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AUTHOR Hatch, Evelyn
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ABSTRACT

This document reports an investigation of the developmental changes in the use of certain syntactic structures by white, monolingual, middle class five- and seven-year-olds, and of the differences between the syntax of young children and that used in beginning reading textbooks. Approximately half of the publication presents the methods and results of four separately designed experiments: (1) mass and count noun responses of young children, (2) pronoun case preference of young children, (3) comprehension of time connectives by young children, and (4) comprehension of conditional structures by young children. Other findings reported are that, in the presentation of syntactic structures, reading books followed neither a pedagogically-determined sequence nor one which paralleled the child's language development. It is recommended that new structures be systematically introduced orally, but not be presented in the reading texts until the child can understand and use them. Included are statistical tables, a list of references, and results of other relevant studies. (MF)

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Four Experimental Studies In Syntax of Young Children

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FOUR EXPERIMENTAL STUDIES IN SYNTAX OF YOUNG CHILDREN

Evelyn Hatch

INTRODUCTION

In preparing a set of beginning reading materials, certain assumptions are made about the language ability of the child. Some of these assumptions are clearly stated. For example, the vocabulary chosen may be justified as being at a given frequency level for the child. Assumptions are also made about the child's ability to learn the reading code from a greater or lesser number of phoneme-grapheme correspondence rules given in a series. Much effort is spent on formulating these guidelines.

Assumptions made about the child's syntax, however, are scarcely mentioned at all. Some series do claim to begin with "basic sentences" and to work from there to more complex sentences. The assumption seems to be that children acquire complex sentences after first learning more basic sentences, and that textbooks should also follow this order. But to most textbook writers this advice has apparently meant staying within a certain word limit (the magic 11), for such sentences as the following from preprimers and primers used as source materials[1] can scarcely be considered syntactically simple:

[1]Lippincott, MacMillan, SRA, and SWRL textbooks were used for all sentence examples cited in the studies.

"It's right for me to have to take it."
"Away he ran to get it fast."
"We will see if that fat fish is in the sand."
"Do some wild animals not have to run at all?"

This lack of concern for sentence syntax is, perhaps, traceable to the generally accepted statement that the child entering school knows his language. Writers who accept this statement believe they have carte blanche as to structures they may include in a primer. If the child knows all the structures of his language, the writer need scarcely concern himself with syntax; he can devote all his efforts to the problem of word attack skills and vocabulary building. Furthermore, the statement is generally endorsed by students of child language acquisition. Berko (1958), for example, gave support to the statement by showing that children entering school have little trouble with the rules of English morphology. In language samples gathered by Loban (1964), Strickland (1962), and O'Donnell, Griffin and Norris (1967), language structures of the 5- and 6-year-old were generally just as complex as those of the 8- to 10-year-old child. Menyuk's studies (1963, 1964) move the appearance of many complex structures back to the 3-year-old group.

Such studies have done much to promote the idea that language learning is not really the ultimate example of learning behavior as once described (i.e., a system developed by the child through a learning process begun with imitation of the parent model and continued with gradual increases in skill over a 15-year period, if not longer). Rather it shows language acquisition as an amazing 30-month process made possible by wired-in abilities set off by physical maturation. It is, as Fraser (1964) jokingly remarks, as if every child were born with his own little copy of Chomsky's Aspects tucked away inside him which magically unfolds page by page until at 36 months the constructing process is so sophisticated that the child produces all varieties of sentences up to the 10- or 11-word limit.

Nevertheless, few kindergarten teachers would agree that there is no room for development (aside from vocabulary building) of the child's language ability. And recent research is beginning to show that the grammar of the child of 5 still differs in many respects from that of an adult. Olds (1968), for example, showed that children aged 7 to 11 do not give consistently appropriate responses to commands using certain connectives. Carol Chomsky (1968) showed an orderly picture of gradual acquisition of certain structures in the responses of children aged 5 to 10.

Statement of the Problem

The problem of this study was to investigate designated areas in the syntax of young children. Two aspects of the problem were studied:

1. The developmental changes in the use of certain syntactic structures by children between the ages of 5 and 7 years.

2. The ways in which syntax of young children differs from that used in beginning reading textbooks.

Following a survey of the literature in the field of language acquisition, four areas of syntax were chosen for experimental study. The criteria for selecting these particular structures for further investigation were:

1. Incomplete empirical evidence on comprehension or production of the structure by young children.

2. Anecdotal evidence of alternative child language forms for the structure.

3. Frequency of the structure in the preprimers and primers used as source reading textbooks.

The four experimental studies reported here include:

1. Mass and Count Noun Responses of Young Children.
2. Pronoun Case Preference of Young Children.
3. Comprehension of Time Connectives by Young Children.
4. Comprehension of Conditional Structures by Young Children.

Each of the four studies was designed as a separate experiment; each is reported separately. Since the linguistic variables, and the hypotheses concerning these variables, differ for each of the studies, these are described at the beginning of each study.

Method

Subjects. Subjects for the experiments were from the Los Angeles speech community. After the first experiment, only Anglo children participated in testing, and subjects with Spanish surnames (whether or not Spanish was spoken in the home) were removed from the data base for the first experiment. Subjects, then, were white, monolingual, and their socioeconomic status was middle class. Two groups were used:

1. Kindergarten children who had not yet begun a reading program (5-year-old children).

2. Second grade children with a minimum of one year or exposure to a reading program (7-year-old children).

The use of two groups allowed us to look for developmental trends in the acquisition of the structures tested.

Procedure. In each of the four experiments, subjects were tested individually by the experimenter. Prior to the test trials, a short training session prepared the subject to respond according to the requirements of the task. While the number of test trials and the test time varied from study to study, the time for each task was approximately 10 minutes with approximately 36 test trials per subject.

The task in each experiment elicited either non-verbal comprehension responses to the structure, imitation of the structure, or production of the structure by the subject. The form of the task is particularly important if research is to be related to a reading program since a child may understand a structure long before he is able to use it. If the child neither produces nor comprehends a structure, there can be little justification for including it in a beginning reading book where emphasis must be on teaching word attack skills. However, if the child seldom produces a structure or produces his own alternate of the structure, there is some justification for including the adult form in the reading materials and arranging for oral practice of the structure in an adjunct program.

Materials, procedure, and task are described in detail for each experiment in the appropriate chapter.

Design. The design for each experiment differed according to the variables being considered in the experiment. In each case, however, developmental level (kindergarten vs 2nd grade) was one of the factors to be considered. Therefore, each study included an overall analysis of variance in which developmental level was a factor.

CHAPTER I. LITERATURE SURVEY OF DEVELOPMENTAL SYNTAX

A survey of the literature on child language acquisition was undertaken to:

1. Ascertain the direction of recent research in language acquisition.
2. Avoid duplication of the research on syntax already completed in the field.
3. Find workable procedures for testing syntactic structures of young children.

In recent years there has been a dramatic shift in the area of interest, that is, in what questions are to be asked, in the field of child language development. Prior to 1950, most investigators were interested in the establishment of language norms for children. Given age X, the child should know A, B, and C but not D, E, and F. Given age Y, he should know A, B, C, and D but not F. These studies are nicely summarized in tables in the McCarthy survey (1954). The data that set many early norms were collected for the most part by parents who had observed developmental stages in the language produced by their child or children. Such data are not necessarily suspect; much careful recording was done (cf. Leopold, 1939 and Gregoire, 1947).

However, the questions being asked in the field have changed. Given the language corpus, investigators (cf. Brown & Bellugi, 1964; Braine, in press) ask: what is the grammar of the child, and how do the rules of that grammar change over a period of time? In these studies the data were collected by recording the child's conversation with parents and/or peers, in the classroom and/or at home, and either in a few sessions or over a period of many months or even years. Rules were then abstracted from the corpus. The problems involved in such analyses are obvious. Not least among these is the well-known fact that children sometimes understand and produce a structure but that no occasion arises during the observation period to record it. The analysis of such a corpus can only be a useful first step, as Chomsky noted:

> If anything far-reaching and real is to be discovered about the actual grammar of the child, then rather devious kinds of observations of his performance, his abilities, and his comprehension in many different kinds of circumstances will have to be obtained...Direct description of the child's actual verbal output is no more likely to provide an account of the real underlying competence in the case of child language than in the case of adult language...Not that one shouldn't start here, perhaps, but surely one shouldn't end here, or take too seriously the results obtained by one or another sort of manipulation of data of texts produced under normal conditions. (Chomsky, 1964, p. 36)

A change, therefore, has also taken place in the methodology of data collection. Attempts of various sorts have been made to get at the linguistic competence of the child by looking at his non-verbal responses to verbal stimuli rather than at his verbal production (cf. Gleitman, 1965; Olds, 1968; and Carol Chomsky, 1968). Many studies have also elicited structures from the child as evidence of rule acquisition (cf. Berko, 1958; Livant, 1962; and Shriner, 1968).

The literature on developmental syntax can, therefore, be broken down into two types: studies concerned with setting norms and those concerned with describing the grammar of the child. The methodology is also of two types: observational, where the child's speech production is collected in a natural situation, and experimental, where the structures are elicited from the child. And, again, the experimental studies are of two types: those which test comprehension and those which elicit production of the structure. Observational studies will be reported first, followed by those classed as experimental.

A. Observational Studies

If one looks at performance, the starting place for developmental syntax must be the one-word sentence. While it is used, the one-word

sentence must convey a variety of meanings. If the child says "mama," it may serve to mean "There's mama," "Come here, mama," "Mama did it," etc. It is this hopelessly ambiguous situation which McNeill (1967) sees as impelling the child to progress beyond the holophrastic sentence.

The child begins to use two-word sentences at 18 months (Brown & Bellugi, 1964), at 20 to 24 months (Miller, 1951), or 23 to 25 months (McCarthy, 1954). These two-word utterances consist of two classes of words which Braine (in press) has labeled pivot words and open-class words. The child has a one-rule grammar at this point: Utt $\rightarrow$ (P) X (P). Each pivot word occupies a characteristic position, either pre or post X. For example, <u>off</u> was used as a pivot word by one of Braine's children in a large number of X P utterances ("Shoe off.... light off," etc.) while <u>more</u> appeared in initial P X position ("more toast...more read...more hot"). Braine reports that Gvozdev's Russian subject at 20 months also had a first rule: Utt $\rightarrow$ (P) X (P).

Once the three-word sentence is reached, the possible number of different utterances becomes extremely large. Alternative sets of rules have been written to account for the child's grammar at this point. Braine describes the grammar as consisting of two utterance types: a pred sentence and an ostensive sentence. The pred sentence consists of an optional NP plus the predicate. The following samples from Braine's data support his claim that in moving to three-word sentences, the child immediately replaces a pred phrase with a subject plus pred construction:

Andrew (27 months)
- Chair...Pussycat chair.
- Plug in...Andrew plug in.
- Want that...Andrew want that.
- Change pants...Poppa change pants.

Stevie (25 to 26 months)
- Cinna toast...Betty cinna toast.
- Go nursery...Lucy go nursery.
- Push Stevie...Betty push Stevie.
- Crawl downstairs...Cathy crawl downstairs.

Jonathan (26 to 27 months)
- Other coffee...Daddy other coffee.
- Close radio...Mother close radio.
- On table...Wine on table.
- Up sky...Jona up sky.

The second sentence type, the ostensive sentence, consists of an introducer plus an NP: for example, <u>that</u> <u>Mary</u>, <u>here</u> <u>sock</u>, <u>there</u> <u>Mommy</u>. The rules for the child's grammar, according to Braine's analysis, are:

$$\text{Utterance} \rightarrow \begin{Bmatrix} S_{ost} \\ S_{pred} \end{Bmatrix}$$

$S_{ost} \rightarrow$ (I) NP

$S_{pred} \rightarrow$ (NP) Pred

NP $\rightarrow$ (Mod) N

I $\rightarrow$ see, that, there, etc.
Mod $\rightarrow$ a, the, two, etc.
N $\rightarrow$ bear, bird, block, boat, etc.
Pred $\rightarrow$ all gone, broken, fall down, etc.

The data used to fomulate these rules were taken from Eve_1 and had already been assigned to rule form by Brown and Fraser (1963) as:

$$\text{Utterance} \rightarrow \begin{cases} (C1) & (C3) & C2 \\ (C3) & (C2) & C4 \end{cases}$$

C1 $\rightarrow$ see, that, there, etc.
C2 $\rightarrow$ bear, bird, block, boat, etc.
C3 $\rightarrow$ a, the, two, etc.
C4 $\rightarrow$ all gone, broken, fall down, etc.

The difference in rules is not crucial, but Braine's examples for the pred sentence present a problem for Gruber's (1967) analysis of the structures produced by one child, Mackie (data collected by Bulowa, Jones, & Bever, 1964). In the data, nouns seldom appeared in pre-verb position. Those that did were, according to Gruber, announced topics for the comment. In his definition of topic and comment, he uses the example: "Salt, I taste it in this food," with salt as the topic, and "I taste it in this food" as the comment. Of course, such sentences are rare in the speech of adult English speakers (though quite common in many other languages). Gruber finds them essential to the child's grammar at this stage of development. Since it is quite unlikely that the child has picked up this construction from the speech of adults, Gruber postulates that the topic-comment structure underlies the subject-predicate and is possibly closer to the child's "innate knowledge" (the wired-in part) of language. According to Gruber, this would account for the spontaneous creation of the structure. Looking at Braine's examples (above) in the light of this analysis, it is difficult to say whether the topic and comment can be that easily identified.

The best known of the observational studies is the longitudinal study of Adam and Eve, and Sarah. Data gathered on these children under the direction of Roger Brown have been discussed in several reports. To write rules for the data, samples of the noun phrase, neg utterances, question utterances, etc., were abstracted from all of the tapes. Then each chunk of the data was divided into the two parts. Rules were written for one part and then checked for accuracy against the other. A good deal of discussion (cf. Fraser, 1964) has taken place on what can be defined as ungrammatical in the data. Since it is impos-

sible to ask the child if an utterance agrees with his intuition, it has been assumed in the analyses that ungrammatical equals not-elicited.

Brown & Bellugi (1964) reported on the NP section of the data. They followed the sorting out of the modifiers by the two children and also noted the subclassification of the noun. The data were described in three developmental stages. In stage 1, the child placed a modifier before the noun:

Stage 1	Examples
NP → M + N	a Becky, my mommy, more nut, two sock, big boot, that knee

The stage 2 rule was:

NP → (dem) (art) (M) N

which yields the following possible combinations:

NP_1 → dem + art + M + N	that a blue flower
NP_2 → art + M + N	a my pencil, a your car, a nice nap
NP_3 → dem + M + N	that my cup
NP_4 → art + N	a horse
NP_5 → dem + art + N	that a car

Later it was decided that sentences like "that a blue flower" were actually cop sentences with <u>be</u> omitted. The basis for the decision was that the dem + art + M + N only appeared when the NP was in subject position.

It was also noted that Adam used both pronoun and its noun through stage 2, giving sentences like: "saw it ball" and "I Adam don't." The pronoun always preceded the noun.

The subdivision of the noun occurred in stage 3. Proper nouns were sorted out by both children (Adam at 33½ months and Eve at 24½ months). Eve attained some concept of mass nouns by 40 months but Adam did not. The noun singular-plural contrast was not solved by either child; the forms were in free variation. Later in the report, it was noted that Adam learned plurals 8 months before the <u>s</u> of the third person singular verb, and long before the possessive <u>s</u>. Susan Ervin-Tripp (1964), however, reported that the seven children she observed did make the singular-plural contrast between the ages of 2 and 3 years. None of the 7 children used the adult form when plurals were attached to words already ending with a sibilant. For these words the plural contrast was omitted. That is, a word like <u>glass</u> remained <u>glass</u> in the plural, the /-ɨz/ plural was not used. When the /-ɨz/ plural finally did appear, it was then in free variation with the /-s/ and /-z/ plurals for many months.

A second piece of the Adam and Eve data, negation and question pattern development, was reported by Klima & Bellugi (1964). These patterns were also described in three developmental stages. The neg pattern began as neg + nucleus, or nucleus + neg (e.g., "no mitten" or "mitten no"). Gvozdev (1967) showed that neg is also initial in the acquisition of negation in Russian; Gregoire (1947) showed this to be true for French too, through the child only uses pas as the neg marker until 30 months. McNeill (1968) reported that Iznani (Japanese) began with neg in sentence final position.

Stage 1 for the acquisition of negation was:

Stage 1

$$\text{Neg S} \rightarrow \begin{Bmatrix} \text{no} \\ \text{not} \end{Bmatrix} \text{ Nucleus } \begin{Bmatrix} \text{no} \\ \text{not} \end{Bmatrix}$$

Examples:
- no play that
- not cowboy
- more no

In stage 2, the stage 1 rule continues plus the following rule:

Stage 2

$$\text{S} \rightarrow \text{Nom } (\text{Aux}_{\text{neg}}) \begin{Bmatrix} \text{Pred} \\ \text{MV} \end{Bmatrix}$$

$$\text{Aux} \rightarrow \begin{Bmatrix} \text{Neg} \\ \text{V}_{\text{neg}} \end{Bmatrix}$$

$$\text{Neg} \rightarrow \begin{Bmatrix} \text{no} \\ \text{not} \end{Bmatrix}$$

$$\text{V}_{\text{neg}} \rightarrow \begin{Bmatrix} \text{can't} \\ \text{don't} \end{Bmatrix}$$

Examples:
- I no taste them.
- That no mommy.
- That not little.
- Don't bite me.

Stage 3 is described by the following rules:

Stage 3

$$\text{S} \rightarrow \text{Nom Aux} \begin{Bmatrix} \text{Pred} \\ \text{MV} \end{Bmatrix}$$

$$\text{Aux} \rightarrow \text{T } \text{V}_{\text{aux}} \text{ (neg)}$$

$$\text{V}_{\text{aux}} \rightarrow \begin{Bmatrix} \text{do} \\ \text{modal} \\ \text{be} \end{Bmatrix}$$

Examples:
- I didn't did it.
- He won't talk. (modal)
- Don't touch that fish.
- I not hurt him.
- I can't see it.
- I not a doctor. (be)

T-rules to delete be and do:

$$\text{NP } \underline{\text{be}} \rightarrow \text{NP}$$

$$\underline{\text{do}} \text{ V} \rightarrow \text{V}$$

The question structure began as rising intonation on an echo question (e.g. "ball go↗"). The rules for the stages are as follows:

Stage 1:	Examples:
yes/no nucleus	see hole↗
Q-<u>what</u> NP (doing)	what man doing?
Q-<u>where</u> NP (go)	where Ann pencil? where kitty go?

Stage 2:

$S_{neg} \rightarrow$ (Q(yes/no)) nucleus	you want eat?
<u>what</u> nucleus	what book name?
<u>where</u> nucleus	where me sleep?
<u>why</u> (<u>not</u> (V_{neg}) nucleus	why not he eat? why you smiling?

T-rule:

why-not-V_{neg}-Nom-MV ⟹ why not me can't dance?

why-not-Nom-V_{neg}-MV

Stage 3:

$S \rightarrow$ (Q) Nom Aux {Pred / MV}	Can't you work this thing? Can I have a piece of paper? Will you help me? Does lions walk? Is Mommy talking to Grandma? Where my spoon goed? What I did yesterday? Why Paul caught it? Which way they should go? How he can be a doctor? How they can't talk?
$Aux \rightarrow T\ V_{aux}$ (neg)	
$V_{aux} \rightarrow$ {can / do / will / be}	
NP → wh + ind.	

T-Rules:

1. Prepos
   Q X_1 wh + ind X_2 ⟹ Q wh + indet X_1 X_2

2. Interrog. Inversion
   Q NP V_{aux} X ⟹ Q V_{aux} NP X

3. Do deletion
   <u>do</u> V ⟹ V

Huxley (1967), in her discussion of the Klima & Bellugi report, insisted that the results of the longitudinal study being done at Edinburgh would produce quite different rules for the neg and question patterns. She also protested that writing rules only elevates the status of the data on which they are based and that such rules cannot be a serious report of the child's competence.

Brown's subsequent report (1968) on the same data for the question forms also showed three stages of development, but his analysis differed in that questions before stage 3 were treated as non-transformational "routines." The child has heard "What's this?" hundreds of times, so that "What dat?" is just a formula, a routine which doesn't need a rule.

Brown accounts for the child's learning of the wh questions in the following manner. The child is exposed to countless "occasional questions" in the speech of adults:

Statement: John will read a book.
Occasional Questions:
John will read what?
John will read when?
John will read where?
John will do what?

In the 7,000-utterance corpus collected of conversations of the three children, Adam, Eve, and Sarah, and their mothers, the ratio of occasional questions to all other types in the speech of the mothers was as follows: Adam's mother 1:57, Eve's mother 1:80, and Sarah's mother 1:146.

From these occasional questions, the child develops two question forms: the weak prepos and the strong prepos. The strong prepos contains an inflection, a modal or be while the weak prepos does not:

Weak: What John read?
Strong: What he will read?
What he reads?
What his name is?

Transformations are used only to account for such forms as "What will John read?" where the aux is moved.

In these reports, the mothers of the two more rapidly developing children (Adam and Eve) not only used a higher number of occasional questions but also expanded the child's "telegraphese" more frequently. This observation prompted Cazden's experiment (1965). Her hypothesis was that the child whose telegraphic speech was consistently expanded by an adult would show greater linguistic advancement in a 3-month period than would the child whose speech was simply responded to with well-

formed sentences. She divided 12 nursery school children (aged 28 to 38 months) into three groups: children of one group received 40 minutes per day of intensive, deliberate expansion of their utterances by adults; children of the second group received 30 minutes per day of well-formed sentences in response to their speech; and the third group (control) received no special training.

