning. In particular, the children in all the modeling conditions heard irreversible passives along with the reversible ones and there is evidence that children understand the former type of sentence before they master the latter (Bever, 1970; Strohner & Nelson, 1974). The results of a study reported by Ehri and Galanis (1980) suggest that the presence of the irreversible passives may itself have facilitated reversible passive comprehension. (For a description of this study, see Appendix G).

It cannot be determined *post hoc* whether the present results and Brown's (1976) findings vary because of differences in the verbal context in which reversible passives were modeled. The effects of these differences in methodology should be addressed in future research.

Subprocesses in Syntactic Rule Learning

Given the intentionally uninformative story context used in the

present research, how did the combination of prior knowledge about the sentence referents and enactment operate to promote learning? Brown (1976) argued that enactment is unlikely to have worked primarily by affecting attentional functions. The investigator noted that children in his modeling with enactment condition and those in his modeling with pictorial referents condition appeared to be equally interested and attentive during treatment. Therefore, he reasoned, the superior performance of the former children could not be attributed to attentional factors. According to Brown, enactment would seem rather to have influenced retention, mainly by providing complete information about the events and relationships stated in the modeled sentences.

Brown's analysis does not explain the present results. In contrast to Brown's study, enactment was the only type of visual aid employed in the present research. Thus attention to the story may have been much greater in the enactment conditions than in the modeling alone or the modeling with relevant information conditions. In addition to the reasons cited earlier, a lesser degree of interest on the part of the no-enactment subjects, as compared with the enactment subjects, may partially explain the failure to obtain a main effect of prior information type.

More generally and even more importantly, Brown did not distinguish between attentiveness or interest and selective attention. Enactment may arouse interest in the story and also provide high fidelity information about the relationships represented in language. But the real question is whether children selectively attend to the task-relevant aspects of the visual presentation rather than fixating on unimportant details.

The passive sentence has three critical grammatical elements: the grammatical object of the sentence, the action and the agent. The young child's principal task in learning to decode the passive is to understand the object-agent relationship (Brown, 1976). In the present study, the combined treatment apparently succeeded better than eanctment alone in clarifying the nature of this relationship. A plausible explanation is that enactment directed children's attention to the specific action being performed rather than to the agent-object relationship. The kinetic aspect of the visual presentation may have attracted children's interest to the point where they simply did not pay much attention to which character was being hit, for example, and which character was doing the hitting. Hearing the relevant information before watching the demonstration may have "set" children to focus on the characters who were to be the grammatical agents and objects of the modeled sentences.

As Brown (1976) argued, it seems highly likely that enactment does influence retention. A large number of studies (Rohwer, 1970; Paivio, 1971) has shown that information presented in the form of concrete enactive referents is better remembered than the same information presented verbally. However, unless during enactment children attend to the agent-object relationship, it is difficult to see how this information will be incorporated into a memory image and stored along with information about the action. Thus prior relevant information may work at the attentional stage to ensure that the agent-object relationship is encoded. Validation of this explanation must await future study. Social learning theory clearly

specifies the subprocesses activated during learning by observation. However, the body of social learning research on language skills has only recently begun to include work on comprehension. Thus future studies should focus not only on assessing the efficacy of variables accompanying varbal modeling but also on dlucidating the processes by which specific variables produce their effect.

Language Learning and Directions for Future Research

The present study should be viewed against the larger background of social learning research on language skills. The social learning approach to language acquisition focuses on the induction of language rules from modeled exemplars. Thus as Brown (1979) pointed out, it emphasizes the importance of environmental conditions which foster learning and activate the performance of learned skills. At the same time, social learning theorists stress the cognitive processes which underlie learning and performance. From a social learning perspective, environmental influences on syntactic rule learning include modeled linguistic structures, the nonverbal contexts in which those structures are uttered and the model's behavior.