Tutors were instructed in techniques of sentence expansion. Given a sentence from the child's speech such as "Mommy lunch," the tutor of the experimental group would expand the sentence to something like "Mommy is having her lunch." The tutor of the second group would respond to such a sentence with something like "What is she going to eat?" On all six measures used to test linguistic gain, the gain for children in the second group was higher than that of the experimental or control group. This led Cazden to suppose that richness of verbal stimulation must be more critical than the use of expansion.

Ervin-Tripp (1964) reported on the development of the past tense in her study of seven children. The children produced the irregular past forms first. Next they learned the regular past rule and began producing analogic past tense forms for the irregular verbs. That is, they first produced "did," "broke," "came," etc., but then later generalized the regular past rule so that "did~doed," "broke~breaked," "came~comed" were observed in free variation. These children also used be and do in free variation in the early stages of language development. For example, in response to such a sentence as "There aren't any blocks," the child might say, "There do." In response to "I'm Bozo," the child might say, "No, you don't, you're Daddy." A later note in the study mentions use of do with number and tense agreement in tag questions by the age of 3.

Miller and Ervin-Tripp (1964) concluded from the study of these children that variations from adult speech of the 2- and 3-year-old child are few. Those that occur are omissions ("I'll turn water off"), overgeneralizations ("foots"), incorrect subclassifications of lexical class ("a Betty"), and doubly marked forms ("mine's").

Menyuk carried out a series of impressive studies (1963, 1964) with preschool and first-grade children. Data were obtained by recording the Ss' responses to Blacky Pictures (Blum, 1950) along with general conversation with both the E and peers. The data were then divided into that which was "grammatical" for an adult speaker and that which only appeared in the children's grammar. She found that both age groups could produce grammatical active declarative sentences (which she labeled as the phrase structure level of ability) and could use grammatical inflectional rules (morphological level). The two groups did differ, however, on their ability to produce grammatical utterances on the transformational level. Of the 26 transformations compared, statistically significant differences between the two age groups were found for (1) passives, (2) aux have, (3) if clauses, (4) so clauses, and (5) nominal-

izations. That is, more children in the first-grade group used these transformations than in the preschool group. Because of the somewhat confusing terminology, examples as well as the labels used for the transformations are quoted directly:

1. Passive (He was tied up by the man.)
2. Negation (I am not.)
3. Question (Is he sleeping?)
4. Contraction (He'll choke.)
5. Inversion (Now I have kittens.)
6. Relative question (What is that?)
7. Imperative (Don't use my brushes.)
8. Pronominalization (There isn't any more.)
9. Separation (He took it off.)
10. Got (I've got a book.)
11. Auxiliary verb
    a. be (He is not going to the movies.)
    b. have (I've already been there.)
12. Do (I did read a book.)
13. Possessive (I'm writing daddy's name.)
14. Reflexive (I cut myself.)
15. Conjunction (They will be over here and momma will be over there.)
16. Conjunction deletion (I see lipstick and a comb.)
17. Conditional (I'll give it to you if you need it.)
18. So (He saw him so he hit him.)
19. Causal (He won't eat the grass because they will cry.)
20. Pronoun in conjunction (Blacky saw Tippy and he was mad.)
21. Adjective (I have a pink dog.)
22. Relative clause (I don't know what he's doing.)
23. Complement
    a. infinitival (I want to play.)
    b. participial (I like singing.)
24. Iteration (You have to clean clothes to make them clean.)
25. Nominalization (She does the shopping and cooking and baking.)
26. Nominal compound (The baby carriage is here.) (Menyuk, 1963, 410-411)

Next, Menyuk compared the "ungrammatical" structures used by the two groups; that is, utterances which are not part of an adult's grammar but do appear in children's speech. She found that significantly more children in the preschool group used sentences which omitted prepositions and articles in simple sentences. There was also a significant difference in the number of children in the younger group who performed only the first step of the transformation for relative question, pronominalization, and adjective. At the morphological level, more preschool children used regular past for irregular verbs than did the first-grade children. Significantly more first graders used redundancy ("The boy he stooded there.") than did preschool children.

In a second report, Menyuk (1964a) compared transformations used by eight children aged 2.8 to 3.0 with those used by the same children when they were eight months older. She found that the reflexive and nominalization transformations were used by some of the children at the 3.5 to 3.7 level but that they had not appeared in the grammar of any of the children at the earlier age. On the morphological level, as in the original study, kindergarten children had difficulty with third person singular s, past tense of verbs, singular and plural of nouns, and possessive pronouns and adjectives. The younger children also had free variation in pronouns (e.g., "Me have this one." "I like that.") As in the previous study it was found that first graders had not completely mastered the following transformations: Aux have, participial complement, iteration, and nominalization.

In a later study (1964b), Menyuk compared Ss diagnosed as using "infantile speech" with normal Ss using the same general transformation format.

Harwood's study (1959) attempted a quantification of structures used by the Australian 5-year-old child, and the probabilities of occurence for lexical entries in those structures. He remarked that the 5-year-old child seldom uses passive constructions. His definition of the passive includes the agent. It seems that this would rule out the got-passive which seems to be the preferred form for the preschool child.

The O'Donnell, Griffin & Norris (1967) study, while not strictly a naturalistic study (children watched two films, then retold the stories, and answered a few questions about the narrative), compared oral responses of kindergarten children with those of children in grades 1 to 7 under six headings: (1) garbles (a category which, unfortunately, included rather than established a separate category for redundancies); (2) length of utterance; (3) length of total response; (4) total number of "sentence-combining transformations" (that is, where sentence has been chosen more than once in the base); (5) kinds of "sentence-combining transformations" used; and (6) main clause patterns. As expected, the relative amount of garbled speech decreased slightly with increase in grade level while total length of response and single utterance length increased. The increase in the total number of transformations used per child was especially marked in grades 1 and 7. In types of transformations, main clause coordination increased steadily to grade 5; those transformations within the NP and within the Adverb increased to grade 6, with adverbial transformations doubling in frequency from kindergarten to grade 7.

The study showed that while the frequency of the patterns might vary over the grade span, all clausal patterns were used by at least some of the kindergarten subjects. As to simple sentence types used, subject-verb-object was the most frequent pattern for kindergarten through grade 3, followed by the subject-verb pattern. Frequency patterns by grade level for the 11 patterns described as simple sentences are given in Table 1:

TABLE 1

--Structural Patterns of Main Clauses in Speech of Boys and Girls at Six Grade Levels: Rate of Occurrence per 100 T-units (O'Donnell, 1967, 69)

	Kinder-garten	Grade 1	Grade 2	Grade 3	Grade 5	Grade 7
Subject-Verb						
Boys	34.07	31.87	34.07	40.93	46.63	43.12
Girls	38.27	34.13	43.56	44.69	45.14	46.23
Both	36.17	33.00	38.81	42.81	45.89	44.67
Subject-Verb-Object						
Boys	41.93	46.40	47.86	44.71	42.19	40.94
Girls	38.93	46.53	40.75	43.88	42.21	42.23
Both	40.43	46.47	44.31	44.29	42.20	41.59
Subject-Verb-Predicate Nominal						
Boys	6.13	4.07	3.14	2.79	1.88	3.29
Girls	4.00	2.93	1.25	1.69	1.93	1.54
Both	5.07	3.50	2.19	2.24	1.91	2.41
Subject-Verb-Predicate Adjectival						
Boys	2.40	1.93	3.64	2.14	3.56	4.06
Girls	2.60	4.27	3.56	2.81	3.21	2.77
Both	2.50	3.10	3.60	2.47	3.39	3.41
Subject-Verb-Indirect Object-Direct Object						
Boys	.44	.43	.33	.22	.42	.50
Girls	-	1.12	1.05	.11	.93	.43
Both	.23	.77	.69	.17	.67	.47
Subject-Verb-Object-Object Complement (Nominal)						
Boys	.22	-	-	-	-	.14
Girls	-	-	-	-	-	.11
Both	.11	-	-	-	-	.13
Subject-Verb-Object-Adjectival Complement						
Boys	-	.43	.49	.56	.51	1.44
Girls	.47	.67	.60	.23	.84	.54
Both	.23	.55	.55	.39	.67	.99
Adverbial-Verb-Subject						
Boys	.44	.43	.49	-	.09	-
Girls	.23	-	.15	-	-	.22
Both	.33	.22	.32	-	.04	.09
There-Verb-Subject						
Boys	.87	1.13	1.00	3.57	2.13	2.65
Girls	2.53	1.53	2.75	2.19	1.93	2.54
Both	1.70	1.83	1.87	2.88	2.03	2.59
It-Verb-Subject						
Boys	-	.64	.33	.22	.25	.21
Girls	.23	.90	.30	.23	.19	.22
Both	.11	.77	.31	.23	.22	.21
Passive Constructions						
Boys	1.07	.20	.79	.43	-	.76
Girls	-	.73	.44	.38	.86	.92
Both	.58	.47	.61	.41	.40	.84

While one might not expect object and adjective complements (e.g., "They elected John president" and "We thought Mary lazy") or even the passive to be very frequent, it is surprising to find the indirect object sentence ("They gave John a present.") and the It+be+NP ("It's a lion.") so infrequent.

Evidence from the Loban study (1964) is roughly equivalent to that of the O'Donnell study (see Table 2). The subject-verb-object and the subject-verb (grouped with subject-be-loc) account for the largest proportion of the utterances, although there is some range of variation in percentages between the two studies. The indirect object and the object and adj complement sentences were infrequent for all groups in this study too. The there is type sentence increased slightly to grade 3 and then decreased from grade 4 to grade 9. The subject-be-NP ("The man is a teacher.") and subject-be-adj ("The story was good.") doubled from kindergarten to grade 4, but steadily decreased in grades 5 to 9. The percentage of partial sentences decreased steadily with chronological age of the Ss.

The results, as in the O'Donnell study, showed that some of the kindergarten children used as wide a variety of complex structures as those in grades 2 through 9. However, when Ss were divided into high and low groups, gradual increases could be more easily traced.

For two children, preselected as in the high and low groups, number and types of transformations used were analyzed at ages 6, 10, and 12. The summary showed a developmental difference in type of transformations used as well as in the total number of times all transformations were used.

Dino (high group)		Frequency and Type	
Grammatical transformations	20	Who/What question	5
Faulty transformations	4	Other questions	1
Total	24	Negatives	1
		Ellipses	6
		Conjunctions	4
		Indirect objects	1
		Comparatives	1
		Passive	1
		Total	20

Angelina (low group)		Frequency and Type	
Grammatical transformations	7	Who/What question	2
Faulty transformations	1	Negatives	2
		Indirect Objects	1
		Conjunctions	2
(Loban, 1964, p. 143) Total	8	Total	7

TABLE 2

RELATIVE PROPORTIONS OF STRUCTURAL PATTERNS
ACCORDING TO PERCENT OF PATTERN USED IN TOTAL TRANSCRIPT

Median of High and Low Groups, Grades Kindergarten through Nine
High N = 25 Low N = 25 (Loban, 1964, pp. 100-102)

	Subj-V S-be-loc		Direct Object		S-be NP Adj		Questions		Indirect Object		Obj & Adj Comp		There is		Passive		Incomplete	
Grade	Hi	Low	Hi	Low	Hi	Low	Hi	Low	Hi	Low	Hi	Low	Hi	Low	Hi	Low	Hi	Low
KG.	19.7	20.2	28.8	21.7	9.2	6.5	0.3	0.0	0.6	0.0	0.0	0.0	3.6	0.0	0.0	0.0	32.2	44.2
1	19.9	22.1	31.3	24.3	14.5	8.1	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.6	0.0	0.0	24.0	28.3
2	20.0	22.9	33.3	33.5	15.1	9.8	0.0	0.0	0.0	0.0	0.0	0.0	5.6	3.3	0.0	0.0	21.8	30.3
3	22.7	22.1	36.2	28.7	15.9	10.4	0.0	0.0	0.4	0.0	0.0	0.0	5.3	3.0	0.0	0.0	17.9	29.9
4	24.0	24.5	36.4	32.8	17.8	13.7	0.0	0.0	1.3	0.6	0.0	0.0	4.1	2.0	0.0	0.0	12.2	22.7
5	26.6	23.5	36.2	32.1	13.9	10.9	0.0	0.0	1.1	1.1	0.0	0.0	3.3	3.1	0.8	0.0	14.3	23.4
6	26.8	26.8	36.1	34.2	16.5	10.8	0.0	0.0	0.9	2.0	0.5	0.0	2.4	2.5	0.9	0.8	11.4	19.2
7	27.6	26.5	40.6	33.3	18.0	11.1	0.0	0.0	1.0	1.9	0.0	0.0	1.7	3.1	2.0	0.6	5.4	15.3
8	27.6	27.0	34.8	35.4	21.2	14.6	0.0	0.0	0.9	1.2	0.4	0.8	2.7	2.1	2.5	1.2	5.7	12.5
9	27.9	28.8	37.2	32.7	20.8	14.1	0.0	0.0	0.9	1.7	0.0	0.3	2.2	1.7	2.9	0.6	6.2	14.6

Finally, Loban used the Watts test (1944) for subordinate connectives (a multiple choice task) with children in grades 5 through 9. A weighted index was drawn up which showed a gradual increase over the age range for Ss in the low group.. Ss in the high group, however, attained high scores on ability to use subordinating connectives at the fifth grade level, and little improvement was noted over the grade range for these Ss. Weighting was accomplished as follows: 1 point for each dependent clause, 2 points for a dependent clause within another dependent clause, 2 points for dependent clauses with infinitive, gerund or participle, and 3 points for a dependent clause modifying a second dependent clause which in turn modified a third dependent clause.

Strickland (1962) reported on the language skills of children in grades 1 through 6. To collect the data, Ss (groups of three) were encouraged to talk about storybook figures, themselves, their families and pets. The taped speech of these 575 children was then described in terms of slot and filler analysis, an analysis which yields a very large number of sentence patterns. She reported that the number of patterns used varied from 658 at grade 1 to 1,041 at grade 6. Those patterns which have fixed word order (e.g., subject-verb-object) were the most frequent. The most frequent of the movables were time and place adverbs. Utterance length varied more within grade than between grades in this study. Significant differences were obtained for the use of subordinate patterns for different age groups, the older children using more subordinate patterns.

While the method for collecting the data varied from study to study, the observational studies reported above all looked at the verbal production of the child. These studies were not concerned with whether the child might understand structures that he does not produce in a natural speech situation.

B. Experimental Studies

To begin with the first evidence of response to verbal stimuli would necessitate reporting all the literature on verbal conditioning of infants. Since this has little to do with syntax, only the Fradkinov study (1966) on eye-blink conditioning will be mentioned. The study showed that at 7 months the Russian child responds only to the rhythmic-melodic nature of words, not to the words themselves. At 7 and 8 months it is no easier to condition the child to words than to other sounds, but by 10 to 11 months, conditioning to words requires four times less reinforcement than conditioning to other sounds.

The experiments by Luria (1959) are also of interest though they, too, are not concerned with syntax but rather with the directive function of speech.[2] That is, given a command to hand the E one of three play objects, the S will do so. This is not taken as comprehension of the imperative but rather as a measure of the power of words to elicit

[2] For a complete discussion of theories of speech and thought (Vygotsky, Luria Piaget, Flavell, and Mead), see Kohlberg, Yaeger, & Hjertholm (1968), and McNeill, D. (1968).

the correct action (so long as the three objects are equidistant from and equally attractive to the S). In the 1956 Paramonova experiment reported by Luria, if the child presses a button when a negative command ("Don't press.") is given, this is not an experiment to test his understanding of negative imperatives, but rather of the inhibitory power of language on an action. Verbal directives will trigger action regardless of their semantic reference. For example, if "blue" means "Press the button," and "red" means "Don't press," red will trigger pressing as much as blue. In fact, having the child say the command himself (Tikhomirov experiment reported by Luria) not only fails to restrain his motor response when the light is blue, but causes him to press the button even harder.

The report presented by Gleitman and her associates (1965) is perhaps the first of studies which have tried to get at a non-performance measure of the child's syntax. Ss in this study were 13 children aged 18 to 33 months. In the home situation, toys were arranged on the floor, 2 to 3 feet apart, within a triangle formed by the mother and two observers. The adults conversed and, on occasion, the mother delivered the stimulus. The commands given to the child consisted of well-formed commands ("Throw me the ball.") or commands using the child's telegraphese ("Throw ball."). Tapes and a written record of sequence of movements were analyzed. Results showed that the youngest children responded better to sentences which conformed to his own grammar. That is, function words were, in fact, disruptive. At a somewhat later stage, the child, while still producing telegraphese, responded better to adult forms of commands, those including the function words. Finally, the child both used and responded best to adult forms of commands.

In this report it was postulated that the child listens selectively. That is, he turns off excessively complex or unfamiliar speech, especially if the unfamiliar appears at the beginning of a sentence. If the child listens primarily when he recognizes the beginning of an utterance, his linguistic input is drastically reduced. This would give him a simplified and less chaotic corpus from which to form the generalizations that learning theorists rely on to explain the acquisition of language. It was also noticed that the child spontaneously repeated only utterances which are a little beyond his own natural speech. Gleitman was uncertain whether this was an attempt to learn the structure or whether such repetition was dictated by the child's limited memory.

Ervin-Tripp (1964) had also suggested that children might imitate, or repeat, sentences selectively. She analyzed the free speech of five children aged 22 to 34 months to see if their spontaneous repetitions were limited to structures more complex than the bulk of their utterances. She did not find a difference in complexity.

Repetition tasks have been used to test the language of the very young child. Limitations of the task are obvious. Echolalic children can repeat sentences they do not comprehend. The changes that young

children do make in repeating well-formed sentences have been considered informative enough to warrant using this method. Fraser (1963) found that children between 25 and 35 months repeated well-formed sentences in their own telegraphese form. Menyuk (1966), however, found that somewhat more advanced children may respond to a modeled ungrammatical sentence taken from the child's own production data with the grammatically correct version of the sentence.

Slobin (1967) has used this technique to elicit a corpus of 1000 imitations from a child (Echo) between the ages of 2 years 3 months and 2 years 5 months. In the child's repetition of modeled sentences, the following phenomena were observed: (1) omitted items were usually unstressed words (articles, copula) or imbedded clauses; (2) intonation and rhythmic aspects seemed to be basic in imitation; (3) stress was preserved, though was not entirely predictable as to placement; and (4) some sentences which Echo could produce were too difficult for her to repeat.

Repetition of relative clauses and conjoined sentences was especially interesting. In repetition of a conjoined sentence, the second sentence was most frequently repeated first. The parallel-sentence form took precedence over semantic content. That is, if Echo could not remember both sentences, she repeated the second section twice (Model: "The candy is marple. The shoe is marple." Echo: "Shoe marple an' a shoe marple"(2;3;3)). If the two sentences were not of the same structure, Echo had great difficulty in retaining the structures, hesitated, used false starts or changed the sentences so that they were parallel (Model: "Mozart got burned and the big shoe is here." Echo: "Mozart got burned an-duh...big shoe got burned" (2;3;3)). The got-passive had been used in spontaneous speech at this age by Echo.

With relative clauses her repetition suggested that she comprehended but could not produce the clause. Instead, she repeated relative clauses as conjoined sentences:

Model: Mozart who cried came to my party.
Echo: Mozart cried and he came to my party. (2;4;3)

Model: The man who I saw yesterday got wet.
Echo: I saw the man and he got wet. (2;4;3)

Sentences once given as conjoined sentences:

Model: The owl eats candy and the owl runs fast.
Echo: Owl eat candy and he run fast. (2;4;3)

were given again with a relative clause:

Model: The owl who eats candy runs fast.
Echo: Owl eat a candy and he run fast. (2;4;3)

A set of sentences with relative clause and who-deletion was given to Echo, but these sentences proved to be beyond her comprehension:

Model: The boy the book hit was crying.
Echo: Boy the book was crying. (2;5;1)

Model: The house the boy hit was big.
Echo: boyhouse was big. (2;5;2)

Model: The boy the chair hit was dirty.
Echo: boy hit the chair was dirty

Slobin suggested that Echo searched for the subject-verb-object pattern in the model and repeated this. Given scrambled sentences, she frequently extracted a subject-verb-object relationship:

Model: the man the boy the book hit tore who
Echo: boy the man tore the book who

Slobin questioned the "selective listening" postulate of Gleitman (1965) since he found that Echo did attend to unfamiliar words in sentence-initial position. She frequently repeated them without difficulty.

The study reported by Berko (1958) is probably the best known of the experimental studies. In this case, production rather than comprehension was tested. The Ss in the study ranged in age from 4 to 7 years. Using nonsense content words and appealing pictures to elicit examples of the rules of English morphology, she found that while the child does know most of these rules, he still has problems with certain rules. For example, the percentage of correct plural forms for nouns supports Ervin's (1964) statement that children have trouble with the /-ɨz/ plural allomorph (at least with these nonsense samples). Correct plural allomorphs were given (80 to 90% range over the age span) for the /-s/ and /-z/ plurals but only 28 to 36% correct responses were given for the /-ɨz/ form. The same problem with the final s was evident in the data on possessives and third-person singular present tense. Her analysis of the past tense allomorphs also agrees with Ervin's report that the /-t/ and /-d/ allomorphs are much easier for the child than the /-ɨd/ form. For the progressive -ing, 90% correct responses were obtained. Derived forms were very difficult for the children. The comparative (-er, -est) was not produced by a large number of children. No child used a diminutive affix (wuggy) but rather provided a compound substitute (baby wug). Nor did they use adjectives derived from nouns. Thus, a dog with quirks was not a quirky dog but rather a quirk dog.

Slobin (1967) reported on studies concerned with development of Russian morphological endings by young children. According to this literature, mastery of Russian morphology proceeds much more slowly

than that reported for English. Diminutives and other forms which do not change the lexical meaning of the word are learned first by the Russian child.

The Anisfeld & Tucker (1966) study, again on morphology, showed that most errors in the singular to plural conversions occured in the /-ɨz/ form; number was used more often as an alternate response when the plural required was /-ɨz/. A second part of the study showed that in a CVC pattern, any lengthening affix was preferred to vowel change within the CVC pattern as a possible plural form.

Shriner (1968) replicated portions of the Berko study with two groups of children judged "disadvantaged" and "advantaged" who were matched by mental age. A comparison of the morphological forms used by the two groups revealed no statistically significant difference, a rather surprising result if the children were speakers of Black English. The conclusions of this study deserve to be tested further.

Livant (1962) reported a study on noun compounding with 5-year-old Ss. Results show a much better ability to combine nouns than was shown in the Berko study. For example, asked "What would you call a baby who cries?", the child is to answer "a cry baby" with proper stress. Claims made in this study have been seriously questioned by Gleitman (1967) who found that adult Ss were not able to perform a similar task without confusing stress.

Various tests of preposition usage of young children have been attempted. Early tests with very young children usually involved asking them to put circular objects on, in or under square ones, etc. Most results were highly questionable since it was rather difficult for the child to put an object under something without instead putting the other object on top of it. Turton (1966) tested children from 3 to 5 years of age on comprehension and production of in, out of, on, off, under, over, by, between, behind and in front of. Development of use of the prepositions at a level of 40 correct out of a possible 50 responses was noted as follows: Children from 3.0 to 3.5 used in at this level; children 3.5 to 4.0 used in, on and under at this level; and the others used in, on, under and by. In the comprehension section, children 3.0 to 3.5 responded to five prepositions at this level of accuracy, and the children over 4 years responded to 9 prepositions at this level of accuracy. Children respond to prepositions at a higher level than they can produce them. Subjects tended to use by for between, behind, and in front of. Since only an abstract of this study was available, methodology for the comprehension and production tasks cannot be reported.

Kaplan & Yonis (1967) tested the use of on, in, under (series 1) in front, behind, between, (series 2), and down, up, around (series 3). Ss (3 year olds) saw three pictures which were identical except for the spatial relationship of the objects. On hearing the sentence stimulus, the S was instructed to point to the correct picture. Then S and E

changed places and the S was required to produce a sentence for one of the three pictures while the E guessed which of the three was the correct one. The results showed that the child could use all spatial relationships in the two tasks if the requirements of the task were clear. The main statement made by the authors was that studies which make summary statements about development of linguistic forms without considering the communication requirements of production tend to grossly underestimate the child's competence.

Carol Chomsky (1968) tested comprehension by children aged 5 to 10 of four structures. The four structures were: (1) John is easy/eager to please; (2) John told/promised Bill to go; (3) John told/asked Bill what to do; and (4) pronoun reference.

The first structure was tested by presenting the child with a blindfolded doll and asking, "Is the doll easy to see or hard to see?" If the child answered "easy," he was then asked to make it hard to see, in which case the child usually hid the doll. If he said "hard," he was asked to make it easy to see, in which case the child usually removed the doll's blindfold. As a proof that the child does not always produce the pattern correctly, Carol Chomsky noted that in a pilot test which used the sentence "John is easy/eager to please," one child explained that John was very obedient and that it's not hard for him to do what he's supposed to do. When asked who he pleased, the child replied, "He's easy to please his mother, probably."

In the second experiment, the child was given two dolls (Bozo and Donald Duck). After hearing the stimulus, "Bozo told/promised Donald to lie down. Make him do it," the child had to make the correct doll do the action as evidence of comprehending the structure.

In the third experiment, the investigator had originally hoped to test a complex structure ("John asked/told Bill what to do.") but in the pilot it was obvious that the children did not have an ask/tell distinction, so this experiment was changed somewhat.

In the pronominalization experiment, the child was asked about the pronoun referent in three structure types: (1) where the pronoun was in the main clause preceding the NP ("He found that Mickey won the race."); (2) where the pronoun was in the subordinate clause preceding the NP ("After he got the candy, Mickey left."); and (3) where the pronoun in the subordinate clause followed the NP ("Pluto thinks he knows everything."). The purpose was to see whether the child knew that there was a non-identity requirement for sentences of type one as contrasted with types two and three.

Results of the experiments showed that for the promise and easy to see experiments, the youngest children did not know the construction; responses of the 6, 7, and 8-year-olds were mixed, and the 9-year-olds all knew the constructions. In the pronominalization experiment, children below 5.5 did not know the structure; children over

that age uniformly knew the construction. The ask/tell directions had mixed responses at all age levels.

In another recent study, Olds (1968) showed that children aged 7 to 11 had difficulty responding with appropriate behavior to commands incorporating certain logical connectors. Those included in his comprehension test included: although, if, unless, but, before, as soon as, when, after and should. Surprisingly, if and should + conditional were not particularly difficult for these children to comprehend (2.3% error of possible 600 responses). The error was increased to 15% when negation was added to the if clause. Of the time connectors studied, before was the only one which gave children much difficulty. However, it appears to be the only time connective given both in temporal order of occurence and in reversed temporal order. No error breakdown was given for the four time expressions. Unless caused the greatest number of errors, being interpreted as if rather than as if not. The difference between say and tell in the commands was also a significant source of error. The method in this experiment was to have children move markers on a game board in response to commands. Two Ss played the game at a time. Despite the large number of trials (90 commands, 45 to each S), the children's interest and attention were sustained by the competitiveness of the game; the children enjoyed the task.

Connectives were also studied by Katz and Brent (1968). The task required Ss of three age groups (6-7, 11-12, 19-20) to give preferences after listening to pairs of sentences in which connectives were varied, and to explain their choice. Spontaneous speech of the Ss was also recorded and instances of the connectives tabulated. Ss in the youngest group were able to use connectives correctly and to choose correctly between sentence pairs, but they were not able to verbalize the role of the connective in explaining their choice. This is not exactly surprising since the futility of asking children about their language has been noted by many investigators.

The child's reaction to passive vs. active sentences was first reported by Slobin (1966). He found that responses to passive sentences took longer than those to active sentences for the age groups he tested (6, 8, 10, and 12 years). This difference, however, was washed out when the sentences were reversible; that is, where the object and subject could be reversed (The dog is chasing the cat---The cat is chasing the dog vs. The girl is watering the flowers---*The flowers are watering the girl.) Sentence types included were active, active negative, passive, and passive negative. In the task, Ss made a judgment as to the truth or falseness of the sentence in regard to an illuminated picture, pressing a "right" or "wrong" lever. Latency was the measure used in the analysis.

Turner & Rommetveit reported a series of studies (1967, 1968a, 1968b) on active and passive voice in children's speech. One study (1968a) tested the child's recall of active and passive sentences in which subject and object were either reversible or nonreversible.

Pictures which depicted either the actor, the receiver of the action, or the total sentence content were shown to the subject as the stimulus sentence was said. Recall was then prompted either with the same picture or its two alternates. The voice used in sentence recall tended to depend on the focus of the picture used as a recall prompt. Age of S (kindergarten to third grade) was not significant. Kindergarten subjects did use the got-passive most frequently of any of the groups, and 18.6% of the past participles used by kindergarten subjects in passive sentences were incorrect forms.

The study had previously been run (1967) by its investigators using a comprehension, imitation, production task procedure. Ss were 48 children, 4.25 to 9.0 years old. The results showed a trend in order of difficulty (least to most difficult) as: non-reversible active, reversible active, non-reversible passive, and reversible passive. Sentence type was statistically significant for each at the nursery school level but decreased with age to the third-grade level, where none of the differences between sentence types were statistically significant. At the third-grade level a ceiling of perfect scores was reached. In the imitation and production tasks, nursery school and kindergarten Ss again substituted got-passive for be-passive and gave a large number of incorrect past participles (e.g., rided, catched, droved).

The third study (1968b) discussed two experiments with reversible vs. nonreversible actions presented in picture form. Both experiments were concerned with the number of passive sentences that the child would produce under certain conditions. In the second experiment the child was presented with the picture and four questions were asked by the E: (1) What is (the actor) doing? (2) What is happening in the picture? (3) What is being done to(the acted-upon)? (4) What is happening to the(acted-upon)? Only active sentences were elicited by query 1 and query 2, and the difference in number of passive sentences elicted by queries 1 and 2 vs. query 3 and query 4 was highly significant at each grade level (kindergarten, 1, 2, and 3). No difference was found between reversible vs. non-reversible pictures. It was also noted that query 4 elicited more got-passive examples than did query 3. In the first experiment, the child was asked to "name" a picture; that is, tell what was happening in the picture. Secondly, the picture was gradually drawn past a cellophane window in a cardboard frame. In some cases the actor appeared first and in some cases the acted-upon appeared first. The child was told that he should give the picture a name which would tell what was happening in the picture. The results showed some evidence to support the hypothesis that the voice of an utterance can be controlled by manipulating the direction in which a picture is scanned. However, the investigators felt the task was not structured enough to elicit passive-voice sentences effectively. The only significant result for number of passives produced as age increased was found when a training session was added which allowed the E to give verbal examples of passive sentences (the acted-upon element presented first) and active sentences (the actor presented first).

Huttenlocher and her associates (1968a, 1968b) reported experiments in which 5, 7, and 9-year-old children were asked to place a block on top of or below a fixed block on a ladder. She found it was easier for the children to place the block in relation to the fixed position if the block to be placed was the grammatical subject of the sentence given (the error ratio was 2:10% for first graders):

Make it so
The red block (to be placed) is {on top of / under} the orange block (fixed).

The orange block (fixed) is {on top of / under} the red block (to be placed).

The difference in prepositions (on top of vs. under) was non-significant. When the ladder holding the blocks was enlarged to hold two fixed blocks and the child was instructed to place his block in relation to these two, the error ratio of subject vs. object for the first graders was 0:22%; for the third grade it was 0:15%.

In a second experiment, the child was asked to place a truck in relation to another truck in fixed position in response to sentences where active vs. passive voice was used:

Make it so
The red truck (to be placed) is {pushing / pulling} the blue truck (fixed).

The red truck (to be placed) is being {pushed / pulled} by the blue truck (fixed).

The blue truck (fixed) is {pushing / pulling} the red truck (to be placed).

The blue truck (fixed) is being {pushed / pulled} by the red truck (to be placed).

Latency of correct responses was the measure used since errors were too rare to be compared statistically. Results showed that it was easier to place the truck when the stimulus sentence was active if the truck to be placed was the subject of the sentence. For passives, it was easier to place the truck if it was the receiver of the action in the stimulus sentence. In all cases, the reaction time to passives was slower than to active sentences.

Summary

The purpose of the literature survey was two-fold: (1) to avoid duplication of research on structures already tested and (2) to find workable procedures for testing structures.

A number of studies were suggested by the literature survey. These were checked against samples of simple, compound and complex sentences inventoried in the preprimers and primers investigated. Experiments on comprehension and production of four structures will be reported. The four structures under consideration are: (1) mass/count noun subclasses, (2) pronoun case, (3) time connectives, and (4) if-then structures.

Since we are interested in both comprehension and production (rather than just production) of syntactic structures of the 5 to 7-year-old group, the experimental studies were especially helpful in suggesting methods which could be used in experiments to be run. The observational method (gathering natural data for analysis) was discarded both on theoretical grounds and for cost restrictions. Promising procedures appeared to be:

Comprehension
    picture identification (Brown)
    game playing (Olds)
Imitation (Slobin)
Production
    picture cued (Berko)

After some discussion regarding methodology, the following procedures (given in more detail in the separate experiments) were decided upon. In the pronoun experiment, it was clear that there was no comprehension difficulty of the pronoun in simple sentence constructions. Carol Chomsky's experiment had shown no comprehension problems on pronoun reference even in dependent clauses requiring non-identity restrictions on reference with Ss older than 5.5. It was also clear from the data of a previous study on conjoined sentences (Hatch, Sheff & Chastain, 1968) that the 5 to 6-year-old child produced a large number of accusative case pronouns in subject position. Since comprehension was not a problem and production was, it was decided to use a repetition task for this experiment.

Again, in the mass/count noun study there was no evidence for supposing that children did not comprehend sentences involving mass/count. The problem, if there was to be one, was predicted for production. It was expected that while the 5-year-old would have difficulty in producing the correct syntactic cues for the two noun classes, the 7-year-old would not. To test this, a production task (story participation and guessing game) was decided upon.

Finally, in the time clause and if-then experiments, we felt both comprehension and production should be tested. The procedure for the time clause experiment was a variation of Olds' procedure: a simplified game was constructed in which the S moved markers as evidence of comprehension of the sentence stimulus. A picture identification task was used for the if-then experiment. In both studies an imitation task was also included.

CHAPTER II. MASS AND COUNT NOUN RESPONSES OF YOUNG CHILDREN

Braine (in press) noted that adult mass nouns are assimilated by young children to the count noun category. The child says "I want two bacons," and "How many ice creams you want?" rather than "two pieces of bacon" and "how much ice cream."

Brown (1967) reported some grasp of the mass/count subclassification by 4 and 5 year olds. Brown & Berko (1960) showed that nonsense words introduced as mass nouns were not responded to as well as those introduced as count nouns. In the Fraser, Brown & Bellugi study (1963), syntactic cues used were a + count noun vs. some + mass noun. Since some can be used with either mass or count nouns, the distinction in their production task must depend on whether or not the child attached an -s to the noun (some mog, some mogs) rather than on the some cue. This, in turn, would depend on whether the child consistently used the singular/plural distinction and whether or not nonsense words ending in sibilants are requiring the more difficult /-iz/ were used. Finally, Gvozdev (1949) reported that for his Russian-speaking child, the mass/count distinction was established at age 8.

This study asks (1) whether the child entering a reading program has mastered the syntactic cues for the mass/count noun distinction and (2) whether the child's ability to use these cues improves markedly by age 7.

METHOD

Subjects. Forty-one kindergarten (mean age 5.1) and 23 pre-second grade (mean age 7.2) Ss from a local school district were used. Only Anglo children (white, monolingual) were used in the compilation of the data; Ss with Spanish surnames were not included. Pre-kindergarten Ss had not begun a reading program. The community is, according to teacher estimation, socioeconomically middle class. However, family income for the area (Brewster, 1962) places it in the lower middle class income bracket.

Materials and Procedure. Two sets of materials were used. Set 1 consisted of 20 questions (10 mass, 10 count) in a participation story form. The child was asked "how many/many" questions, and both stimulus and Ss response were recorded. Set 2 of the materials required the Ss, after a short training session, to ask the "how many/many" question in response to a deck of picture cards containing the same 10 mass and 10 count nouns. Presentation of the nouns within each set was randomly ordered. High frequency nouns (see Table 1) were selected from the Rinsland list (1945) and checked for frequency at levels 1 and 2 of the list prepared by Dale et al. (1963)

TABLE 1

NOUN SUBCLASS TYPE OF SELECTED VOCABULARY

Mass	Count
bread	oranges
cheese	eggs
gum	hot dogs
lettuce	vegetables
cake	apples
water	cookies
fruit	bananas
meat	sandwiches
milk	tomatoes
pie	carrots

Picture cues were explicit as to noun subclass; that is, cake was pictured as a slice, not as a possible whole count object; egg was pictured as three whole eggs, not as a possible scrambled mass object. Materials and instructions for the two sets appear in Appendix A.

Design. Of the 41 pre-kindergarten Ss, 25 had Set 1 first and 16 had Set 2 first. The unequal n is the result of discarding Ss with Spanish surnames. Of the 23 pre-second grade Ss, 11 had Set 1 first and 12 had Set 2 first. Each S underwent four conditions: (1) answer count noun, (2) answer mass noun, (3) question count noun, and (4) question mass noun. Thus, order of presentation was the between-S factor, and the noun type (count vs. mass) and task (answer vs. question) were the two within-S factors.

Scoring. Each recorded response was scored for accuracy on the basis of correctness of the cues used by the S, and a percent correct score was obtained for each condition. Examples of correct responses include:

Count:	# + count noun + s	(two apples)
	how many + count noun + s	(how many apples)
Mass:	# + quant + mass noun + ∅	(three pieces of gum)
	how much + mass noun + ∅	(how much water)

When a pronoun was given, "# of them" for count nouns and "# of it" for mass nouns were scored as correct.

Examples of incorrect responses include:

Count:	# + count noun + ∅	(two apple)
	how much + count noun (+s)	(how much apple(s))
Mass:	# + mass noun (+s)	(two lettuce(s))
	how many + mass noun (+s)	(how many milk(s))

RESULTS AND DISCUSSION

The results are presented in Table 2. Separate 2 x 2 x 2 analyses of variance were done for the pre-kindergarten and pre-second grade scores. These are presented in Tables 3 and 4. Order of presentation of the two sets of the experiment was not statistically significant (.05 level) for either age group.

The pre-kindergarten group gave reliably more correct responses to count than to mass nouns, while the pre-second grade group showed a trend toward better performance on count noun than mass noun cues. The results further show that pre-kindergarten children give more correct responses in the question task (cards) than in the answer task (story). The analysis of variance indicates that this difference is statistically significant at the .001 level. This may be due to the smaller range of possible responses on the question task. If a child knows whether the noun takes an -s, he has a 50-50 chance of correct much/many choice, and therefore a correct question response. On the answer task, the range of possible responses is wider and favors better production on the count category. For count nouns, the response was usually # + count noun + s. Mass noun responses ranged from # pieces of, # slices of, a gallon of, etc., to a little (though a few is not acceptable). The pre-kindergarten children, where the difference in correct responses to mass nouns is greatest, however, used a glass of for liquids and # pieces of for solids almost exclusively; the pre-second grade group used a much wider range of response types.

The analysis shows a significant Noun Type x Task interaction for both age groups (see Figure 1). The interaction may be due to assimilation of the wide variety of possible mass noun responses in the answer task to the one count noun answer form, while the range of possible responses in the question task for both mass and count nouns is minimal.

A statistically significant three-way interaction (Order x Noun Type x Task) was obtained in the pre-kindergarten group. This can again be traced to the mass noun category (see Figure 2). While responses to the count noun category remained consistently higher for both tasks regardless of which was presented first, Ss gave a larger number of correct mass noun responses on the initial task whichever it was. A possible explanation might be that the fatigue factor in the second task affected responses to the more difficult noun class (mass nouns) without affecting the easier count noun responses.