In the past, efforts to examine language acquisition from a social learning point of view have been somewhat hampered by evidence from developmental psycholinguistic studies which seemed to imply that a number of variables relevant to social learning theory do not operate in the natural environment. For example, Whitehurst and Vasta (1975) formulated their CIP hypothesis (see p. 18) in part as a way of explaining how children learn to produce new syntactic forms when, according to developmental psycholinguists, parents typically do not reinforce young children for correct grammatical usage. However, recent work indicates that mothers

use a wide variety of techniques, including corrective feedback, to teach syntax and morphology as well as semantics (Moerk, 1976). Thus findings from such observational studies provide encouragement for those wishing to study how the behavior of adult models influences language learning. Future social learning research should explore not only the use of such teaching techniques but also their specific functions.

The present research was inspired in part by correlational studies of semantic and cognitive factors which have been found to affect children's comprehension of complex syntactic structures. In addition to expectation, investigators have identified other semantic and cognitive factors which also enhance comprehension. Among those cited by Gowie and Powers (1978) are one's understanding of the issue being discussed and knowledge of the intended referent. The effect on syntactic rule learning of supplementing verbal modeling with these variables should be examined. Finally, future investigations should determine whether variables which combine with modeling to promote comprehension also lead to imitation and spontaneous production.

Implications for Education

Social learning theory holds that cognitive processes play an important role in learning by observation. According to Bandura (1977),

> ...modeling influences produce learning principally through their informative function. During exposure observers acquire mainly symbolic representations of the modelled activities which serve as guides for appropriate performances (p. 22).

Social learning theory explicitly distinguishes between acquisition and performance. Reinforcement affects the probability that a learned response will be performed. However, reinforcement is not

a necessary condition for learning to occur. In the present study, it was found that verbal modeling accompanied by prior relevant information and enactment promoted comprehension even though the treatment did not include opportunities for the children to make overt responses during modeling and thereby to receive reinforcement. Thus the present results add to a growing body of support for the social learning view that language skills can be acquired through modeling alone.

Observational learning requires the induction of rules from a set of modeled exemplars. The present results support the hypothesis that prior information about sentence referents together with the information conveyed by the model's demonstrations permitted children first to understand the modeled passive sentences and then to induce the word order rule for passives. Prior research has demonstrated that children's store of information about the probable behavior of people and animals is a key factor in children's comprehension of language. Apparently, however, no previous studies have shown that exposure to modeling, combined with symbolic information about sentence referents, leads to the learning of language rules. Although in the present study relevant information exerted its influence only in the presence of enactment, other means of presenting relevant information (see p. 59) should prove to be more effective. The present findings are encouraging. Even though the method of providing prior relevant information may not have been optimal, children evidently used the information as a problem-solving tool.

In discussing research trends, Gowie and Powers (1978) also noted the current emphasis on the problem solving nature of language

comprehension, "...there has been a gradual revision in how comprehension is viewed from a focus on the importance of deep or underlying syntactic structure, then to a focus on semantic constraints and multiple cues including extralinguistic factors and finally to the more recent focus on prior knowledge or referential event structures" (p. 485). As the authors remarked, comprehension of a spoken sentence is a process to which "...The listener makes a contribution, ultimately, the contribution of interpretation" (p. 486).

The present findings seem to have importance for educational practice. A major educational goal is to free children of dependence on immediate events in comprehending spoken language. Children need to master the linguistic code so that they can understand oral and written communication about past and future occurrences. Using information about sentence content to understand complex linguistic forms represents a transition between reliance on physical context and complete control of language. The finding that children can use such information to learn language rule has implications for the design of early language training programs. For example, such programs might be planned so that at first, maximal contextual support would accompany the modeling of complex constructions. Relevant information given before modeling might then replace physical context. Only after comprehension of linguistic rules is well established would language forms be modeled in isolation. Such an approach would call upon children's ability to use their interpretational and problem-solving skills to gain control of language. Like other recent investigations, the present study supports the hypothesis that even the young child is an active participant in the process of language learning.

APPENDICES

Appendix A

In order to examine comprehension test reliability, a group of high comprehenders (children whose comprehension pretest scores of 8 or above made them ineligible for training) received posttest 3 at least one week after pretesting. This group, which consisted of 17 children, included all high comprehenders who were available for retesting when the experimenter's schedule permitted.

Because of the restricted range of the children's pretest scores, a correlational method for determining reliability was not used. Instead, the percentage of children who were classified as high comprehenders on both the pretest and on posttest 3 was computed. A total of 15 youngsters, 88% of the group, achieved the high comprehension level on both tests.