TABLE 2

NUMBER OF CORRECT RESPONSES TO MASS/COUNT NOUNS

Noun Subclass	Task	Kindergarten Order 1	Kindergarten Order 2	Second Grade Order 1	Second Grade Order 2
Count	Question	5.72	6.87	7.45	7.75
	Answer	8.80	8.87	9.90	9.67
Mass	Question	4.40	3.19	7.82	7.42
	Answer	3.16	4.50	5.82	7.83

TABLE 3

ANALYSIS OF VARIANCE FOR NUMBER OF CORRECT RESPONSES TO MASS AND COUNT NOUNS FOR PRE-KINDERGARTEN SUBJECTS

Source	df	MS	F
Between			
Mean	1	5217.22	--
Order (O)	1	3.71	.39
Error	39	9.35	--
Within			
Noun (N)	1	548.74	37.12*
O x N	1	2.32	.15
Error	39	14.78	--
Task (T)	1	1498.78	163.62*
O x T	1	6.22	.67
Error	39	9.16	--
N x T	1	89.27	25.58*
O x N x T	1	30.11	8.63*
Error	39	3.49	--

* p <.01 level

TABLE 4

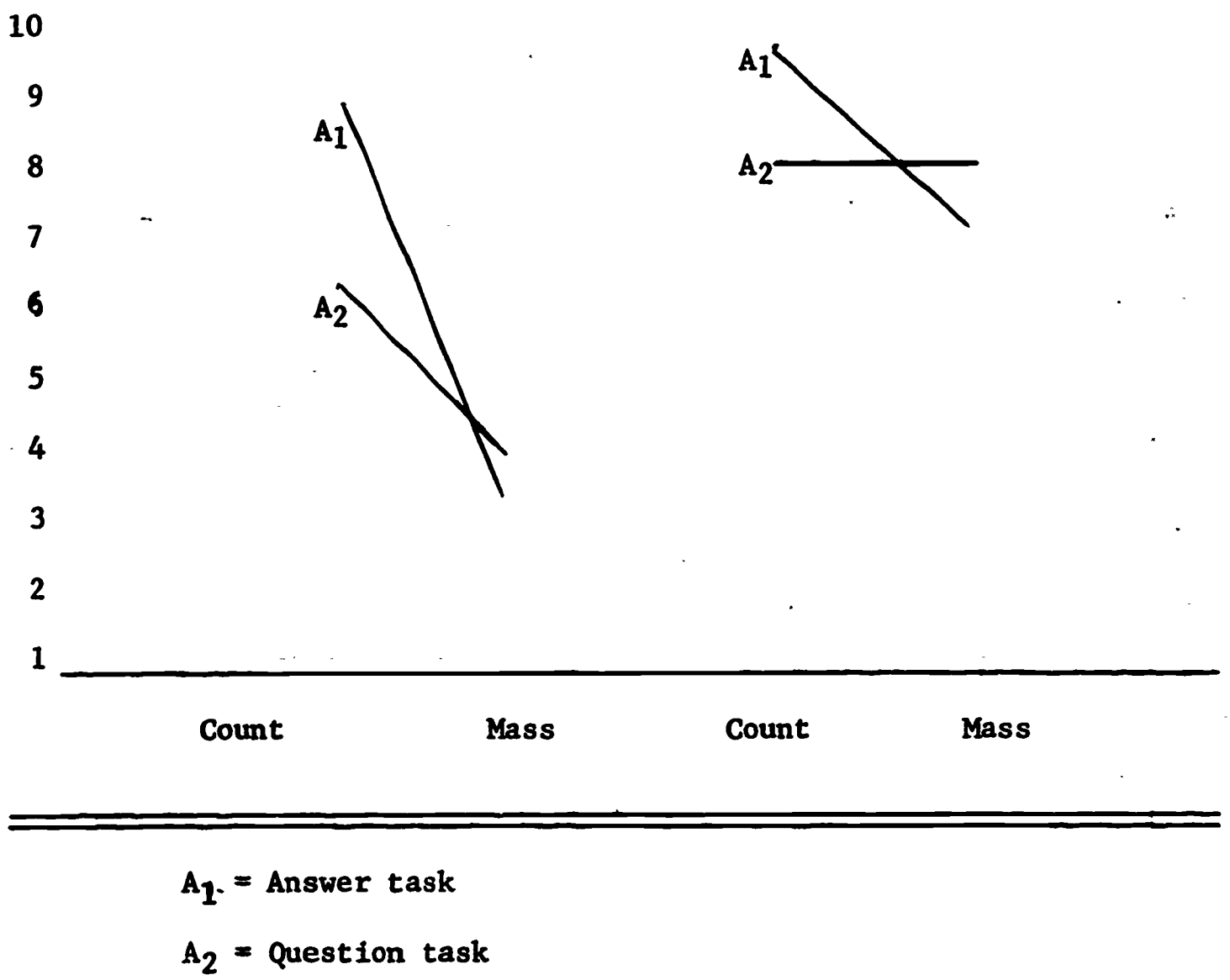
ANALYSIS OF VARIANCE FOR NUMBER OF CORRECT RESPONSES TO MASS AND COUNT NOUNS FOR PRE-SECOND GRADERS AS A FUNCTION OF TYPE OF TASK

Source	df	MS	F
Between			
Mean	1	5840.10	--
Order (O)	1	3.75	1
Error	21	6.11	--
Within			
Noun (N)	1	48.79	4.17**
O x N	1	3.73	1
Error	21	11.70	--
Task (T)	1	11.87	2.70
O x T	1	5.26	1.20
Error	21	4.39	--
N x T	1	48.76	6.39*
O x N x T	1	12.33	1.62
Error	21	7.63	--

** $p < .01$
* $p < .05$

Figure 1

NUMBER OF CORRECT RESPONSES TO COUNT AND MASS NOUNS
AS A FUNCTION OF NOUN TYPE AND TASK

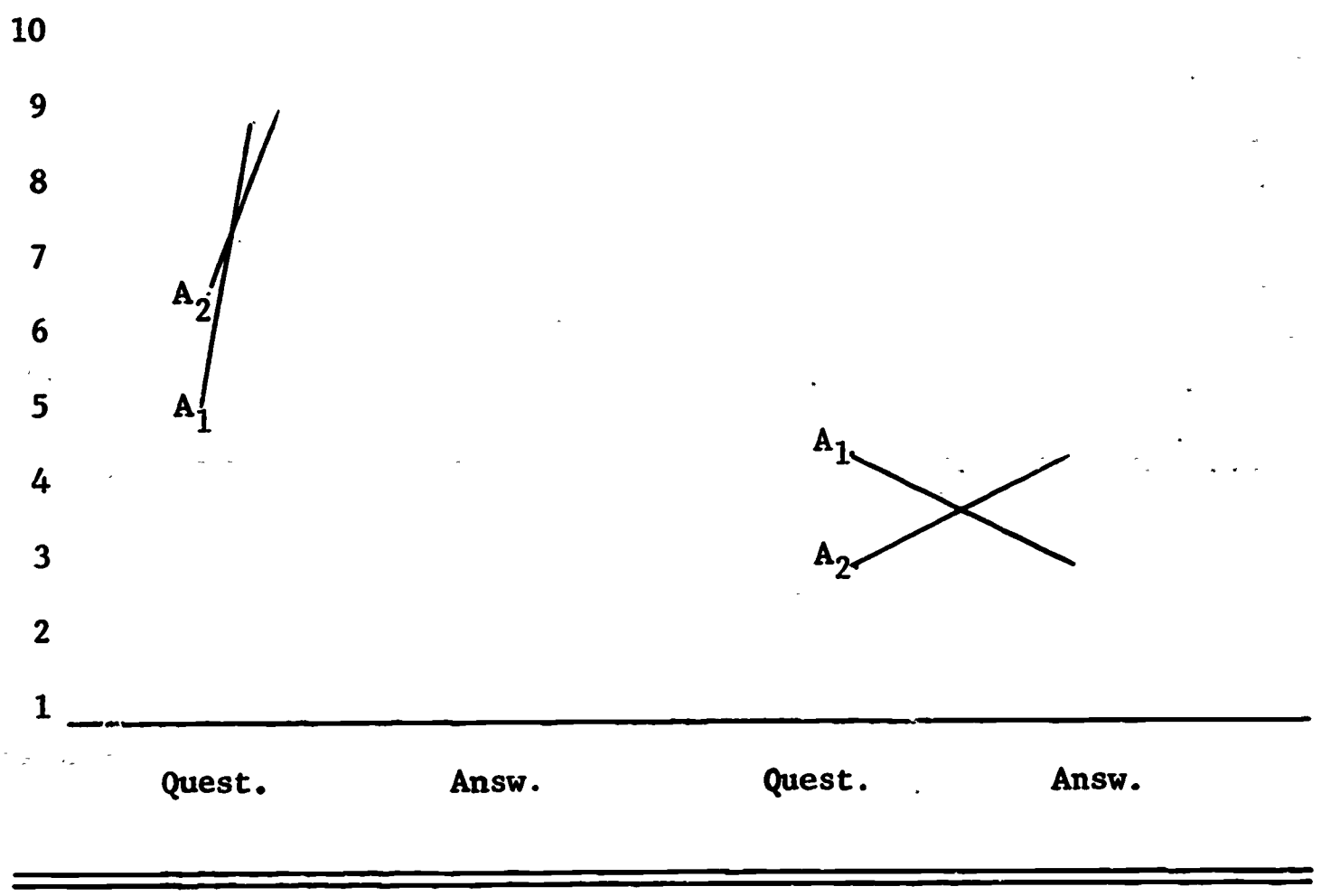


A_1 = Answer task

A_2 = Question task

Figure 2

NUMBER OF CORRECT RESPONSES TO COUNT AND MASS NOUNS
AS A FUNCTION OF TASK AND ORDER OF TASK



A_1 = Story first

A_2 = Game first

TABLE 5

PERCENTAGE OF ERRORS FOR TYPE OF NOUN CONSTRUCTION

Subclass	Percent	Type	Example
Mass	.46	many + Mass Noun + Ø	"How many cheese?"
Mass	.37	# + Mass Noun + Ø	"Five bread."
Mass	.09	many + Mass Noun + s	"How many waters?"
Mass	.05	# + Mass Noun + s	"Five gums."
Mass	.02	much + Mass Noun + s	"How much lettuces?"
Count	.61	much + Count Noun + s	"How much oranges?"
Count	.17	many + Count Noun + Ø	"How many apple?"
Count	.12	# + Count Noun + Ø	"Five egg."
Count	.10	much + Count Noun + Ø	"How much sandwich?"

Total errors:
Mass Nouns = 552
Count Nouns = 286

A breakdown of errors (see Table 5) showed that while it might be said that the ∅ vs. s ending is learned with the lexical item, fewer errors were due to this in mass than in count noun responses. Of the 552 errors made in the mass category for both age groups, only 14% contained errors in the ∅ ending--that is, where the child added an -s incorrectly (how many gums, how much meats, 5 milks). In the 286 count errors, 38% included omission of the -s (how many banana, how much orange, 5 carrot). Contrary to expectation, -s omission was no more frequent in the two noun examples requiring the /-iz/ plural (oranges, sandwiches) than for those requiring /-s/ or /-z/. The breakdown of errors suggests that performance should have been better on the mass question task than on the count question task since no -s need be added to the noun and the much/many choice is equal chance. Pre-kindergarten scores, however, showed a mean of 6.12 for count questions and 3.93 for mass questions.

It is clear from the study that both pre-kindergarten and pre-second grade children make more correct responses to count nouns than to mass nouns. A statistically significant difference was shown only for the pre-kindergarten group. Therefore, while mass cues are still a problem, the ability to use correct cues has improved by age 7. The study shows that the child entering a reading program has not mastered the syntactic cues for the mass/count noun distinction.

CHAPTER III. PRONOUN CASE PREFERENCE OF YOUNG CHILDREN

The accusative case pronoun as subject is common in early childhood language. Examples such as "me throw it" and "him go right back" seem to appear in the data for the three-year-old child as frequently as "I go away" and "he saw it."

Since gender is relatively unimportant in English, it is easy to discard errors in examples[3] like "mother...he" and number plus gender errors like "Billy and Steve...she" as cases where the child was not attending to the stimulus. And one can claim that in cases like "Betty... he," the child does not know the gender of certain less-familiar proper nouns. In languages where gender is marked, the child must (1) learn that all nouns have gender, (2) learn the placement of gender morphemes in utterances, and (3) learn the allomorphs of gender. Gregoire (1947) showed that his children (French speaking) learned the article as a prefix to the noun, so few errors in gender occured between the article and noun; that "some errors" occurred between noun and adjective gender agreement; but that the most persistent source of error was form of the pronoun allomorph (il est mechante, la fille; ou est-elle, le garcon). This kind of persistent error is similar to the errors in gender of the pronouns in the English examples above. It may well be, then, that it is a mistake to disregard number/gender errors so lightly.

[3] Examples are from the production data of 5-year-old children collected for a previous study, Hatch, Sheff & Chastain, SWRL Technical Report 9, 1968.

The use of object pronouns in subject position cannot, however, be explained away in the same way as the other errors. The object pronoun as subject is common in early childhood language. Gruber (1966) accounts for this phenomenon by positing a preliminary topic-comment grammar for the child. Klima (1964) has suggested that subject pronouns, once used exclusively for nominative case ("It is I"), have been replaced since 1850 by the objective case in post-Verb position ("It's me"). His study suggests that accusative case pronouns may very well replace nominative pronouns in other sentence positions. At the moment, however; such sentences as "Me and him went to the movies" do not seem to be accepted as standard English. This study, in a sense, asks the 5-year-old entering a reading program and the 7-year-old who has been exposed to such a program how acceptable such sentences are to him.

The response measure in the study is a repetition task. While the child's ability to mimic utterances in a rote manner is well known, the repetition method has been used successfully by Shipley, Gleitman and Smith (1965), by Menyuk (1963), by Ervin (1964), and by Fraser, et al. (1963). They conclude that if the child were repeating by rote there would be no reason for the speed of response and accuracy to differ with grammatical and ungrammatical stimuli. In explanation, Smith says:

> Why should it be difficult for the child to accurately repeat ungrammatical sentences, when it is relatively easy for them to repeat grammatical sentences? ....With an ungrammatical sentence as stimulus, the child has a grammatical error as well as the sentence's normal structure to deal with. We can think of an error as a kind of footnote to the structure that increases the difficulty of repeating. At the stage of identification, the child must disentangle structure and footnote; he must store both, which is more cumbersome than the structure alone; he must reproduce both, which at least involves an extra step. Successful repetitions of grammatical sentences reproduce a given structure s; successful repetitions of ungrammatical structures reproduce structure and a footnote, s + f; corrections reproduce just the structure, s; inadequate responses reproduce neither structure nor footnote. (Smith, 1966, p. 21)

The child then should respond quickly and accurately to any sentence which he feels is grammatical; if the sentence is not grammatical for him, he should take longer and make more errors in the repetition, or he might, instead, correct the sentence.

METHOD

Subjects. Forty pre-kindergarten Ss whose mean age was 5.1 years and 20 pre-second grade Ss whose mean age was 7.0 from a local school

district were used. Only Anglo children (white, monolingual) were tested. Pre-kindergarten Ss had not begun a reading program. The community is lower middle class (Brewster, 1962).

Materials and Procedure. In an initial training session, the S was taught to repeat a sentence stimulus. During the testing session, both stimulus and response were recorded on tape. Sentences were: reversible Subject+Verb+Object patterns. Vocabulary was selected at Level 1 on the Dale List (Dale, et al., 1963). Pronouns studied were I, me, she, her, he, him, we, us, they, them. It and you were omitted since one form serves both cases. Two equivalent sets of sentences were used (see Table 1). Each set consisted of 10 sentences with a pronoun in object position and 10 with a pronoun in subject position. Five of each set of 10 were grammatical and 5 ungrammatical.

TABLE 1

SENTENCE SETS AND VOCABULARY SAMPLE

Set	Number	Subject Slot	Object Slot
A	1	X caught the snake.	The doctor asked X.
	2	X saw the cow.	The rat watched X.
	3	X liked the mouse.	The puppy needed X.
	4	X chased the bear.	Father thanked X.
	5	X followed the teacher.	The boy washed X.
	6	X helped the kitten.	The policeman answered X.
	7	X found the children.	Mother called X.
	8	X hit the girl.	The boy carried X.
	9	X pushed the baby.	The dancer knew X.
	10	X told the nurse.	The bird heard X.
B	1	X asked the doctor.	The snake caught X.
	2	X watched the rat.	The cow saw X.
	3	X needed the puppy.	The mouse liked X.
	4	X thanked father.	The bear chased X.
	5	X washed the boy.	The teacher followed X.
	6	X answered the policeman.	The kitten helped X.
	7	X called mother.	The children found X.
	8	X carried the boy.	The girl hit X.
	9	X knew the dancer.	The baby pushed X.
	10	X heard the bird.	The nurse told X.

X = pronoun

The pronouns were automatically inserted into the above sets according to Table 2.

TABLE 2

ORDERING OF PRONOUNS

	1	2	3	4	5	6	7	8	9	10
1	I	him	me	her	they	she	we	he	us	them
2	me	them	she	us	he	her	I	we	they	him
3	she	us	he	they	we	them	me	him	I	her
4	her	I	him	me	them	we	he	us	she	they
5	he	her	they	she	us	him	them	me	we	I
6	him	me	we	them	I	he	she	they	her	us
7	them	he	her	I	him	they	us	she	me	we
8	us	she	I	we	her	me	him	them	he	they
9	they	we	them	he	me	us	her	I	him	she
10	we	they	us	him	she	I	he	her	them	me

Pronoun number and person were thus rotated so that each S received all 10 pronouns twice but not in the same order. Ordering of the 20-sentence set followed Table 3.

TABLE 3

ORDER OF PRESENTATION OF THE SET

Stimulus No.	Set A		Set B	
	Slot	Sent. No.	Slot	Sent No.
1	Subj	1	Obj	1
2	Subj	2	Obj	2
3	Obj	1	Subj	1
4	Obj	2	Subj	2
5	Subj	3	Obj	3
6	Subj	4	Obj	4
7	Obj	3	Subj	3
8	Obj	4	Subj	4
9	Subj	5	Obj	5
10	Subj	6	Obj	6
11	Obj	5	Subj	5
12	Obj	6	Subj	6
13	Subj	7	Obj	7
14	Subj	8	Obj	8
15	Obj	7	Subj	7
16	Obj	8	Subj	8
17	Subj	9	Obj	9
18	Subj	10	Obj	10
19	Obj	9	Subj	9
20	Obj	10	Subj	10

Complete materials appear in Appendix B.

Design. Twenty of the pre-kindergarten Ss had Set A sentences and 20 had Set B (see Table 1); 10 of the pre-second grade Ss had Set A and 10 Set B. The sets were equivalent. Each S underwent four conditions: (1) nominative case subject pronoun, (2) accusative case subject pronoun, (3) accusative case object pronoun, and (4) nominative case object pronoun. Age group was the between-S variable. Slot (subject vs. object) and usage (grammatical vs. ungrammatical) were within-S factors.

RESULTS AND DISCUSSION

The mean number of changed sentences is presented in Table 4. The actual number of changes made by each child in repeating the sentences was small since changes which involved change to the same pronoun case (Model: We followed the teacher. ECHO: He followed the teacher.) were not counted as changes.

The analysis of variance (Table 5) indicates that children changed ungrammatical sentences at a statistically significant higher level (.001) than grammatical sentences. They also changed object pronouns more often that subject pronouns (.01 level). The interaction between slot and grammaticalness gives correct vs. incorrect case for each position. Significantly more changes (.001 level) were made to correct the nominative case object pronoun (ungrammatical) than the accusative case subject pronoun (ungrammatical). The child accepted, or at least did not change, accusative case pronouns in subject position. This suggests that the accusative case is preferred by the child for the object slot where it is grammatical and is an acceptable alternate for the nominative pronoun in subject position.

While age group was not shown to be statistically significant, it was interesting to note that 12 pre-kindergarten Ss showed instances of changing grammatical nominative-case subject pronouns to the ungrammatical accusative case form (e. g., "He caught a snake" was changed to "Him caught a snake."). No instances of this were recorded in the pre-second grade data.

Most changes in repetition involved a simple change of case. That is, he was changed to him, she to her, etc. A number of children, however, changed case and number in the sound-alike pair we/me. The nominative we was changed to me when placed in object position. It could be that the child heard the pronoun as me. However, there was no instances of me in object position being changed to (or heard as) we. Thus, the data all point in the same direction: accusative case pronouns in subject position are acceptable to the young child while nominative case pronouns in object position are not. Perhaps the most extreme example of the unacceptability of the latter was the repetition of the stimulus sentence "The mouse liked I" as "The mouse had a black eye."

It seems clear from the study that accusative case pronouns in subject position are acceptable alternatives for nominative case. This was true both for the 5 and the 7-year-old group. However, actual instances of changing already grammatical subject pronouns to accusative case occurred only in the kindergarten group.

Pronoun case, then, seems to be an area of some confusion for the child who is beginning a reading program as well as for the second-grade child who has already been exposed to preprimers and primers which contain only the grammatical pronoun case.

TABLE 4

MEAN NUMBER OF CHANGED SENTENCES PER TYPE AS A FUNCTION OF AGE

Type	Kindergarten	2nd Grade
Subject Slot Pronoun	.10	.10
Object Slot Pronoun	.17	.14
Grammatical Sentences	.07	.03
Ungrammatical Sentences	.20	.21

TABLE 5

ANALYSIS OF VARIANCE FOR CORRECT RESPONSES BY AGE, TYPE & USAGE

Source	df	MS	F
Between			
Mean	1	97.54	--
A	1	0.30	1
Error	58	1.09	
Within			
B	1	5.10	10.20**
A x B	1	0.42	1
Error	58	0.50	--
C	1	33.00	53.23**
A x C	1	1.02	1.65
Error	58	0.62	--
B x C	1	10.84	16.42**
A x B x C	1	2.68	4.06*
Error	58	0.66	--

Factors: A = Group (kindergarten vs. 2nd grade)
B = Type (Subject vs. Object)
C = Usage (Grammatical vs. Ungrammatical)

* $p<.05$ level
** $p<.01$ level

CHAPTER IV. COMPREHENSION OF TIME CONNECTIVES BY YOUNG CHILDREN

Although the majority of sentences used in preprimers are simple or compound sentences, certain complex sentences appear both in preprimers and primers. Of these the most frequent are time clauses and if-then structures. In the four reading series used as source materials, time clauses are presented both in order of temporal occurence and in reversed temporal order. The time clause usually follows the main clause in the reading books; sometimes, however, it is preposed. Examples are:

Linguistic Order	Temporal Order	Reversed Temporal Order
main clause + time clause	1. S_1 and then S_2	4. S_2 but first S_1
	"Fill this and then set the fish in it." (SWRL)	"You can go to the moon but first talk to your father." (MacMillan)
main clause + time clause	2. S_1 before S_2	5. S_2 after S_1
	"It made a last goggle and glug before it went to the street." (Lippincott)	"He knows he will get something to eat after he gets the ball." (MacMillan)
time clause + main clause	3. After S_1, S_2	6. Before S_2, S_1
	"After I sell the eggs, I will get a silk dress." (Lippincott)	"Before Tom got to town, he saw nine mules." (Lippincott)

In a recent study, Olds (1968) showed that children aged 7 to 11 have difficulty in responding with appropriate behavior to commands incorporating certain "logical connectors." Of the eleven connectors studied, before was the only time expression for which a significant difference in performance was obtained. It was the only time connective which gave Ss any difficulty. However, before appears to be the only time expression which was given in both linguistic orders (initial and final in the sentence), and it, therefore, is the only time connective included in the study which illustrated both temporal and non-temporal order:

> "Before you move a square, move a circle."
> (time clause initial - reversed temporal order)
> "Move a triangle before you move a circle."
> (time clause final - temporal order)

The difficulty of the before expression may have been a function either of linguistic order or temporal order of events. Had the other time expressions been presented in both orders, one might expect results simi-

lar to those for the before data. Other time connectives studied were as soon as, when, and after.

Clark & Clark (1968) showed that adult Ss had no particular difficulty recalling sentences with preposed time clauses of the before/after type (e.g. sentences 3 and 6 above). Ss did, however, recall sentences most easily if they were presented in order of temporal occurence (e.g. sentences 1, 2 and 3 vs. 4, 5, and 6 above). Linguistic order of the time clause was not particularly important to adult Ss. However, in our study of conjoined sentences (Hatch, Sheff & Chastain, 1969) with five year olds, order permutation of the subject-verb to verb-subject did yield significantly fewer correct responses. If order permutation can be generalized, we would expect linguistic order (e.g. 1, 2, 4, 5 vs. 3 and 6) to be an important variable in the child's comprehension of the sentences. The purpose of this study was to investigate difficulty of various time connectives and to identify the variables which account for any differences among them.