Appendix B

So that readers who are familiar with research on passive sentences are not confused by the terminology employed in the present study, an explanation is in order. Different investigators have adopted various schemes for categorizing passive sentences. The simplest division is between semantically irreversible sentences (e.g., "The grass was eaten by the goat.") and semantically reversible ones (e.g., "Joe was greeted by Bill."). The basis for this distinction is readily discerned.

Other investigators (Bever, 1970; Strohner & Nelson, 1974) have used a three-category system in which probable passives (e.g., "The ball was carried by the wagon.") are roughly equivalent to irreversible passives in the two-category system and improbable passives (e.g.,"The wagon was carried by the ball.") represent the opposite state of affairs from probable ones. Reversible passives refer to actions which could with equal probability be performed by either the grammatical agent or the grammatical object of the sentence (e.g., "The yellow bird was followed by the blue bird.").

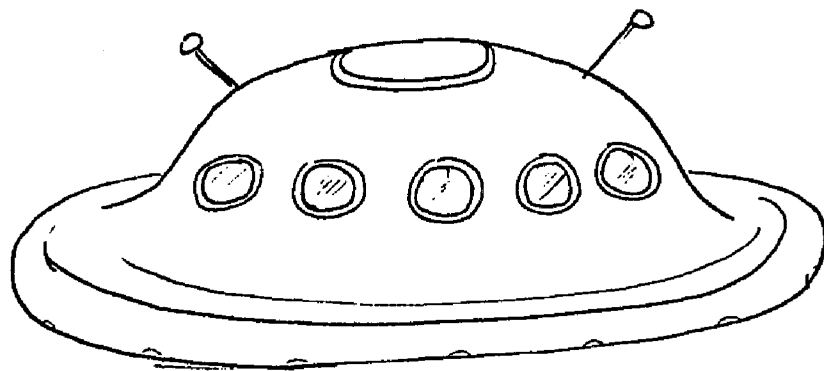
Finally, Gowie and Powers (1978) distinguished between sentences which are harmonious with expectation, contrary to expectation and neutral with respect to expectation. In a departure from previous research, Gowie and Powers classified sentences on the basis of children's responses to questions about people and animals. The investigators found that children of different ages have different expectations about behavior and therefore, that whether a given sentence is harmonious, contrary or neutral may vary with the age of the children to whom it is presented.

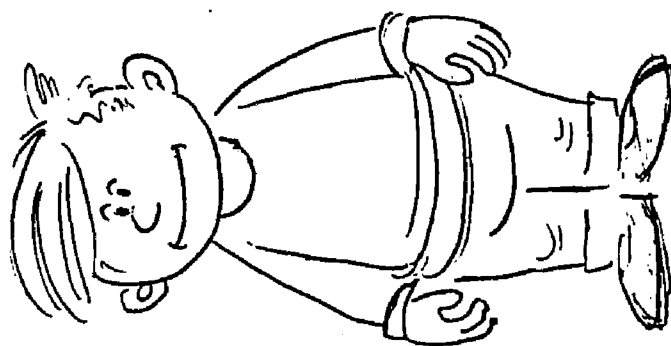
Both three-category systems point up the inadequacy of the two-category scheme. In the case of the latter, the category of reversible passives includes sentences which differ widely in terms of the likelihood of occurrence of the events to which they refer. For example, both the following sentences would be considered reversible: "The cat was chased by the mouse." and "The mouse was chased by the cat." Therefore, in the present study, a classification system with more than two categories was deemed appropriate. It was decided not to adopt the terminology of Gowie and Powers (1978) because their terms imply an empirical approach to determining sentence probability. Instead, a variant of Bever's (1970) classification system was preferred. What Bever would term "reversible" is called "neutral" in the present study. And in addition to Bever's sentence types, the category of irreversible passives was included because (unlike the term "probable") it uniquely describes sentences which are grammatically correct but semantically unacceptable.

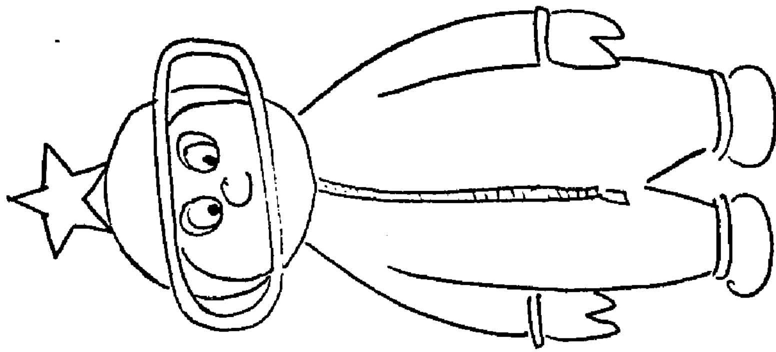
Appendix C

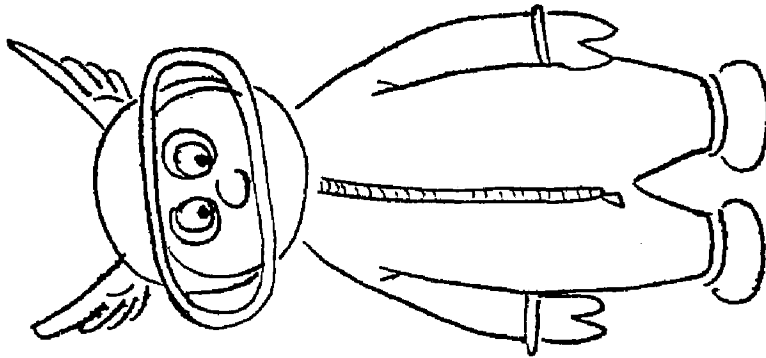
Introductory Passage For All Subjects

The story I'm going to tell you is about a boy named George (shows picture). This is a picture of George. In the story, George meets some people who come from a far-away place on another planet. To get here, these people travel in a spaceship (shows picture of spaceship). George meets two people. This is one of them (shows picture). You can see that he's wearing a spacesuit. His name is Star because he has this Star on his hat (points to star). This is the other one (shows picture). His name is Wings because he wears these wings on his hat (points to wings).









Appendix D

Prior Information

Prior Relevant Information

George is six-years old. George is a very nice boy. When he meets other children, George tries to make friends and play. George is kind to other children. He is good to them. Star is also six-years-old. But Star is mean and fights with other children. Star is not good to them. Wings is Star's father. Wings doesn't like Star to fight. Wings wants Star to play with other children. Wings tries to help Star make friends.

Prior Irrelevant Information

George lives in a house near a green field. Lucky George! George can take walks in the field. When it is cold, George wears warm clothing such as a heavy jacket and furry boots. Star and Wings go to many places in their spaceship. Whenever Star and Wings travel, they wear spacesuits. Star and Wings also wear special hats called helmets. Their spaceship is round and silver-colored. It has five windows so Star and Wings can easily look out.

Appendix E

Text of Story

One day George went walking in the green field near his house.

Suddenly, he saw something strange.

There in the middle of the field was a silver spaceship.

And standing right in front of the spaceship was...Star!

Star was waved at by George.

George and Star came close to each other.

Again, Star was waved at by George.

Then Star was hugged by George.

And Star was patted by George.

But George was hit by Star.

George was kicked by Star.

George was knocked down by Star.

Then Star was hugged by George again.

And Star was patted by George.

But do you know what?

George was hit by Star.

George was chased by Star.

Star and George went away from the spaceship and into the green field.

Again, George was hit by Star.

George was kicked by Star.

And George was chased by Star some more.

All of a sudden, there was a loud noise.

What do you think it was?

It was Wings.

Wings had been watching them.

Now, Star was grabbed by Wings.

Star was scolded by Wings.

Then George was picked up by Wings.

George was rocked by Wings.

After that, they all went to get some delicious ice cream.

George was fed by Wings.

Star was also fed by Wings.

Then they got some cookies.

George was fed by Wings.

And Star was fed by Wings.

Then it was late.

It was time to say good-bye.

Once again, Star was hugged by George.

Star was patted by George.

Good-bye.

Appendix F

Test Items

Pretest Sentences

The boy is pulled by the girl.