METHOD

Subjects. 20 kindergarten and 20 second-grade Ss from a local school district were tested. The district is socio-economically middle class. Only Angle children (white, monolingual) were used as Ss. Kindergarten Ss had not begun a reading program.

Materials and Procedure. Each S participated in two tasks: comprehension and imitation. Ss were tested individually in a small room adjacent to the classroom building. Total testing time was approximately 15 minutes per child. Ss were given a short rest period between the 2 tasks (approximately 2 minutes) during which time they moved about the room and talked about what they were doing in school that day.

In the comprehension task, Ss were directed to move markers on a 4-column bent abacus (pictured in Materials Appendix) in response to commands given by a tape card fed into a Bell & Howell Language Master. The colors of the movable markers (red, yellow, green, and black) were randomly ordered on the rods of the abacus, with the restriction that four different colors be in each row. All Ss were pretested on color identification. Four Ss were unable to correctly identify the color names and were excluded from further testing.

Following the short training session (see Appendix) the 36 test trials were presented via Language Master tape cards. The test trials covered six examples of each of 6 sentence structures. Examples of the 6 sentence types are presented below:

Sent. Type	Example
1.	Move a red one and then a yellow one.

2. Move a yellow one before you move a green one.
3. After you move a black one, move a red one.
4. Move a green one but first move a red one.
5. Move a yellow one after you move a green one.
6. Before you move a black one, move a yellow one.

Order of presentation of sentence types within the 36 trials was randomized; one half of the Ss received the randomized set of sentences in forward order; the other half received the set in reverse order. Ss were alternately assigned to the 2 orders as they arrived from the classroom. An equal number of boys and girls were assigned to each order. E noted correctness of moves made by each S. Latency was measured to the nearest hundreth of a second from the final word of the sentence stimulus to the click of the marker on the rod.[1]

In the imitation task, the S listened to the sentence presented on a Language Master card and repeated the sentence. Both the sentence stimulus and the Ss' repetition of the model were tape recorded on a Sony tape recorder, Model TC-800. Accuracy of repetition and latency scores were obtained from the tapes.

Scoring for comprehension accuracy presented no problem--the S did or did not move the markers in correct sequence. Scoring for repetition accuracy was more difficult. If the S changed the sentence in repetition without altering the semantic sense of the instruction, the response was counted as correct. Samples of responses counted as correct and incorrect are:

Model: Before you move a black one, move a yellow one.

Correct: First you gotta move a yellow and then you can move a black.
Move a yellow one 'fore you move a black one.
After that yellow one, move a black one.

Incorrect: Move a black one and a yellow one.
Use a red one and a black one.
A yellow one...a black one.

Design. Each S received 6 versions of each of the 6 sentence types in each task (comprehension and repetition). Half of the Ss performed the comprehension task before the imitation task; half received the imitation task before the comprehension task (order 1 vs. order 2). Half of the Ss within each order received one randomized order of the sentences, and the other half were given the reverse randomized order.

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[1]Grateful acknowledgment is made to Paula Mindes for recording the latency data.

RESULTS AND DISCUSSION

The results, the accuracy of responses are presented as mean scores in Table 1. A 2 x 2 analysis of variance was done for each age group and task (Tables 2, 3, 4 and 5). For both age groups and both tasks the Sentence Type variable was significant at the .01 level. Order effects were not significant on the repetition task for either group. However, a reliable order effect was obtained for kindergarten Ss on the comprehension task. The younger Ss' performance on this task was poor if they were asked to do it as the second task, perhaps due to a fatigue effect. A reliable Order X Type interaction was obtained. This interaction suggests that the scores on the more difficult sentence types were more drastically depressed than the easier ones when the S became ratigued.

Since is was clear from the overall analysis that Sentence Type was an important variable, the Neuman-Keuls test for multiple comparisons was used to test each of the 6 sentence types against all others. Results of this test are presented in Tables 6, 7, 8, and 9. For the comprehension task (Tables 6 and 7) mean scores rank the sentences for difficulty as follows:

Easiest	Type 1	S_1 and then S_2
↓	Type 4	S_2 but first S_1
	Type 2	S_1 before S_2
	Type 3	After S_1, S_2
	Type 6	Before S_2, S_1
Most difficult	Type 5	S_2 after S1

Differences in sentence types which reached statistical significance (.01 level) for kindergarten Ss were:

Before S_2, S_1 (6) compared to { S1 and then S_2 (1); S_2 but first S_1 (4); S_1 before S_2 (2) }

S_2 after S_1 (5) compared to { S_1 and then S_2 (1); S_2 but first S_1 (4); S_1 before S_2 (2); After S_1, S_2 (3) }

The 2nd grade comparisons showed a .01 level significance for comparisons in the second group above (Type 5 compared to Types 1, 4, 2, and 3). At the .05 level, performance on Type 6 (Before S_2, S_1) was reliably more difficult than Type 1 (S_1 and then S_2).

In the repetition task (Tables 8 and 9) significant differences were obtained when Type 1 (S_1 and then S_2) was compared to each of the other sentences types for the kindergarten group, and when Type 1 was compared with Type 5 (S_2 after S_1) for the 2nd grade group.

TABLE 1

MEAN CORRECT SCORES* IN RESPONSE TO SIX TIME CONNECTIVE SENTENCE TYPES

	Type 1 S_1 & then S_2	Type 2 S_1 before S_2	Type 3 After S_1 S_2	Type 4 S_2 but 1st S_1	Type 5 S_2 after S_1	Type 6 Before S_1 S_2
Comprehension						
Kindergarten						
Order 1	5.40	5.20	4.50	5.90	3.30	4.70
Order 2	5.10	5.20	4.30	4.60	1.70	1.80
Combined Orders	5.25	5.20	4.40	5.25	2.50	3.25
2nd Grade						
Order 1	6.00	5.80	5.20	5.80	3.70	5.10
Order 2	5.80	5.60	5.80	5.80	3.30	4.70
Combined Orders	5.90	5.70	5.50	5.80	3.50	4.90
Repetition						
Kindergarten						
Order 1	5.10	3.10	4.10	3.40	3.70	2.50
Order 2	4.90	3.10	4.00	4.10	3.30	4.00
Combined Orders	5.00	3.10	4.05	3.75	3.50	3.25
2nd Grade						
Order 1	5.80	5.50	5.20	5.40	4.60	5.00
Order 2	5.60	4.80	5.50	4.90	4.50	5.00
Combined Orders	5.70	5.15	5.35	5.15	4.55	5.00

* Range of scores is 0 to 6.

TABLE 2

ANALYSIS OF VARIANCE FOR COMPREHENSION ACCURACY - KINDERGARTEN

Source	df	MS	F
Between			
Mean	1	2227.41	
Order (O)	1	33.08	7.32*
Error	18	4.52	
Within			
Type (T)	5	27.87	17.08*
O x T	5	6.18	3.78*
Error	90	1.63	

*p <.01 level

TABLE 3

ANALYSIS OF VARIANCE FOR COMPREHENSION ACCURACY - 2ND GRADE

Source	df	MS	F
Between			
Mean	1	3392.03	
Order (O)	1	.53	.26
Error	18	2.08	
Within			
Type (T)	5	9.63	8.56*
O x T	5	1.49	1.33
Error	90	1.13	

*p <.01 level

TABLE 4

ANALYSIS OF VARIANCE FOR REPETITION ACCURACY - KINDERGARTEN

Source	df	MS	F
Between			
Mean	1	1710.08	
Order (0)	1	1.88	.11
Error	18	17.60	
Within			
Type (T)	5	9.54	6.94*
O x T	5	2.58	1.88
Error	90	1.37	

*p <.01 level

TABLE 5

ANALYSIS OF VARIANCE FOR REPETITION ACCURACY - 2ND GRADE

Source	df	MS	F
Between			
Mean	1	3182.70	
Order (0)	1	1.20	.37
Error	18	3.23	
Within			
Type (T)	5	2.90	3.42*
O x T	5	.64	.76
Error	90	.85	

*p <.01 level

TABLE 6
NEUMAN-KEULS TEST FOR COMPREHENSION ACCURACY - KINDERGARTEN

		Type 1 S1 & then S2	Type 4 S2 but 1st S1	Type 2 S1 before S2	Type 3 After S1 S2	Type 6 Before S1 S2	Type 5 S2 After S1
	Mean	5.25	5.25	5.20	4.40	3.25	2.50
Type							
Difference scores between types	1		.00	.05	.85	2.00**	2.75**
	4			.05	.85	2.00**	2.75**
	2				.80	1.95**	2.70**
	3					1.15	1.90**
	6						.75

**p ≤.01 level
*p ≤.05 level

TABLE 7
NEUMAN-KEULS TEST FOR COMPREHENSION ACCURACY - 2ND GRADE

		Type 1 S1 & then S2	Type 4 S2 but 1st S1	Type 2 S1 before S2	Type 3 After S1 S2	Type 6 Before S1 S2	Type 5 S2 after S1
	Mean	5.90	5.80	5.70	5.50	4.90	4.10
Type							
Difference scores between types	1		.10	.20	.40	1.00*	1.80**
	4			.10	.30	.90	1.70**
	2				.20	.80	1.60**
	3					.60	1.40**
	6						.80

**p <.01 level
*p <.05 level

TABLE 8

NEUMAN-KEULS TEST FOR REPETITION ACCURACY - KINDERGARTEN

			Type 1 S 1 & then S2	Type 3 After S1 S2	Type 4 S2 but 1st S1	Type 5 S2 after S1	Type 6 Before S2 S1	Type 2 S1 before S2
		Mean	5.00	4.05	3.75	3.50	3.25	3.10
Type								
Difference scores between sentence types	1			.95*	1.25**	1.50**	1.75**	1.90**
	3				.30	.55	.80	.95
	4					.25	.40	.65
	5						.15	.40
	6							.25

**p <.01 level
* <.05 level

TABLE 9

NEUMAN-KEULS TEST FOR REPETITION ACCURACY - 2ND GRADE

			Type 1 S1 & then S2	Type 3 After S1 S2	Type 2 S1 before S2	Type 4 S2 but 1st S1	Type 6 Before S2 S1	Type 5 S2 after S1
		Mean	5.70	5.35	5.15	5.15	5.00	4.55
Type								
Difference scores between sentence types	1			.45	.55	.55	.70	1.15**
	3				.10	.10	.25	.70
	2					.00	.15	.60
	4						.15	.60
	6							.45

**p <.01 level

The kinds of errors in the repetition task differed markedly for the two age groups. Errors made by the 2nd grade group were not particularly revealing; they usually involved changes in color names or substitution of before for after. Errors made by kindergarten Ss were of 2 types--inability to remember the complete sentence, and omission of all connectives except the and then type. One would, of course, except children to perform best on the and then pattern since it is a pattern which appears very frequently in observed speech of children. Omission of other time connectives gave the possibility of one response to all the other sentence types:

Models:
Move a red one but first move a green one.
Move a red one before you move a green one.
After you move a red one move a green one.
Before you move a red one, move a green one.
Move a red one after you move a green one.

Response:
Move a red one (and) a green one.

This suggests that if a portion of the kindergarten Ss hear and respond only to the imperative move plus 2 color names and move the markers in the order of mention, their scores on the comprehension task should be high on Types 1, 2, and 3 and low on 4, 5, and 6. Looking back at the comprehension task mean scores for kindergarten subjects, this seems to be true except for Type 4 (S_2 but first S_1).

To test this prediction, the next step was to group the sentence types for comparisons; Scheffe's test for multiple comparisons was used. The first comparison was for temporal order vs. reversed temporal order (Types 1, 2, 3, vs. 4, 5, 6). The results are presented in Table 10. On the comprehension task, kindergarten Ss performed at a significantly higher level on sentences exemplifying temporal order. This was also true of 2nd grade performance at the .05 level. Differences on the repetition task were not significant for either age group. A second comparison was done for the position of the time clause in the sentence--initial vs. final (Types 1, 2, 4, 5 vs. 3, 6). While the responses (especially of the kindergarten Ss) appear to be much better for sentences where the time clause was final, a statistically significant difference was not obtained for either age group on either task (Table 10).

The difference shown on scores for and then/but first commands vs. before/after commands suggested that a comparison be made between them (Types 1, 4 vs. 2, 3, 5, 6). A statistically significant difference was found on the comprehension task (.01 level) and significantly (.05 level) better performance on the and then/but first types in the repetition task for kindergarten Ss. For 2nd grade Ss a reliable difference (.05 level) was obtained on the comprehension task wherein Ss tended to give more correct responses to and then/but first commands

TABLE 10

SCHEFFE TEST FOR MULTIPLE COMPARISONS (F Scores)

Comparison	Comprehension Task		Repetition Task	
	Kg.	2nd Grade	Kg.	2nd Grade
1, 2, 3 vs 4, 5, 6 (temporal order)	30.28**	15.66**	6.61	8.86
1, 2, 4, 5 vs 3, 6 (linguistic order)	8.60	2.13	.15	.06
1, 4 vs 2, 3, 5, 6 (and then/but 1st vs. before/after	32.64**	15.15*	15.73*	5.35

*p<.05 level
**p<.01 level

than to before/after commands. This data is presented in Table 10. Whether or not the differences can be accounted for by frequency of and then/but first in natural speech as compared to before/after (or whether frequency differences are simply a reflection of difficulty) is open to question.

Finally a 2x2x2 analysis of variance was done, which included age group as a factor (Tables 11 and 12). The 2nd grade Ss performed at a significantly higher level on both tasks. The signific Grade X Order interaction indicates that the kindergarten Ss tired and did less well on the comprehension task as a result of having already repeated the sentences. As would be expected, sentence type remained a significant variable when the two groups were combined. The significance (.05 level) of the Order X Type and the 3-way interaction (Order X Grade X Type) can best be explained by the depressed scores for the more difficult sentence types when comprehension was the 2nd task for kindergarten Ss versus the slight improvement of performance on the more difficult sentences when comprehension was the second task for 2nd grade Ss.

Latency data

The latency data is presented in Table 13. The Pearson Product Moment correlation between latency and accuracy data shows statistically significant (.01 level) negative correlations for each group on the comprehension task (kindergarten - .84; 2nd grade - .87). That is, the more difficult the sentence and therefore the fewer correct responses, the longer it took the S to make his response. Negative correlations were also obtained for the repetition task (kindergarten - .81; 2nd grade - .38). However, a statistically significant level (.01) was obtained only for kindergarten Ss. Timed latencies for 2nd grade responses on the repetition task were quite invariant over sentence types.

It is clear from the data that temporal order is the most important variable to be considered in presenting sentences time connectives to young children. Both age groups responded better on the tasks when the order of mention in the sentence was the same as the order of the action required. Frequency of the connective itself proved to be an important variable for kindergarten Ss; they responded better to and then/but first sentences than to before/after sentences. Indeed, in the repetition task a number of kindergarten Ss omitted all connectives except the and then type. This suggests that a command including before/after may simply be processed in temporal order with no attention paid to the connective by these Ss. Linguistic order--whether the time clause appeared in initial or final position in the sentence--did not produce differences in responses which were statistically significant, though more correct responses were obtained when the time clause was in final position.

TABLE 11

ANALYSIS OF VARIANCE FOR KINDERGARTEN AND 2ND GRADE COMBINED - COMPREHENSION

Source	df	MS	F
Between			
Mean	1	5558.43	
Grade	1	61.01	18.49*
Order	1	12.61	3.82
G x O	1	21.00	6.36*
Error	36	3.30	
Within			
Type	5	34.77	25.20*
G x T	5	2.73	1.98
O x T	5	4.17	3.02
G x O x T	5	3.49	2.53
Error	180	1.38	

*$p < .01$ level

TABLE 12

ANALYSIS OF VARIANCE FOR KINDERGARTEN AND 2ND GRADE COMBINED - REPETITION TASK

Source	df	MS	F
Between			
Mean	1	4779.34	
Grade	1	113.44	10.89*
Order	1	.04	.01
G x O	1	3.03	.29
Error	36	10.42	
Within			
Type	5	10.11	11.75*
G x T	5	2.33	2.71
O x T	5	1.61	1.87
G x O x T	5	24.30	28.26*
Error	100	.86	

*p < 01 level

TABLE 13

MEAN LATENCY SCORES

Sentence Type	Comprehension Task				Repetition Task			
	Kindergarten		2nd Grade		Kindergarten		2nd Grade	
	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect
1	3.67	3.94	2.55	3.70	1.36	2.45	1.22	1.80
2	3.52	5.68	2.81	3.12	1.68	1.99	1.33	1.78
3	3.77	4.60	2.74	3.42	1.70	2.08	1.42	1.35
4	3.26	8.21	2.61	2.92	1.80	2.32	1.62	3.42
5	4.07	3.79	3.03	2.95	1.69	2.20	1.40	2.31
6	3.81	4.14	3.02	2.94	1.79	2.08	1.42	1.77

The results of this experiment suggest that it is not so much the connective itself but rather temporal order which accounts for problems in comprehension of sentences joined by time connectives. Rather than ordering time connectives as Olds (1968) did in his experiment (before as more difficult than as soon as, when, and after), it seems clear that writers should be concerned with the following variables in the order that they are given: (1) temporal order, (2) frequency of the connective, and (3) the position of the time clause in the sentence.

CHAPTER V. COMPREHENSION OF CONDITIONAL STRUCTURES BY YOUNG CHILDREN

Conditional structures include a variety of sentence types; this study investigates three: if-then, if not-then, and unless.

The difficulty of sentence types involving "logical juxtaposition" has often been noted in the literature on child language acquisition (Piaget, 1956; Loban, 1964; Strickland, 1962). In more recent years, Bereiter (1967), Deutsch (1965) and others have taken lack of comprehension or production of standard English conditional if-then forms by "disadvantaged" ghetto children as evidence of cognitive underdevelopment. The fact that the same concept is expressed using a different form by these speakers of Black English has apparently escaped their attention.

In the preprimers and primers used as source materials, the if clause of the if-then sentence appeared in both initial position and in final position in the sentence. Temporal order is, in a sense, fixed since the if clause always precedes in time the then clause, or implies that it must happen first in order for the rest of the sentence to occur. The position of the if-clause in the sentence determines whether or not order of mention is the same as order of occurence. Although negative if-then sentences of the unless type do not occur at the primer level, they are included here for testing because: (a) they do appear at the next level in the reading books, and (b) the empirical data on comprehension of this structure by young children is incomplete. Examples of the set to be tested are:

	If clause + main clause	Main clause + if clause
Affirmative	"If I shut it, it will fill."	"We will scare the fish if we wade in the water."
Negative (aux + neg)	"If Bolo didn't get the ball, I said 'No, No, Bolo.'"	"I can't swim if you won't help me."
Negative (unless) affirmative main clause	"Unless we have a skit, what can we do?"	"We will tell mom unless you tell us the plan."

Negative (unless) + negative main clause	"Unless you help me, I cannot go back."	"I can't sell the eggs unless I fill the box."

Even more complicated versions of the if-then structure are found in the primers. For example, included questions are used: "If we do, how will we get to the dog show?" Sentence types where if signals whether or not also are used. But these cannot be manipulated for linguistic order:

"We will see if that fat fish is in the sand."
*"If that fat fish is in the sand, we will see.

In some samples the if-clause appears in medial position in place of a graphemically difficult when-clause: "Mom said if I am six, I can get a cap gun." (SRA)

In his study of comprehension of sentences involving "logical connectors," Olds (1968) found that unless caused the largest number of errors made by children aged 7 to 11 years. The use of unless in his experiment poses two problems. First, linguistic order was not considered as a variable, although both orders were used in the experiment. Second, the main clause of the sentence was always in the affirmative:

"Unless you have a large piece, you may move any piece two spaces."
"Unless you have a circle, you may move any piece one space."
"You may move any piece one space, unless you have a square."

Sentences in the reading books, however, almost always have a negative main clause when an unless-clause is used:

"You can't see the Thunderbird unless you watch for him."
"Unless you can read, you can't know how much paint to mix."

Linguistic order and negation in the main clause seem to influence an adult's evaluation of the acceptability of these sentences. The following 4 sets of sentences were given to adult Ss with instructions to rank the groups in the order that sounded best to them:

Group 1:
Unless he has a red nose, he won't read the book.
Unless your hands are clean, don't come to the table.
Unless you stand in line, you can't buy a ticket.

Group 2:
Unless he has a red nose, he will read the book.
Unless your hands are dirty, come to the table.
Unless you stand in line, you can buy a ticket.

Group 3:

He won't read the book unless he has a red nose.
Don't come to the table unless your hands are clean.
You can't buy a ticket unless you stand in line.

Group 4:

He will read the book unless he has a red nose.
Come to the table unless your hands are dirty.
You can buy a ticket unless you stand in line.

The order of preference for the sentences, as judged very informally by 28 adults, was as follows: Group 3 (24 Ss) as best, Group 1 (20 Ss) as second, Group 2 (16 Ss) as third, and Group 4 (15 Ss) as last. It seemed possible then that the large number of errors made by children in the Olds experiment might at least partially be accounted for by the use of the affirmative main clause in the sentence stimuli.

Secondly, it was not clear how responses were scored for correctness in the Olds study. For example, given the instruction, "Unless you have a square, move a triangle three spaces," it is not clear (where the child has a square) whether the only correct response is to do nothing. It seems possible that if the child has a square, he might also move it three spaces. That is, the sentence is ambiguous with "Unless you have a square (which you can move three spaces) move a triangle three spaces."