The boy is lifted by the girl.

The girl is pulled by the boy.

The boy is covered by the girl.

The boy is pushed by the girl.

The girl is washed by the boy.

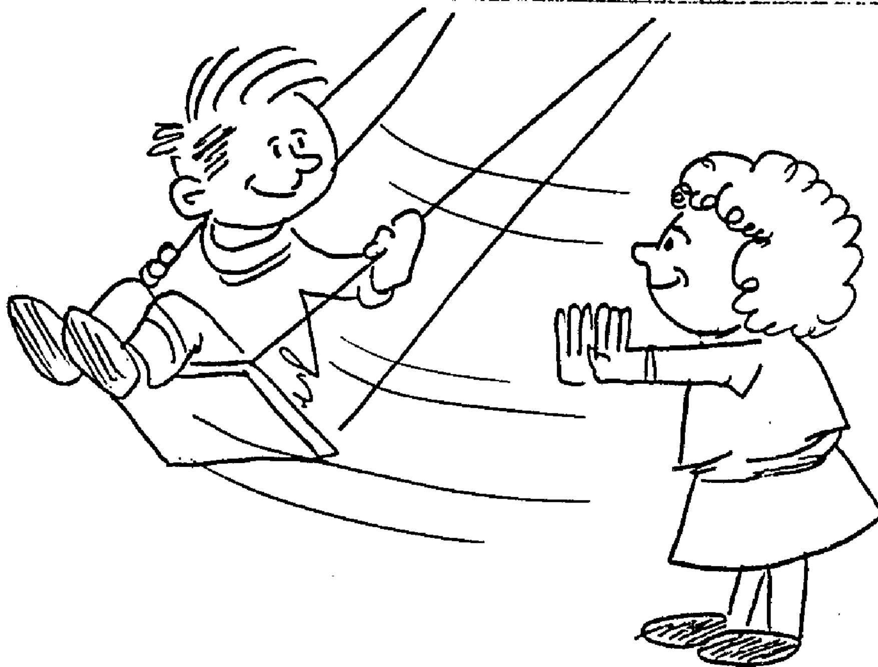
The girl is covered by the boy.

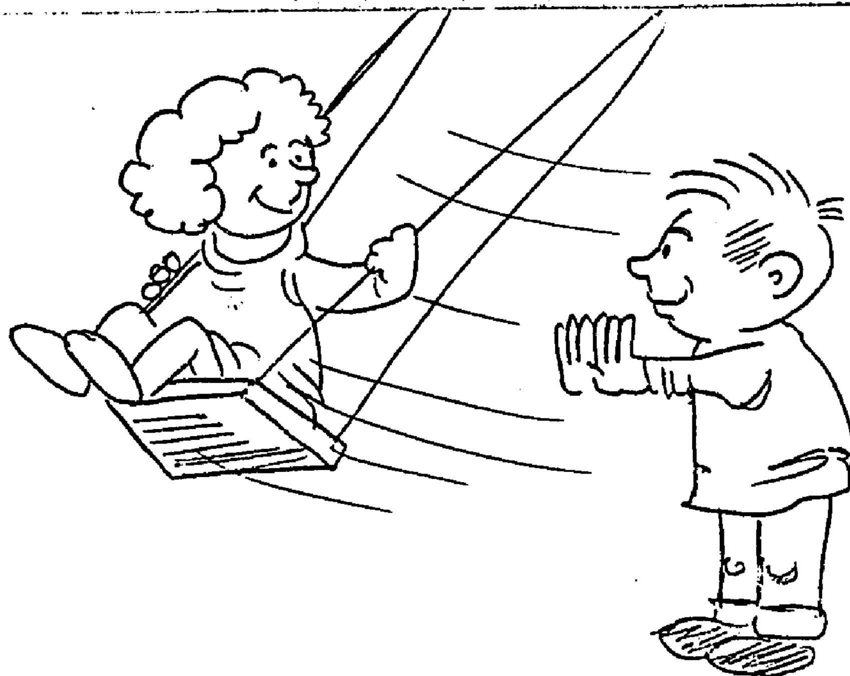
The girl is lifted by the boy.

The boy is washed by the girl.

The girl is pushed by the boy.

Response Choices for Sample Pretest Items





Posttest 1 Sentences

Star is waved at by George.

Star is hugged by George.

Star is patted by George.

George is hit by Star.

George is kicked by Star.

George is knocked down by Star.

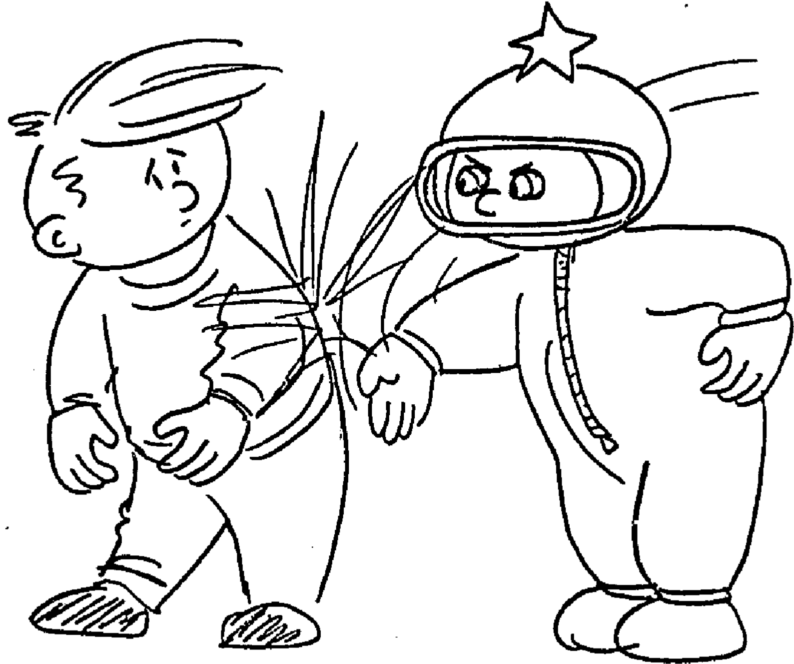
George is chased by Star.

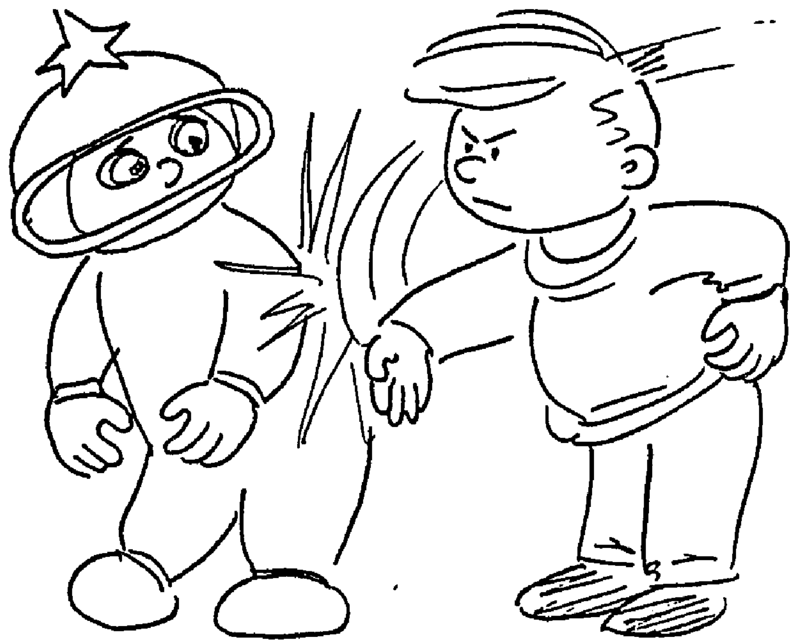
Star is grabbed by Wings.

George is rocked by Wings.

George is fed by Wings.

Response Choices for Sample Posttest 1 Items





Posttest 2 Sentences

Star is smiled at by George.

Star is kissed by George.

Star is tickled by George.

George is punched by Star.

George is scratched by Star.

George is slapped by Star.