Finally, it is not clear how Olds collected latency data (a secondary measure used to back up the correctness measure) when the correct response was for the child to do nothing.

Questions raised by the Olds study and the presence of a large number of if-then structures in the reading books suggested that the following study be conducted.

METHOD

Subjects. Forty kindergarten and 40 second-grade children from a local school district served as subjects. The district is socio-economically middle class. Only Anglo children (white, monolingual) were tested. Kindergarten Ss had not begun reading instruction. Twenty kindergarten and 20 second-grade children were assigned to the repetition task, and another 20 kindergarten and 20 second-grade children participated in the comprehension task. Equal numbers of boys and girls participated in each task. Ss were assigned to each task in the order that they were received from the classroom.

Materials & Procedure. Each S was brought from the classroom by E to a Mobile Language Laboratory which was parked next to the classroom building. During the first few minutes, E showed the Laboratory and the

special equipment to the S. Actual testing time was approximately 15 minutes per S for the comprehension task and 10 minutes per S for the repetition task.

Special testing equipment was designed for the comprehension task.[1] Pictures of the equipment and a technical description are included in the materials appendix. A short training session preceded the comprehension task. Besides acquainting the S with the equipment, the training session required correct identification of 4 color names (red, yellow, green, and black) and required the S to give behavioral evidence of comprehension of sentence negation. The training session also accustomed him to using the headset and pressing the correct lever for his choice of responses. Six kindergarten Ss were excluded from the study on the basis of poor performance during the training session.

In the comprehension task, Ss listened to a taped stimulus sentence through a headset. The sentence was one of the following 8 sentence types:

Sent. Type	Example:
1	If it's red, raise your hand.
2	Raise your hand if it's red.
3	If it isn't red, raise your hand.
4	Raise your hand if it isn't red.
5	Unless it's red, raise your hand.
6	Raise your hand unless it's red.
7	Unless it's red, don't raise your hand.
8	Don't raise your hand unless it's red.

Upon hearing the stimulus sentence, the S was required to push a lever to indicate which of 2 pictures projected on a screen in front of him correctly reflected the stimulus sentence. The picture choices on each slide (correct or incorrect) showed the actor performing the action (raised hand) or the actor in a neutral position (hands at side) as well as a circle colored in one of 4 colors. All sentences were identical in form: $\underline{\text{it}}+\underline{\text{is}}+\text{adj}_{(\text{color})},+\text{verb}_{(\text{imper})}+\underline{\text{your}}+\text{noun}_{(\text{direct obj})}$. A complete list of the sentences used appears in the appendix. Forty-eight slides with taped sentence stimuli were presented to each S. Σ recorded Ss' responses and noted any additional behavioral responses of the S.

Latency data was automatically obtained. A "signal" (inaudible to S) was placed at the beginning of the last word of the sentence stimulus. The signal started a clock counter which was automatically

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[1]Grateful acknowledgement is made to Richard Hoskin for designing and assembling the equipment.

stopped when the S depressed the lever to indicate his picture choice. The latency data was recorded to the nearest tenth of a second.[2]

In the imitation task, the child fed language master cards containing the sentence stimuli into a Bell & Howell Language Master one at a time, and repeated the stimulus sentence to the E. Both the sentence stimulus and the S response were recorded on a Sony tape recorder, model TC-800; accuracy and latency data were then obtained from the tape.

In both tasks the S was given a short rest at the end of 24 trials during which time he was asked about events at school that day.

Design. Each S participated in either the comprehension task or the imitation task. In both tasks, Ss responded to 6 examples of 8 sentence types, 48 trials in all. The sentence presentation order was randomized within each group of 8 sentence types. Half the Ss received sentences which had been thus randomized in forward order; the other half received the sentences in reversed order (O_1 or Order $_2$). Sentence type was then a within-S variable and order was a between-S variable for each task.

RESULTS & DISCUSSION

The results are presented as mean scores in Table 1. Separate 2 x 2 analyses of variance were performed for each age group for each task (Tables 2, 3, 4 and 5). In the repetition task this showed that sentence type was a significant variable (.01 level) for each age group (Tables 4 and 5). In the comprehension task (Tables 2 and 3) sentence type was again a significant variable for both age groups. While order (forward or reverse order of the randomized list of sentences) was not significant in either group for either task, it did reliably interact with sentence type in the 2nd grade responses on the comprehension task. This difference is reflected in the mean scores for if not sentences (Types 3 and 4) for the 2nd grade (see Table 1). Four Ss in Order 1 gave a total of 4 correct responses out of a possible 48 to if not sentences. There is nothing in the order of occurence of if not sentences in the sample to explain this. (If-not sentences occur as #1, 7, 11, 15, 17, 19, 29, 30, 37, 38, 46 and 48 in Order 1, and as #1, 3, 11, 12, 19, 20, 30, 32, 34, 38, 42, and 48 in Order 2.)

Since sentence type proved to be a significant variable for both age groups in both tasks, the Neuman-Keuls test was used to compare differences between each sentence type and every other member of the set (see Tables 6, 7, 8, and 9). In the comprehension task, differences

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[2]Grateful acknowledgement is made to Annie Losoff for recording the latency data.

TABLE 1

MEAN CORRECT SCORES* ON COMPREHENSION AND REPETITION BY KINDERGARTEN AND 2ND GRADE CHILDREN ON EIGHT CONDITIONAL SENTENCE TYPES

	Type 1 If...X	Type 2 X...if	Type 3 If not..X	Type 4 X..if not	Type 5 Unless..X	Type 6 X..unless	Type 7 Unless..Xneg	Type 8 Xneg..Unless
Comprehension Task								
Kindergarten								
Order 1	3.80	4.40	3.00	3.00	1.60	2.40	3.40	4.40
Order 2	3.40	3.70	2.30	3.40	3.10	2.10	3.20	3.20
Combined	3.60	4.00	2.50	3.20	2.35	2.25	3.30	3.65
2nd Grade								
Order 1	5.80	5.90	2.80	2.50	0.40	0.30	4.40	5.60
Order 2	5.70	4.40	4.70	4.70	0.50	0.40	3.40	4.90
Combined	5.75	5.40	3.75	3.60	0.45	0.35	3.90	5.25
Repetition Task								
Kindergarten								
Order 1	5.00	4.80	3.80	4.00	2.70	2.10	2.00	2.90
Order 2	5.00	4.70	4.70	4.10	3.80	3.70	3.50	3.70
Combined	5.00	4.75	4.25	4.05	3.25	2.90	2.75	3.30
2nd Grade								
Order 1	6.00	6.00	5.70	5.60	4.60	4.50	4.60	4.40
Order 2	6.00	6.00	5.90	5.80	5.40	5.90	5.30	5.60
Combined	6.00	6.00	5.80	5.70	5.00	5.20	4.95	5.00

* score range is 0 to 6.

TABLE 2

ANALYSIS OF VARIANCE FOR COMPREHENSION ACCURACY - KINDERGARTEN

Source	df	MS	F
Between			
Mean	1	1587.60	
Order (O)	1	1.60	1.21
Error	18	1.32	
Within			
Type (T)	7	9.03	5.42*
O x T	7	3.43	2.06
Error	126	1.67	

* $p < .01$ level

TABLE 3

ANALYSIS OF VARIANCE FOR COMPREHENSION ACCURACY - 2nd GRADE

Source	df	MS	F
Between			
Mean	1	1988.10	
Order (O)	1	0.63	.29
Error	18	2.14	
Within			
Type (T)	7	86.57	59.21*
O x T	7	8.64	5.91*
Error	126	1.46	

* $p < .01$ level

TABLE 4

ANALYSIS OF VARIANCE FOR REPETITION TASK - KINDERGARTEN

Source	df	MS	F
Between			
Mean	1	2287.66	
Order (O)	1	21.76	.99
Error	18	22.01	
Within			
Type (T)	7	14.48	6.20*
O x T	7	2.24	.96
Error	126	2.34	

*p <01 level

TABLE 5

ANALYSIS OF VARIANCE FOR REPETITION TASK - 2nd GRADE

Source	df	MS	F
Between			
Mean	1	4763.31	
Order (O)	1	12.66	2.16
Error	18	5.86	
Within			
Type (T)	7	4.31	4.01*
O x T	7	1.48	1.38
Error	126	1.07	

*p <.01 level

TABLE 6

NEUMAN-KEULS TEST FOR COMPREHENSION ACCURACY BY SENTENCE TYPE -KINDERGARTEN

Sentence Type	Type 2 X...if	Type 8 Xneg..unless	Type 1 If...X	Type 7 Unless..Xneg	Type 4 X...if not	Type 3 If not..X	Type 5 Unless..X	Type 6 X..unless
	Mean=4.05	m=3.8	m=3.6	m=3.3	m=3.2	m=2.65	m=2.35	m=2.25
2		.25	.45	1.75	.85	1.40**	1.70**	1.80**
8			.20	.50	.60	1.15	1.45**	1.55**
1				.30	.40	.95	1.20*	1.30*
7					.10	.55	.80	.90
4						.45	.70	.80
3							.25	.35
5								.10

**p <01
*p <05

TABLE 7

NEUMAN-KEULS TEST FOR COMPREHENSION ACCURACY BY SENTENCE TYPE - 2ND GRADE

Sentence Type	Type 1 If...X	Type 8 Xneg..unless	Type 2 X...if	Type 7 Unless..Xneg	Type 3 If not..X	Type 4 X...if not	Type 5 Unless..X	Type 6 X..Unless
	Mean=5.75	m=5.25	m=5.15	m=3.90	m=3.75	m=3.60	m=.45	m=.35
1		.50	.60	1.85**	2.00**	2.15**	5.30**	5.40**
8			.10	1.35**	1.50**	1.65**	4.80**	4.90**
2				1.25**	1.40**	1.55**	4.70**	4.80**
7					.15	.30	3.45**	3.55**
3						.15	3.30**	3.40**
4							3.15**	3.25**
5								.10

**p <01 level
*p <05 level

TABLE 8
NEUMAN-KEUHLS TEST FOR REPETITION ACCURACY - KINDERGARTEN

Sentence Type	Type 1 If...X	Type 2 X...if	Type 3 If not..X	Type 4 X...if not	Type 8 Xneg..unless	Type 5 Unless..X	Type 6 X..unless	Type 7 Unless..Xneg
	Mean=5.0	m=4.8	m=4.3	m=4.0	m=3.3	m=3.3	m=2.9	m=2.8
1		.20	.70	1.0	1.70**	1.70**	2.10**	2.20**
2			.50	.80	1.50*	1.50*	1.90**	2.00**
3				.30	1.00	1.00	1.40*	1.50*
4					.70	.70	1.10	1.20
8						.00	.40	.50
5							.40	.50
6						+		.10

**p< .01 level
*p< .05 level

TABLE 9
NEUMAN-KEULS TEST FOR REPETITION ACCURACY - 2ND GRADE

Sentence Type	Type 1 If...X	Type 2 X...if	Type 3 If not..X	Type 4 X...if not	Type 8 Xneg..unless	Type 5 Unless..X	Type 6 X..unless	Type 7 Unless..Xneg
	Mean=5.0	m=4.75	m=4.25	m=4.05	m=3.30	m=3.25	m=2.90	m=2.75
1		.25	.75	.95*	1.70**	1.75**	2.10**	2.25**
2			.50	.70	1.45**	1.50**	1.85**	2.00**
3				.20	.95*	1.00**	1.35**	1.50**
4					.75	.80	1.15**	1.30**
8						.05	.40	.55
5							.35	.50
6								.15

**p< .01 level
*p< .05 level

in kindergarten Ss' responses to sentence types reached a significant level of at least .05 when:

Unless sentences (5 or 6) were compared to {if sentences (1 or 2) neg main clause + unless (8).}

If not sentence (3) was compared with main clause + if sentence (2).

Statistically significant differences in second grade Ss' responses in the comprehension task to pairs of sentence types were:

Unless sentences (5 or 6) compared to {if sentences (1 or 2); unless + neg clause sents. (7 or 8); if not sentences (3 or 4)}

If not sentences (3 or 4) compared to {if sentences (1 or 2); unless + neg main clause sents. (8)}

Unless + neg main clause (7) compared to {if sentences (1 or 2); neg main clause + unless sents. (8)}

In the repetition task both age groups ordered the difficulty of sentence types as:

Easiest	Type 1	(if-clause + main clause)
↓	Type 2	(main clause + if-clause)
	Type 3	(if not clause + main clause)
	Type 4	(main clause + if not)
	Type 8	(neg main clause + unless)
	Type 5	(Unless + main clause)
	Type 6	(main clause + unless)
Most difficult	Type 7	(unless + neg main clause)

Statistically significant differences for kindergarten repetition responses were obtained when Types 5,6,7, or 8 were compared to 1 or 2 and Type 3 compared to 6 or 7. 2nd grade repetition responses differed significantly when: Types 5,6,7, or 8 were compared to Type 1 or 2, Types 5,6 or 7 were compared with Type 3, and when Type 4 was compared with Type 6 or 7.

Since the sentence types fell into similar comparison pairs, groups of sentences were next tested for statistical significance using the Scheffe test for multiple comparisons. The groups of sentence types compared were:

1. Types 1,2 vs 3,4. Neg if not-sentences should obtain fewer correct responses than affirmative if-sentences.

2. Types 5 and 6 vs 3 and 4; Types 5 and 6 vs 1 and 2. Since if not and unless are synonymous, there should be no significant difference in responses to these two groups. If children interpret unless as synonymous with if, then a significant difference should be obtained for both groups above.

3. Types 5 and 6 vs 7 and 8. If children read (2nd grade Ss) or hear (both groups) unless more frequently with a negative main clause, a significant difference should be shown between these 2 groups.

4. Types 1,3,5,7 vs. 2,4,6,8. If position in the sentence (temporal and linguistic order) is an important variable, significant differences should be obtained between these two groups.

The results of the Scheffe test for multiple comparison are shown in Table 10. 2nd grade responses to both task will be discussed first and each comparison will be discussed in turn.

SECOND GRADE RESULTS

Second grade Ss gave significantly better responses (.01 level) to affirmative if sentences than to negative if not sentences on the comprehension task. A drop of 30% in number of correct responses (91% correct for if-sentences and 61% for if not-sentences) was caused by the addition of negation to the if-clause.

The extremely large number of incorrect responses to unless-sentences when followed by an affirmative main clause (7% correct responses) resulted in significant differences in comparison with synonymous if not- sentences. It seems obvious from this comparison, and from the statistically significant comparison of differences between unless and if sentences, that 2nd grade Ss uniformly interpreted unless followed by an affirmative clause synonymous with if-sentences rather than with if not-sentences. This finding agrees with Old's statement that children (7 to 11 years in his study) consistently interpreted unless as if rather than if not.

It is interesting to see that once the main clause following unless is changed to negative, a correct interpretation is assigned to the unless clause. Differences in accuracy of responses to unless vs unless + negative main clause are statistically significant. The percentage difference in correct responses to the two groups is 76% correct for unless + neg main clause and 7% correct for unless + affirmative main clause.

The difference in response scores to initial vs final position of the dependent clause (Types 1,3,5,7 vs 2,4,6,8) was not large enough to reach statistical significance. Since scores were so low on the unless +affirmative main clause types, these two types were omitted and the

TABLE 10

SCHEFFE TEST FOR SENTENCE TYPES
F SCORES

Comparison	Comprehension Task		Repetition Task	
	Kindergarten	2nd Grade	Kindergarten	2nd Grade
Types 1, 2 vs 3, 4 (If vs If not)	9.73	43.10**	4.50	1.17
Types 5, 6 vs 3, 4 (Unless vs. if not)	4.69	146.70**	9.90	8.49
Types 5, 6 vs 1, 2 (Unless vs. if)	27.93**	88.95**	27.75**	15.10*
Types 5, 6 vs 7, 8 (Unless vs. Unless + neg main clause)	18.79*	238.45**	.01	.39
Types 1, 3, 5, 7 vs 2, 4, 6, 8 (Initial vs. final clause position)	2.35	.43	.07	.07

**p <.01
*p <.05

analysis run again. The differences for order in the sentence still missed the .01 significance level on the Scheffe test.

In the repetition task, where differences between scores were much smaller and all scores were higher, the only reliable difference (.05 level) obtained was between *if*-sentences vs. *unless* + affirmative clause sentence types (1 and 2 vs 5 and 6). *Ss* made fewer errors on the *if* sentences than on *unless* + affirmative clause sentences. This difference can be traced to two 2nd grade *Ss* who consistently repeated these "unless" sentences as "and if" sentences:

Model: Unless it's red, raise your hand.
S: An' if it's red, raise your hand.

This will be discussed in more detail along with the kindergarten repetition data.

LATENCY DATA

Looking at the latency data for 2nd grade responses to the sentence types (Table II), one expects to find that *Ss* took longer to respond to the sentence types which were most difficult. This appears to be true with the exception of the *unless* + affirmative clause sentences. On these, responses were made just as rapidly as to other sentence types. It seems that though their responses were wrong, *Ss* spent no time considering alternative answers. *E* noted the sureness of these responses during the testing situation. Contrary to their behavior in response to *if not* sentences, *Ss* exhibited no false starts or switching back and forth between the 2 levers before a final choice was made. It seems, then, that though *Ss* interpreted *unless* incorrectly, they had no doubt that they were responding correctly. Unfortunately, the reversal of speed of response to accuracy for *unless*-sentence types resulted in a non-significant negative correlation score. Removing the 2 *unless*-sentence types from the analysis yields a significant correlation score (-.97). On the repetition task the time differences as well as the correctness differences are very small. While a negative correlation was obtained, the score did not reach a significant level.

KINDERGARTEN RESULTS

The Kindergarten *Ss*' responses on the comprehension task form a very different pattern. The mean scores hover around the 50% correct level with slightly higher scores (63% correct) for *if* clauses and slightly lower scores for *if not* clauses (41% correct) and *unless* clauses (39% correct). The explanation for this has to be inability to comprehend sentences of this type at age 5. The *Ss* were able to distinguish color names by pressing the appropriate lever. They also were able to respond correctly to training sentences like: "Is it red? Then raise your hand," when the color was or was not red. Successful

TABLE 11

MEAN LATENCY SCORES (Seconds)

Sentence Type	Comprehension Task				Repetition Task			
	Kindergarten		2nd Grade		Kindergarten		2nd Grade	
	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect	Correct	Incorrect
1	2.50	2.67	1.30	0.51	1.74	1.79	1.30	nd
2	2.72	2.72	1.54	1.25	1.85	2.08	1.31	nd
3	3.05	3.20	2.56	2.22	1.76	1.83	1.58	1.25
4	3.23	3.75	3.63	2.76	1.96	2.09	1.60	1.48
5	3.25	2.52	1.60	1.94	1.75	1.81	1.48	1.46
6	3.62	2.08	1.66	1.77	1.82	2.29	1.68	1.61
7	2.31	2.62	1.99	3.26	2.06	2.44	1.73	1.73
8	2.33	3.78	1.66	2.19	1.68	2.17	1.54	1.43

completion of the training session was required; 6 kindergarten Ss were excluded from the study for inability to identify color correctly or inability to make correct responses to the training sentences. In the testing situation it was obvious that once the structure was changed to a conditional clause, at least half of the Ss were unable to comprehend the meani 'f the sentence well enough to make correct choices. This forced them to search for alternative strategies. Two Ss decided, after about 15 trials, that the best solution was to chose the right hand lever for the majority of their responses with an occasional change to the left hand lever. If this strategy were used consistently, scores varying from 40% to 60% correct for the sentences types could have been obtained since the experiment had been balanced for correct right vs left lever responses. Five Ss, after a few trials, decided that the best solution was to chose the action picture consistently, This solution if used for every item, would yield a 50% correct score since the experiment was balanced so that half of the responses for each sentence type required chosing the action picture and half required the neutral picture. In addition, most of the Ss exhibited at least lip movement before they made a choice during the first half of the experiment. Some carried out extensive verbalization ("Oh no, he ain't right...it's that guy," etc.). Three Ss consistently exhibited difficulty in restraining movements as well as verbalization; other Ss showed occasional motor responses in their hand movements. For example, if taped sentence stimulus was, "If it's green, touch your shoes," the directive function of speech was strong enough (even though the S understood quite well that his task was to chose the correct picture by pushing the lever) to make the child begin to perform the action of reaching for his shoes and then switch to reaching for the lever. This was true even for negative commands. Experiments on the directive function of speech (Luria, 1959) have been conducted almost exclusively with 3 and 4 year old Ss. It is interesting to see this evidence of the directive power of speech in 5 year olds.

Given the above strategies and the resulting scores, it is not surprising to find few statistically significant differences in responses to sentence types in the experiment (see Table 10). No significant differences were found between *if* and *if not* sentences. An .05 level was reached for the higher scores on *unless* + neg main clause compared to *unless* + affirmative main clause. The only .01 level difference obtained was for the comparison of *if*-sentences with *unless*-sentences. This, of course, was the area of greatest differences in scores for the 2nd grade Ss as well.

Errors made by kindergarten Ss in the repetition task are quite interesting for the light they shed on performance in the comprehension task, even though different Ss were used for the two tasks in this study. It is impossible, for example, to check to see how Ss who consistently repeated initial *if* clauses as yes/no questions comprehended the conditional aspect of *it*. Examples of such repetitions are:

Model: If it's black, comb your hair.
S; Is it black? (rising intonation) Comb your hair.

Model: If it isn't green, bend your arm.
S: It isn't green? (rising intonation) Bend your arm.