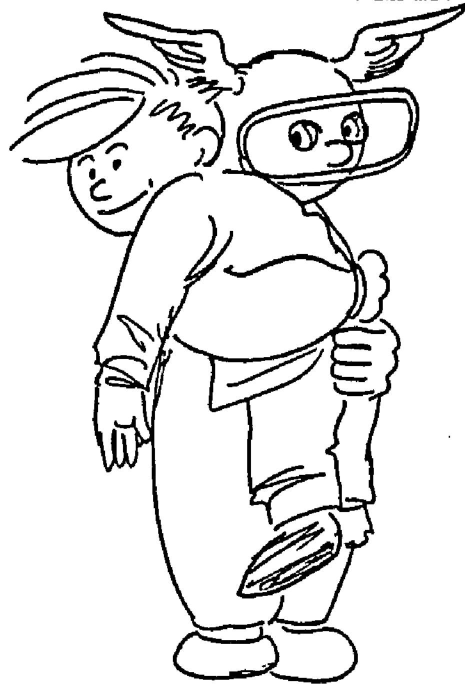
George is pinched by Star.

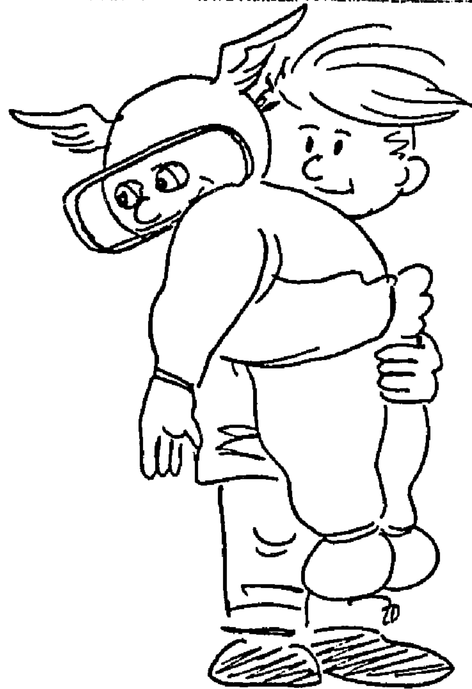
Star is caught by Wings.

George is held by Wings.

George is treated by Wings.

Response Choices for Sample Posttest 2 Items





Posttest 3 Sentences

The girl is carried by the boy.

The boy is pulled by the girl.

The boy is dried by the girl.

The boy is sprayed by the girl.

The girl is pushed by the boy.

The boy is carried by the girl.

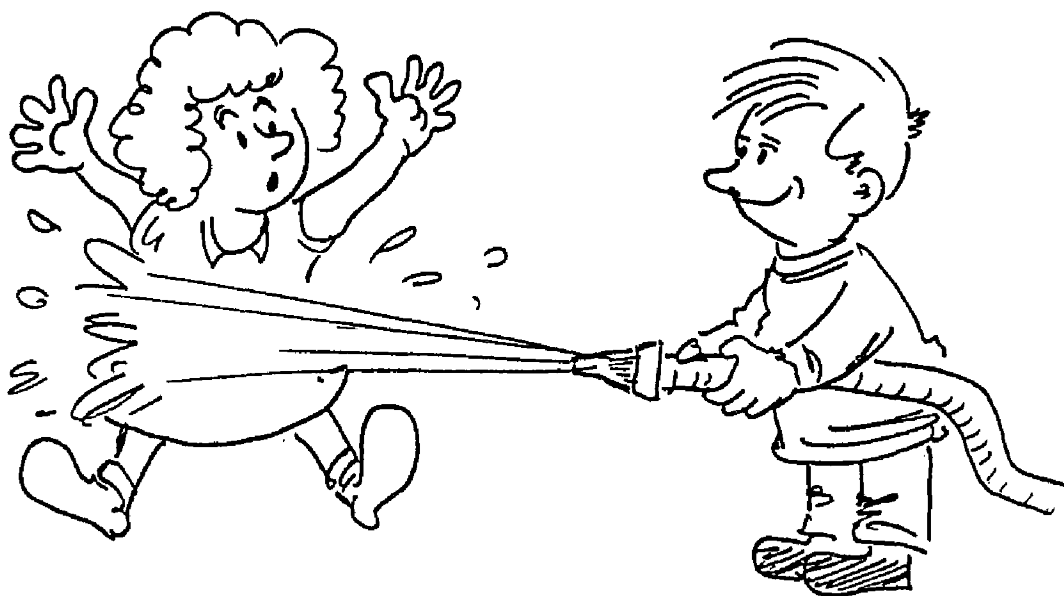
The girl is pulled by the boy.