The training session for the repetition task (see appendix) did not include questions. Intonation on the model was falling; it is possible that the S heard vowel lengthening and medial pause as rising intonation.

When the if clause appeared in final position, these Ss either retained the if as is without rising intonation or omitted the if and copula:

Model: Clap your hands if it's green.
S: Clap your hands is it green.
S: Clap your hands it...uh...green.

With negation the if was omitted:

Model: Close your eyes if it isn't yellow. (Contrastive stress on isn't)
S: Close your eyes...it isn't yellow.
S: Close your eyes...it...uh..not yellow. (stressed not)

Errors in repetition of the unless sentences showed that Ss simply omitted the unless in final position.

Model: Wiggle your fingers unless it's red.
S: Wiggle your fingers...it's red.

In initial position a number of substitutions were made:

Model: Unless it's green, touch your shoes.
S: An' if it's green, touch your shoes.
S: When it's green, touch your shoes.
S: An'...it's green, touch your shoes.
S: Um...it's green, touch your shoes.

Needless to say, such interpretations of unless would lead to incorrect responses on a comprehension task.

Errors in the unless + negative main clause were usually incomplete responses, but when unless was initial, the structure elicited the same type of response:

Model: Don't count your fingers unless it's green.
S: Don't count to your fingers.....
Model: Don't clap your hands unless it's red.
S: Don't you clap an'....

Model: Unless it's black, don't tie your shoes.
S: An' if it's black, tie your shoes.
S: An'...it's black...tie your shoes.

With the omission of negation from the main clause, such an interpretation would result in a correct response on the comprehension task. It is, of course, stretching the argument a great deal to claim that this could account for the better performance in the comprehension task for the unless + negative main clause sentence types as compared to the unless + affirmative main clause sentence types. No other explanation is at hand, though, unless the frequency argument mentioned above is adopted.

In the comparisons of the repetition responses by kindergarten Ss using the Scheffe test (see Table 10) only one comparison proved statistically significant. More Ss were able to repeat more if-clauses correctly than unless-clauses.

LATENCY DATA

Correlation of the latency data with the correctness data for kindergarten Ss showed reliably (.05 level;-.68) longer latencies on incorrect responses in the comprehension task. The small negative correlation on the repetition task was not significant.

Finally, the overall analysis of variance to compare grade level differences and interactions in the responses of kindergarten Ss vs 2nd grade Ss is presented in Tables 11 and 12. Because of the various strategies employed by kindergarten Ss in the comprehension task, their correctness scores cannot be compared with 2nd grade responses with any pretense of validity. A difference nonetheless is obtained at the .05 level. Type is, of course, significant for combined scores. The interaction between grade and type was caused by the automatically-obtained 50% correct scores (approximately) on all sentence types for kindergarten Ss as compared to a range from uniformly high scores on if sentences to uniformly low scores on unless-sentences for 2nd grade Ss. The Order X Type interaction still appears to be due to better performance on if not sentences by 2nd grade Ss in Order 1. The 3-way interaction is difficult to explain except as a combination of the above factors: kindergarten Ss responded to all sentence types in a fairly uniform manner with small differences in order while 2nd grade responses varied widely over sentence types with better performance by Ss in Order 1. Despite the range of scores by 2nd grade Ss for various sentence types, their overall scores were still higher than those of kindergarten Ss.

It is clear from the study that kindergarten children have a great deal of difficulty with standard adult conditional structures. While one might claim that it was the difficulty of the comprehension task itself which caused poor performance by kindergarten Ss, the same Ss had no trouble with the task as long as the stimlus was not in the conditional form. Errors made by kindergarten Ss in repeating the sentences also reinforces the notion that kindergarten children have different forms for if-then, if not-then, unless-then, and unless-then not sentences and, in the case of unless-then, their form changes sentence meaning to the opposite of the adult form.

TABLE 12

ANALYSIS OF VARIANCE FOR KINDERGARTEN TO 2ND GRADE COMBINED - COMPREHENSION

Source	df	MS	F
Between			
Mean	1	3564.45	
Order (G)	1	11.25	6.50*
Order (O)	1	.11	.01
G x O	1	2.12	1.23
Error	36	1.73	
Within			
Type (T)	7	73.09	98.77**
G x T	7	22.51	30.41**
O x T	7	7.46	10.08**
G x O x T	7	4.60	6.21*
Error	252	.74	

** p <01 level
* p <05 level

TABLE 13

ANALYSIS OF VARIANCE FOR KINDERGARTEN TO 2ND GRADE COMBINED - REPETITION

Source	df	MS	F
Between			
Mean	1	6826.51	
Grade (G)	1	224.45	16.11**
Order (O)	1	33.80	2.43
G x O	1	.61	.00
Error	36	13.93	
Within			
Type	7	16.90	10.70**
G x T	7	1.89	1.20
O x T	7	3.30	2.09
G x O x T	7	.43	.00
Error	252	1.58	

**p< .01 level
*p< .05 level

Responses of 2nd grade Ss showed that comprehension of if-then sentences is uniformly high. Adding negation to the if clause or using an unless-then not structure resulted in poorer performance by these Ss. If an unless clause is used with an affirmative main clause, 2nd grade Ss uniformly give an incorrect response. With the exception of two 2nd grade Ss, errors made in repetition of these sentences appear to be more or less random. Repetition errors made by the 2 Ss reflect the kindergarten pattern of substitution of an if for unless.

The data for 2nd grade Ss and the repetition data for kindergarten Ss supports Olds' observation that young children interpret unless as if rather than if not. This is, however, true only in those cases where the main clause is in the affirmative.

The study shows that writers preparing material for 2nd grade Ss should be concerned with (1) the Ss' inability to give a correct interpretation to unless when it is followed by an affirmative clause, (2) the comparatively good performance on unless clauses when they are followed by a negative main clause, and (3) the fairly steep decline in the Ss' ability to interpret an if clause when negation is added. The study also shows that none of the standard conditional sentence types tested is comprehended by kindergarten Ss at a high enough level to warrant their inclusion in preprimers which are concerned with teaching the reading code. It is suggested that either the yes/no or when form be used instead.

Finally, it is obvious that lack of comprehension and production of standard English if-then structures is not simply a characteristic of speech of "disadvantaged" children. Like speakers of Black English who repeated if-then sentences with a yes/no form in the Joan Baratz study (1968):

Model: I asked Tom if he wanted to go to the picture at the Howard.
S: I ask Tom did he wanna go to the picture at the Howard.
Model: I don't know if I can get the material for you.
S: I don't know can I get the material for you.

5-year-old Ss (middle class Anglo) in this study repeated sentences using the same yes/no form:

Model: If it's green, touch your shoes.
S: Is it green, touch your shoes.
Model: Close your eyes if it's red.
S: Close your eyes is it red.

In neither case should such differences between child language and adult standard forms be taken as evidence of undeveloped concept formation.

CHAPTER VI: CONCLUSIONS AND RECOMMENDATIONS

The four experimental studies showed that the language used by young children is not identical to that used in beginning reading books. In each experiment, however, a developmental trend toward the standard form was noted between the two age groups tested.

Experiment 1 asked whether the child entering a reading program had mastered the syntactic agreement rules for mass and count nouns. The task involved production of the cues much vs many and # vs # + quant in response to mass and count nouns. The analysis showed that kindergarten children had not mastered the cues for mass nouns. The 2nd grade subjects also made more correct responses to count than to mass nouns, but the difference was not significant. The child about to begin reading instruction has not, then, mastered the syntactic cues for the mass noun category. While mass noun cues are still a problem, the ability to produce them consistently has improved by the time the child is 7 years old.

Experiment 2 used a repetition task to determine how acceptable ungrammatical accusative case pronouns in subject position ("Me and him went to the movies") were to young children. The analyses showed pronoun case to be an area of confusion for both the kindergarten and 2nd grade child; each clearly accepted accusative case pronouns in subject position as an alternative for the nominative case. However, only in the kindergarten data were instances found of subjects changing modeled, grammatical, nominative-case pronouns in subject position to the accusative case. The study showed that pronoun case is not yet standardized in the language of the child who is about to begin reading instruction.

Two tasks were used in the third experiment. The first required the child to give a non-verbal response as evidence of comprehension of time connectives, the second was a repetition task. The analyses showed that temporal order was the most important variable in presenting such structures to young children. Subjects gave more correct behavioral responses when order of mention was the same as the order of the action required. Frequency of the connective was also an important variable for kindergarten subjects. While both groups gave more correct responses when the time clause was final in the sentence, linguistic order was not statistically significant. Time clauses which were not presented in temporal order presented more problems for kindergarten than 2nd grade children, and frequency levels of before and after also made sentence types involving these connectives more difficult for the younger group.

Comprehension and repetition of conditional clauses were tested in the final experiment. The analyses showed that kindergarten children have great difficulty both in comprehension and in repetition of sentences which use the standard conditional forms. 2nd grade subjects appeared to have mastered the if-then structure. They did less well on if not-then and unless-then not sentences, and they uniformly misinterpreted unless-then sentences. All the standard conditional forms used in this experiment could, then, present problems to the kindergarten child who is

beginning a reading program, and 2nd grade children could also be expected to misinterpret unless-then sentences in a reading textbook.

Implications for a Reading Program

From the literature survey, from the experiments and from the cursory examination of preprimers and primers it is evident that there is a mismatch between language used in reading books and that used by the kindergarten child. While it is true that some kindergarten children and even some three year olds have mastered a wide variety of adult structures, the majority still have comprehension and production problems with more complex adult patterns (for example, so clauses, unless clauses, say vs. tell structures verb tenses, irregular past participles, nominalizations, etc.) and these structures do appear in beginning reading books.

This difference may not be critical if the child has at least a passive recognition of adult forms used in reading books. In this sense, the results of Experiments 1 and 2 which showed that Ss did not consistently produce correct cues for mass nouns, and that accusative case pronouns are substituted for subject pronouns are trivial, though interesting, areas of investigation. This does not mean that there will be no interference in reading the standard form for mass noun cues or subject pronouns. There may well be interference, but at least the child will recognize the adult form and have no problem in comprehending sentences which contain such forms if he is able to read them. More critical differences are those shown in the third and fourth studies where lack of standard forms caused the child to misinterpret sentence meaning. This was shown in comprehension tests of (1) various if-then clauses for kindergarten Ss, (2) in incorrect interpretation of the unless clause followed by an affirmative clause by 2nd grade Ss, and (3) in before/after time clauses involving reversed temporal order for kindergarten Ss. It is important that writers and teachers be very much aware of such differences.

However, as Shuy (1968) has remarked in his paper on teaching reading to ghetto children where this mismatch is even more serious, the teaching of reading has not accomodated itself to the natural progression of language acquisition by the child, and saying that "language instruction has been fuzzy in this area is to say the kindest thing imaginable," (Shuy, p. 18).

Traditionally, interest in language acquisition has been concerned with the child's increasing ability to articulate the sounds of English or, at most, to estimate the size of his vocabulary or the length of his sentences. Phonology has naturally dominated language acquisition studies since it is more easily accessible to description than is the sentence grammar. Good descriptions of the development of language structures (beyond the "basis sentence" level) have not been available to writers of textbooks. It is not surprising then, as Strickland (1962)

has pointed out, that little thought has ever been given to systematic presentation of syntactic structures in reading books. Four of her summary statements concerning the language patterns used in four reading series (grades 1 through 6) which she investigated are particularly relevant:

1. Patterns of sentence structure appeared to be introduced somewhat at random.

2. There was no clear arrangement for the introduction of elements of subordination in any of the series.

3. A pattern of structure, once introduced, seemed not to be followed up with further elements of the same or similar sort.

4. The patterns which appeared in the sample differed from series to series and from book to book within a single series. (Strickland, p. 71)

Reading books neither follow a sequence which parallels the child's language development nor, at least in the reading books investigated by Strickland, do they follow any pedagogically-determined sequence in the presentation of structures.

The burden of proof, however still remains with the investigator who claims that this mismatch of the child's language with the language of the reading books, and the random introduction of syntactic structures in the reading books causes interference in the reading process.

Aside from a general appeal to common sense, the first attempts which have been made to support this hypothesis can be reported. Clay (1968) analyzed reading errors made by 100 five-year-old children. While not particularly revealing as to what kinds of sentence structures caused errors, the analysis does show that the child guesses when uncertain, and that his guesses agree with his own syntactic forms. That is, if the child recognizes the, he knows the next word must be a noun. If his word attack skills fail him, he will guess some noun. If he sees an a, he also knows the next word is a noun, but he may well guess a mass noun ("a milk") inless he has mastered the adult syntactic cues for the mass noun category.

Kolers (in press) provides further evidence that the reader's knowledge of syntax plays an important part in the reading process. In this case, errors made by college-age Ss while reading aloud from a text were tabulated. The letters of the text were reversed, presented upside down, run from right to left on the page or from left to right. As one might imagine, a large number of errors were made by the Ss in reading the passages aloud. Three-quarters of all errors made preserved the part of speech of the stimulus word; nouns were substituted for nouns,

verbs for verbs, etc. When frequency of the various parts of speech was taken into account, it was clear that Ss made no errors in one part of speech than another. Errors were corrected by the S most often if the error violated both the syntactic and semantic requirements of the sentence; otherwise, the S seldom noticed that an error had been made. Again, exactly what kinds of syntactic structures (rather than parts of speech) were involved in the errors that Ss made is not clear.

Gibson, Osser & Pick (1963) have pointed out that learning word attack skills can be expected to proceed slowly over a period of time. In the early stages of reading these skills must fail the child frequently, and guessing, dependent of his own oral languages forms must be expected. If the syntax of the sentence he is reading is not one he frequently uses, these guesses will likely fail too. If the syntax is a pattern that causes the child to misinterpret sentence meaning (as in the unless-clause data), it seems reasonable to say that it will not be easy for him to read.

If it can be accepted for the moment that the mismatch does lessen the chances of successful reading performance during the beginning reading program, the pedagogical question still to be considered is whether it is better to change the reading materials to match the child's language or whether one should try to change the child's language to match the materials.

Shuy (1967) makes a strong plea for changing materials to fit the child. His reasoning is that however valuable it may seem to teach the child to use new syntactic patterns, it is not worth the delay it may cause in learning to read. Secondly, he says that traditional theory in education has always been to suit the materials to the child. Goodman (1965) also believes that children should be encouraged to read the way they speak, that written materials should reflect the child's natural language. Both Shuy and Goodman are most concerned with speakers of Black English, and their remarks are directed especially towards those who are preparing reading materials for ghetto children. For speakers of Black English the mismatch is even greater, and there would be a much larger amount of material to practice (not only in syntax but in phonology as well) in order to change the child's language to match the materials.

Baratz (1968) also makes an appeal for a change in materials, materials which not only fit the child's language but also fit the child's culture. Her plea is based on the fact that, despite enormous expenditures of energy and money on remedial reading programs, children in the ghetto communities and elsewhere are not learning to read. A close look at such remedial programs shows, however, that they are almost exclusively concerned with more phonics drills and more word drills, not with practice in the forms of adult sentence syntax.

On the other side of the argument are those who are concerned with compensatory education. They can point out that the greatest part of

the resistance to practicing sentence structures as preparation for reading has been the evidence that teaching a child grammar does not have much measurable effect of his language skills. These studies (see, for example, Zidonis, 1965 and O'Donnell, 1963) have usually been directed toward the secondary school child and have tested the value of various kinds of grammars in relation to composition. There is a great deal of difference between teaching "grammar" and giving practice in using grammatical structures. The effectiveness of oral classroom drill in teaching new languages can scarcely be questioned. The use of this method to teach the native language is, however, quite new.

The Bereiter-Engelman (1967) program at the University of Illinois is perhaps the most adamant about the need to change the child by increasing his language ability in standard English. The method as it is now being used consists mostly of simple substitution drills with picture or object prompts. The children repeat in unison after the teacher:

A_____is a container. (picture cue, choral response)
A_____is not a container.
A_____is a container. (etc.)

The child must participate verbally in the language section of the program. This is perhaps the strongest feature of the program. The program assumes that the child is verbally deficient and that the cause for the claimed deficiency is limited mother-child verbal interaction. Such assumptions are patently false. The child does not use standard adult forms but his own highly structured language system. It is true, however, that one way of dealing with school is not to speak in the classroom, so it is important that the child not be allowed to sit quietly in the corner. It is important that he participate verbally in the classroom and the he be given a standard model to imitate if one wants to increase his use of standard forms.

Watching the films of the Bereiter-Engelmann program, one is impressed with the boredom exhibited by the preschool children as they shout out in unison "An elephant is not a food." The child has much to learn, of course, but we should not underestimate human intelligence. Surely the child knows that pencils are not a subclass of food even though he may chew on them occasionally. What should be listened for, rather, is the -s on pencils and the presences of the copula in the child's response; this is difficult if the children are allowed to shout. If the teaching point is the use of not then the teacher must be able to hear any "ain't no" substitutions. Many errors could be avoided in this type of program if some attention were paid to the progress that has been made in methodology for teaching foreign languages.[1] Even in teaching lexical subclasses, natural activities may develop the notion of class faster than substitution drills where the child is taught to "chant at the top of their voice and in beautiful

rhythm" (Stendler-Vavatelli, 1967, p. 369). For example, the teacher might say, "Let's put the food in the boxes. What should we put in first?" I doubt if many children would suggest pencils or elephants as possible choices. The program (which has now been adopted by Head Start on a nationwide basis) does have a number of strong points. Among these points are that just as the child does talk outside the classroom, he must now talk in the classroom, and that he is given a standard model to follow.

Oral drills have also been used with older children. Ney (1968) has reported on five recent studies aimed at measuring the amount of transfer of training from oral drills to writing. The studies were all similar in that the grade-school children (4th and 7th graders) were given two sentences to combine in whatever sentence pattern was being studied. For example, given:

> The injured captain gave the commands.
> The injured captain was lying in the bow.

the child would be instructed to use a who-clause:

> The injured captain, who was lying in the bow,
> gave the command.

In each exercise, the entire class was involved through choral repetition of response sentences given by the individual S. Progress of the students was measured from pretest to posttest. These test consisted of showing a film (as in the O'Donnell methodology) and requesting the Ss to write as much as they could within a specified period of time on the subject shown in the film. Sentences in the compositions were then classified and tabulated to see if, in fact, the students used those sentences which they had practiced in the oral drills. In the analysis of variance, the difference between the occurrences of the structures taught on the pretest and posttest compositions for the

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[1]For example, games (so familiar to the foreign language teacher who works with young children) can do much to secure the child's attention while practicing language structures. To teach the tested if-then structures, an active game like "Johnny-Cross-the-Ocean" ("Johnny, can I cross the ocean?" "Yes, if the light is green." "Yes, unless you're wearing blue," etc.) or a board game with an instruction to be repeated by the child before he makes each move ("Go to Broadway if it's green.") could be used. When group responses are necessary to practice the pattern, familiar participation stories where the children repeat the key sentences in chorus (Teacher: "And the King said . . . Children: You can't unless you find the gold...You can if you find the gold.) could sustain the child's interest while he practices the patterns.

experimental group vs. the control group reached a reliable level of confidence. The gain on the posttests was attributed to the methodology.

In summary, the language of classroom reading books differs from that used by young children. The arguments for changing reading material to suit the child are impressive. Their greatest appeal is that other methods have produced nothing but failure for a large number of children, and especially for those whose language differs most drastically from that of adult standard English. This failure, however, may be in part due to the "other methods" which have been used to help the child who has difficulty in learning to read. Such methods have meant either more phonics drills or teaching "grammar" in a meaningless, abstract manner. Even those programs which have worked to improve the child's use of standard language forms in preschool programs have concentrated more on vocabulary classification than on sentence syntax.

The evidence of the role that language interference can play in reading failure indicates that perhaps the most effective way to deal with the literacy problem of young readers is to teach them using texts which reflect the structures of his own language. New syntactic structures could then be systematically introduced and practiced orally by the child in as imaginative and meaningful a context as possible. Once these structures have become part of the child's oral language (that is, when he fully comprehends them and can use them even if along with his own alternative forms) they could be presented in the reading texts in the same ordered manner.

Such reading books, programmed for sentence complexity as well as for vocabulary level and phoneme-grapheme correspondence rules. would do much to help the bilingual child and the bi-dialectal child as well as the Anglo child to learn to read.

This report is the first step in a program of experimental research on the syntax of young children. The linguistic variables reported in this study were selected on the basis of incomplete empirical evidence on the structures and the frequency of such structures in the preprimers and primers used as source materials.

A more structured program of research is now underway. The description of the syntax used in the preprimers and primers of 4 reading series is nearing completion. This data will then be matched to that collected in the observational studies of children's natural language. Where little observational data on the structure has been found, experimental investigation will be planned. Structures already noted for experimental investigation include: causatives and double causatives, indirect questions, reference problems in prepositional phrases, and the effects of deletion in relative clauses, time clauses, and so/because clauses.

The research program when complete, should give writers a guide for sequencing syntax structures in a more appropriate manner. It should also be of interest to researchers in the field of second language acquisition, and to those studying Black English.

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MATERIALS APPENDIX

A. Experiment 1 (Mass/Count Nouns)

Part 1 (Participation story)

I'm going to tell a story and I want you to help me. The story is about a little pig. This is a picture of her. What do you think her name is? ( ) Every morning ( ) eats a very big breakfast. Do you know what she ate this morning? Let's see. (Turn page.)

M	How much bread did she eat? (pic cue)	( )	(If the child
CT	How many oranges did she eat?	( )	responds with number
M	How much coffee did she drink?	( )	only, ask "Two what?"
M	How much sugar did she take?		
CT	How many eggs did she eat?		