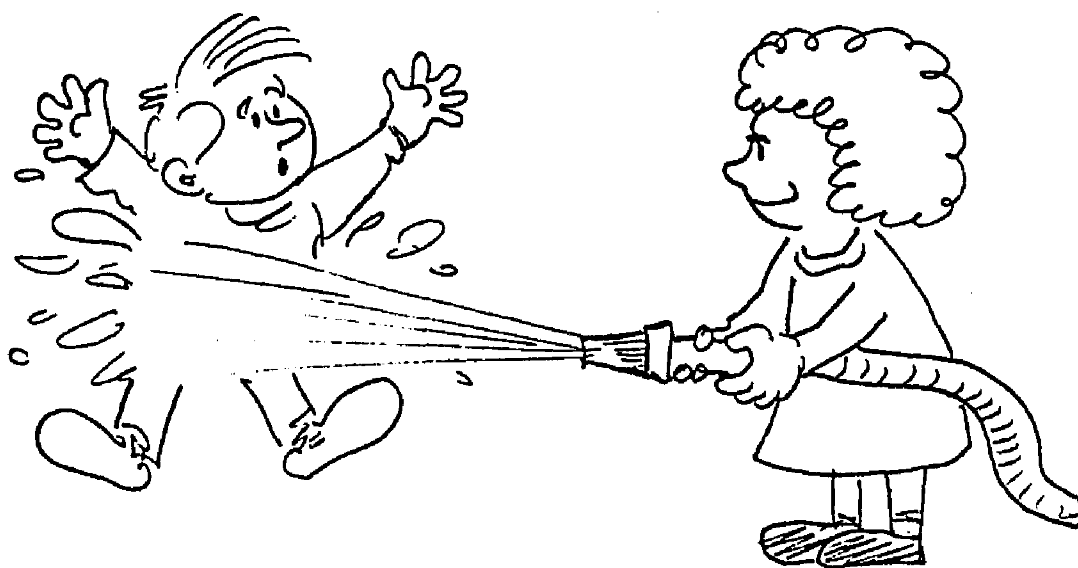
The girl is dried by the boy.

The girl is sprayed by the boy.

The boy is pushed by the girl.

Response Choices for Sample Posttest 3 Items





Appendix G

Ehri and Galanis (1980) sought to teach nursery school children to understand "before" and "after" sentences in which the order of mention of events does not correspond to their actual order of occurrence (e.g., "Before Joe leaps, he looks."). When the events in such sentences are logically sequenced (e.g., "Before Joe opens the door, he unlocks it."), young children use their world knowledge to interpret the sentences correctly. Difficulties in comprehension typically arise only when the events are arbitrarily sequenced (e.g., "Before Joe leaps, he jumps."). In these cases, children adopt an order of mention strategy and thus misconstrue the expressed sequence.

In the Ehri and Galanis (1980) study, the training procedure, which proved to be highly effective, consisted of practice in acting out both logically sequenced sentences and arbitrarily sequenced sentences in alternation. According to the investigators, this procedure caused children to use the incorrect order of mention strategy back to back with the correct reverse order strategy and thus to detect and rectify the inconsistency. Similarly, the children in Brown's (1976) study may have applied the word order rule they used to decode irreversible passive sentences to the interpretation of reversible passives.

Appendix H

The significance of a $\underline{T}^2$ statistic can be investigated in terms of an $\underline{F}$ distribution. $\underline{T}^2$ has two degress of freedom which are equal to 1) NYVAR and 2) N - NYVAR - 1, where NYVAR = the number of dependent variables and N = the total number of subjects. The critical value of $\underline{T}^2$ at a given level of significance is found by multiplying the tabled $\underline{F}$ value by a factor which depends on NYVAR and N, specifically (N-2)NYVAR/(N-NYVAR-1)(Morrison, 1967).

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