And that made ( ) bigger and fatter and rounder. (pic) Soon it was time to eat lunch. She was very, very hungry. Let's see what she ate.

(Turn page.)

CT	How many hot dogs did she eat?	( )
M	How much lettuce did she eat?	( )
CT	How many potato chips did she eat?	( )
M	How much ice cream did she eat?	( )
M	How much water did she drink?	( )

And she got bigger and bigger and rounder and rounder. (pic) Then she took a nap. When she woke up, she was hungry again. So what do you think she ate?

(Turn page.)

M	How much fruit did she eat?	( )
CT	How many vegetables did she eat?	( )
M	How much meat did she eat?	( )
CT	How many apples did she eat?	( )
M	How much milk did she drink?	( )

She got rounder and rounder and rounder. (pic) But she was still hungry so she ate more.

C	How many sandwiches did she eat?	( )
C	How many tomatoes did she eat?	( )
M	How much pie did she eat?	( )
C	How many carrots did she eat?	( )
C	How many bananas did she eat?	( )

( ) got so round she looked just like a balloon. Then the wind began to blow. It blew her up, up in the air just like a balloon. And then she came back down again. She was the very first pig to fly.

Part 2: (Question game)

I want you to play a game with me. It's a guessing game and I want you to be the teacher and I'll be "it". You look at the card and then ask me how many things there on the card. Like this. (Card 1) How many houses are there? Now you do it. ( ) (Card 2) How much money is there? You say it. (Card 3) How many pumpkins are there? (Card 4) How much cheese is there? (Card 5) How many cookies are there? (E answers questions)

Card pack contains training cards (5) and 20 test items. Order is randomized:

Mass	Count
bread	oranges
coffee	eggs
sugar	hot dogs
lettuce	vegetables
ice cream	apples
water	potato chips
fruit	bananas
meat	sandwiches
milk	tomatoes
pie	carrots

B. Experiment 2 (Pronoun Study)

Subject 1

SET A - Type 1, S_1; Type 2, S_6

I saw a cow.
Him caught a snake.
The doctor asked him.
The rat watched me.
Me liked the mouse.
Her chased a bear.
The puppy needed me.
Father thanked them.
They followed the teacher.
She helped the kitten.

Subject 2

SET A - Type 1, S_2; Type 2, S_7

Me saw a cow.
Them caught a snake.
The doctor asked them.
The rat watched he.
She liked the mouse.
Us chased a bear.
The puppy needed her.
Father thanked I.
He followed the teacher.
Her helped the kitten.

The boy washed I.
The bird heard he.
We found the children
He hit a girl.
The policeman answered she.
Mother called they.
Us told the nurse.
Them pushed a baby.
The boy carried her.
The dancer knew us.

The boy washed him.
The bird heard they.
I found the children.
We hit a girl.
The policeman answered us.
Mother called she.
They told the nurse.
Him pushed a baby.
The boy carried me.
The dancer knew me.

Subject 3

SET A - Type 1, S_3; Type 2, S_8

She saw a cow.
Us caught a snake.
The doctor asked us.
The rat watched she.
He liked the mouse.
They chased a bear.
The puppy needed I.
Father thanked we.
We followed the teacher.
Them helped the kitten.
The boy washed her.
The bird heard me.
Me found the children.
Him hit a girl.
The policeman answered him.
Mother called them.
I told the nurse.
Her pushed a baby.
The boy carried he.
The dancer knew they.

Subject 4

SET A - Type 1, S_4; Type 2, S_9

He saw a cow.
I caught a snake.
The doctor asked they.
The rat watched we.
Him liked the mouse.
Me chased a bear.
The puppy needed them.
Father thanked he.
Them followed the teacher.
We helped the kitten.
The boy washed me.
The bird heard us.
He found the children.
Us hit the girl.
The policeman answered her.
Mother called I.
She told the nurse.
They pushed a baby.
The boy carried him.
The dancer knew she.

Subject 5

SET A - Type 1, S_5; Type 2, S_{10}

He saw a cow.
Her caught a snake.
The doctor asked we.
The rat watched they.
They liked the mouse.
She chased a bear.
The puppy needed us.
Father thanked him.
Us followed the teacher.
Him helped the kitten.

Subject 6

SET A - Type 1, S_6; Type 2, S_1

Him saw a cow.
Me caught a snake.
The doctor asked I.
The rat watched him.
We liked the mouse.
Them chased a bear.
They puppy needed me.
Father thanked her.
I followed the teacher.
He helped the kitten.

The boy washed she.
The bird heard I.
Them found the children.
Me hit a girl.
The policeman answered he.
Mother called her.
We told the nurse.
I pushed the baby.
The boy carried them.
The dancer knew me.

The boy washed they.
The bird hear she.
She found the children.
They hit a girl,
The policeman answered we.
Mother called he.
Her told the nurse.
Us pushed a baby.
The boy carried us.
The dancer knew them.

Subject 7

SET A - Type 1, S_7; Type 2, S_2

Them saw a cow.
He caught a snake.
The doctor asked me.
The rat watched them.
Her liked the mouse.
I chased a bear.
The puppy needed she.
Father thanked us.
Him followed the teacher.
They helped the kitten.
The boy washed he.
The bird heard her.
Us found the children.
She hit a girl.
The policeman answered I.
Mother called we,
Me told the nurse.
We pushed a baby.
The boy carried they.
The dancer knew him.

Subject 8

SET A - Type 1, S_8; Type 2, S_3

Us saw a cow.
She caught a snake.
The doctor asked she.
The rat watched us.
I liked the mouse.
We chased a bear.
The puppy needed he.
Father thanked they.
Her followed the teacher.
Me helped the kitten.
The boy washed me.
The bird heard them.
Him found the children.
Them hit a girl.
The policeman answered me.
Mother called him.
He told the nurse.
They pushed a baby.
The boy carried I.
The dancer knew her.

Subject 9

SET A - Type 1, S_9; Type 2, S_4

They saw a cow.
We caught a snake.
The doctor asked her.
The rat watched I.
Them liked the mouse.
He chased a bear.
The puppy needed him.
Father thanked me.
Me followed the teacher.
Us helped the kitten.

Subject 10

SET A - Type 1, S_{10}; Type 2, S_5

We saw a cow.
They caught a snake.
The doctor asked he.
The rat watched her.
Us liked the mouse.
Him chased a bear.
The puppy needed they.
Father thanked she.
She followed the teacher.
I helped the kitten.

The boy washed them.
The bird heard we.
Her found the children.
I hit a girl.
The policeman answered he.
Mother called us.
Him told the nurse.
She pushed a baby.
The boy carried she.
The dancer knew they.

The boy washed us.
The bird heard him.
He found the children.
Her hit a girl.
The policeman answered them.
Mother called me.
Them told the nurse.
Me pushed a baby.
The boy carried me.
The dancer knew I.

Subject 11

SET B - Type 1, S_{11}; Type 2, S_{16}

A cow saw him.
A snake caught me.
I asked a doctor.
Him watched a rat.
The mouse liked we.
The bear chased them.
Me needed a puppy.
Her thanked father.
The teacher followed I.
The kitten helped me.
They washed the boy.
She heard a bird.
The children found she.
A girl hit they.
We answered the policeman.
He called mother.
The nurse told her.
The baby pushed us.
Us carried a boy.
Them knew a dancer.

Subject 12

SET B - Type 1, S_{12}; Type 2, S_{17}

A cow saw they.
A snake caught he.
Me asked a doctor.
Them watched a rat.
The mouse liked her.
The bear chased I.
She needed a puppy.
Us thanked father.
The teacher followed him.
The kitten helped they.
He washed the boy.
Her heard a bird.
The children found us.
A girl hit she.
I answered the policeman.
We called mother.
The nurse told me.
The baby pushed we.
They carried a boy.
Him knew a dancer.

Subject 13

SET B - Type 1, S_{13}; Type 2, S_{18}

A cow saw us.
A snake caught she.
She asked a doctor.
Us watched a rat.
The mouse like I.
The bear chased we.
He needed a puppy.
They thanked father.
The teacher followed her.
The kitten helped me.

Subject 14

SET B - Type 1, S_{14}; Type 2, S_{19}

A cow saw they.
A snake cought we.
Her asked a doctor.
I watched a rat.
The mouse liked them.
The bear chased he.
Him needed a puppy.
Me thanked father.
The teacher followed me.
The kitten helped us.

We washed the boy.
Them heard a bird.
The children found him.
A girl hit them.
Me answered the policeman.
Him called mother.
The nurse told he.
The baby pushed they.
I carried a boy.
Her knew a dancer.

Them washed the boy.
We heard a bird.
The children found her.
A girl hit I.
I answered the policeman.
Us called mother.
The nurse told him.
The baby pushed she.
She carried a boy.
They knew a dancer.

Subject 15

SET B - Type 1, S_{15}; Type 2, S_{20}

A cow saw we.
A snake caught they.
He asked a doctor.
Her watched a rat.
The mouse liked us.
The bear chased him.
They needed a puppy.
She thanked father.
The teacher followed she.
The kitten helped I.
Us washed the boy.
Him heard a bird.
The children found he.
A girl hit her.
Them answered the policeman.
Me called mother.
The nurse told them.
The baby pushed me.
We carried a boy.
I knew a dancer.

Subject 16

SET B - Type 1, S_{16}; Type 2, S_{11}

A cow saw I.
A snake caught him.
Him asked a doctor.
Me watched a rat.
The mouse liked me.
The bear chased her.
We needed a puppy.
Them thanked father.
The teacher followed they.
The kitten helped she.
I washed the boy.
He heard a bird.
The children found we.
A girl hit he.
She answered the policeman.
They called mother.
The nurse told us.
The baby pushed them.
Her carried a boy.
Us knew a dancer.

Subject 17

SET B - Type 1, S_{17}; Type 2, S_{12}

A cow saw me.
A snake caught them.
Them asked a doctor.
He watched a rat.
The mouse liked she.
The bear chased us.
Her needed a puppy.
I thanked father.
The teacher followed he.
The kitten helped her.

Subject 18

SET B - Type 1, S_{18}; Type 2, S_{13}

A cow saw she.
A snkae caught us.
Us asked a doctor.
She watched a rat.
The mouse liked he.
The bear chased they.
I needed a puppy.
We thanked father.
The teacher followed we.
The kitten helped them.

Him washed the boy.
They heard a bird.
The children found I.
A girl hit we.
Us answered the policeman.
She called mother.
The nurse told they.
The baby pushed him.
Me carried a boy.
We knew a dancer.

Her washed the boy.
Me heard a bird.
The children found me.
A girl hit him.
Him answered the policeman.
Them called mother.
The nurse told I.
The baby pushed her.
He carried a boy.
They knew a dancer.

Subject 19

SET B - Type 1, S_{19}; Type 2, S_{14}

A cow saw her.
A snake caught I.
They asked a doctor.
We watched a rat.
The mouse liked him.
The bear chased me.
Them needed a puppy.
He thanked father.
The teacher followed them.
The kitten helped we.
Me washed the boy.
Us heard a bird.
The children found he.
The girl hit us.
Her answered the policeman.
I called mother.
The nurse told she.
The baby pushed they.
Him carried a boy.
She knew a dancer.

Subject 20

SET B - Type 1, S_{20}; Type 2, S_{15}

A cow saw he.
A snake caught her.
We asked a doctor.
They watched a rat.
The mouse liked they.
The bear chased she.
Us needed a puppy.
Him thanked father.
The teacher followed us.
The kitten helped him.
She washed the boy.
I heard a bird.
The children found them.
The girl hit me.
He answered the policeman.
Her called mother.
The nurse told we.
The baby pushed I.
Them carried a boy.
Me knew a dancer.

C. Experiment 3 (Time Connectives)

1. Comprehension Task

Listen to what the machine says. (Insert Card A.) MOVE THE RED ONE. (E moves the red marker.) Now you do it this time. (Insert Card B.) MOVE THE GREEN ONE. (S moves marker.) Good. (Insert Card C.) MOVE THE BLACK ONE AND THE YELLOW ONE. (S moves markers.) Very good. (Insert Card D.) MOVE THE GREEN ONE AND THE BLACK ONE. (S moves markers.) That's very good. (Insert Card E.) MOVE A YELLOW ONE AND A BLACK. (S moves markers.) You're very good at this. Now I'm going to start them all again. (E replaces all markers to starting position.) Note: If S moved the wrong marker, he was corrected by E: "No, listen again," and repeating

the card. If S could not correctly identify color names, he was allowed to play with the abacus for a few minutes and then returned to the classroom.

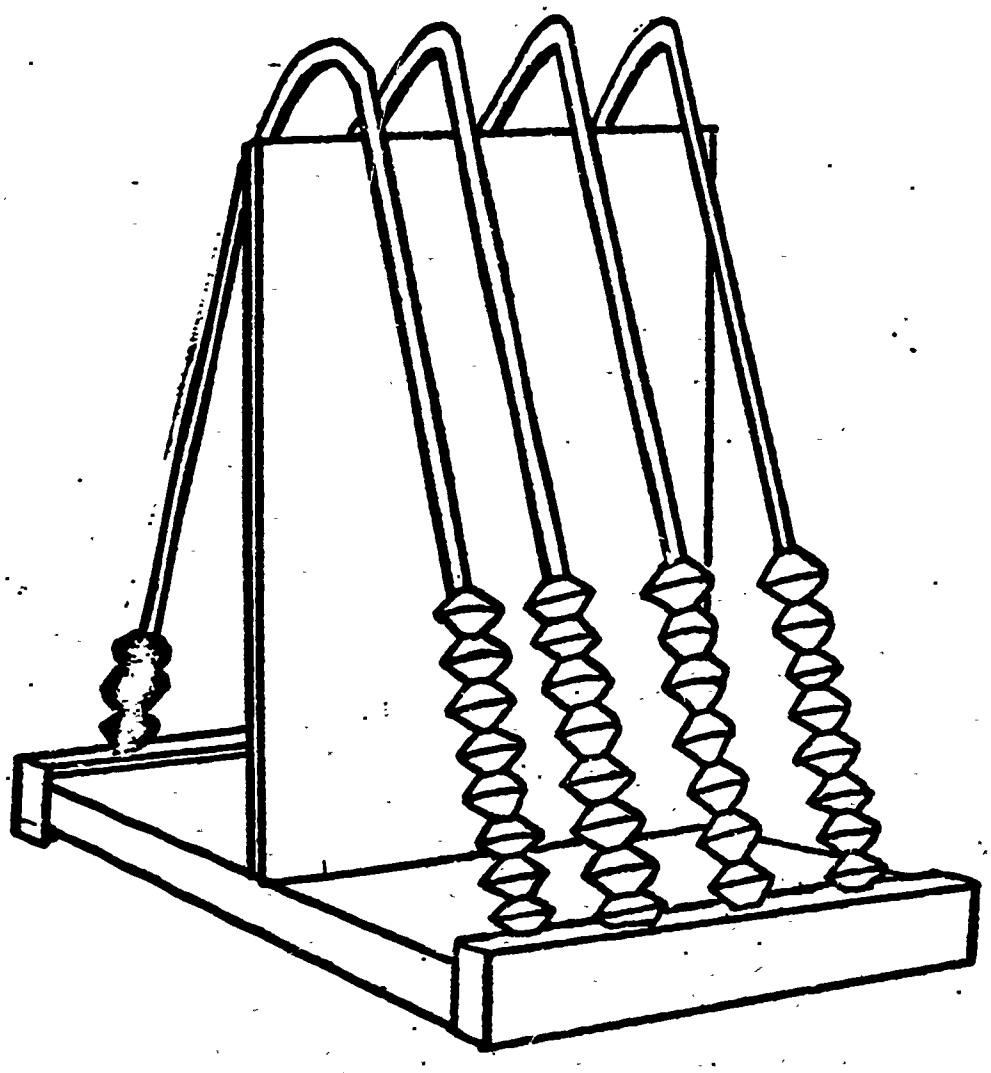
2. Imitation Task

I want you to say what the machine says. Listen. (E inserts Card A.) MOVE A RED ONE. Can you say that for me? ( ) {Good. / No, listen again.} (E inserts Card B) MOVE A BLACK ONE AND A YELLOW ONE. ( ) Good. Would you like to put the card in yourself? (E gives S the card to insert.) MOVE A GREEN ONE AND A YELLOW ONE. ( ). Good. (E hands S card to insert.) MOVE A BLACK ONE AND A GREEN ONE. ( ) You're very good at that. Now let's do these.

Test Sentences:

1. Move a red one but first move a yellow one.
2. Move a yellow one but first move a green one.
3. Move a green one after you move a black one.
4. Before you move a red one, move a yellow one.
5. Move a yellow one and then a green one.
6. After you move a black one, move a red one.
7. Before you move a green one, move a black one.
8. Move a green one, but first move a black one.
9. Move a red one before you move a black one.
10. Move a red one after you move a yellow one.
11. Move a black one and then move a red one.
12. After you move a green one, move a black one.
13. Move a red one and then a green one.
14. After you move a red one, move a yellow one.
15. Before you move a black one, move a red one.
16. Move a black one after you move a red one.
17. Move a yellow one after you move a green one.
18. Move a black one but first move a red one.
19. Move a green one and then a black one.
20. Before you move a yellow one, move a green one.
21. Move a yellow one before you move a green one.
22. After you move a yellow one, move a black one.
23. After you move a black one, move a green one.
24. Move a black one before you move a red one.
25. Move a red one and then a yellow one.
26. Before you move a red one, move a yellow one.
27. Move a red one after you move a yellow one.
28. Move a black one but first move a red one.
29. Move a yellow one and then a green one.
30. Move a red one before you move a yellow one.
31. Move a green one but first move a black one.

32. Before you move a green one, move a yellow one.
33. After you move a green one, move a yellow one.
34. Move a green one before you move a black one.
35. Move a green one before you move a yellow one.
36. Move a black one before you move a red one.



Experiment 4 - Equipment Description

The special equipment consisted of the following parts:

1. A Kodak Carousel 800 which projected the 6-inch visual stimulus on an 8" X 8" screen placed approximately 15 inches from the S.

2. An Ampex Micro 20 tape recorder which gave the audible stimulus and started the latency meter.

3. A latency meter which measured delays of up to 13 seconds in tenth-of-a-second intervals.

4. A relay logic bank.

5. Two subject-operated choice switches which terminated the latency measurement.

A typical sequence of operation:

1. Experimenter placed timer at zero manually and then pressed start button.

2. Screen washout lamp was extinguished and new visual was presented to the subject via the rear screen projection system.

3. The tape machine started delivering an audible message to the child through the headset. At the end of the message, a 90 cycles per second signal on the tape caused RELAY ONE to lockup. This, in turn, stopped the tape and started the clock.

4. Subject made decision by pressing one of the 2 switches located under the screen. This caused RELAY TWO to lockup and unlocked RELAY ONE. Two numbered lamps on the rear of the device were used to indicate which choice was made. RELAY TWO stopped the clock and wiped out the visual with the washout lamp. The tape remained stopped.

5. Experimenter noted response data and then pressed the start button for the next trial.

D. Experiment 4 (Conditional structures)

Comprehension Task

(Slide 1: red-green circles) Tape: IT'S RED. WATCH. (E presses lever beneath red circle.) (Slide 2: same) Tape: IT'S RED. NOW YOU DO IT. (S presses lever and E reinforces correct respnse with "good." This procedure is continued for the remainder of the training slides.)

Slide 2: It's black.
Slide 3: It isn't green.
Slide 4: It's yellow.
Slide 5: It isn't red.

Tape: YOU'RE VERY GOOD AT THAT. NOW LET'S TRY ANOTHER KIND.
(The following slides show 2 pictures, one of a boy sitting and one of a boy standing. In the center of the slide is a colored circle.)

Slide 6: Is it red? Then he can sit down. Which boy is right?
Slide 7: It's yellow. Then sit down. Which boy is right?
Slide 8: It isn't yellow. Then sit down.
Slide 9: It's black. Then sit down.
Slide 10: It isn't green. Then sit down.

Note: If S made an error, E said, "Listen again," and repeated the sentence as well as asking, "which boy is right?" If S was unable to identify colors or unable to understand affirmative and negative imperatives with or without truth value, he was excluded from further testing.

Repetition Task

E: I want you to say what the machine says. Listen. (E inserts Card A.) IT'S RED. SING A SONG. E: Can you say that for me? (E reinforces correct responses with "good.") (Card B) READ THE BOOK. IT'S GREEN. (E: Would you like to put the card in yourself? E hands S Card C to insert.) IT'S YELLOW. THROW THE BALL. (E: You're very good at that. We have all these cards to do. We'll do this many first (½ deck) and then we'll rest. Here's the first one. (Hands S the card to insert.)

Test Trials (no further reinforcement of responses)

___1. Raise your hand if it isn't red.
___2. Touch your shoes if it's green.
___3. Clap your hands unless it's yellow.
___4. If it's black, pull your hair.
___5. Don't close your eyes unless it's red.
___6. Unless it's black, tie your shoes.
___7. If it isn't green, cover your eyes.
___8. Unless it's yellow, don't wiggle your fingers.
___9. Bend your arm if it's yellow.
__10. Shake your hand unless it's red.
__11. Comb your hair if it isn't black.
__12. If it's green, count your fingers.
__13. Unless it's red, clap your hands.
__14. Unless it's yellow, don't pull your hair.
__15. If it isn't green, raise your hand.
__16. Don't touch your shoes unless it's black.
__17. If it isn't black, tie your shoes.

__18. Wiggle your fingers unless it's green.
__19. Count your fingers if it isn't yellow.
__20. If it's red, close your eyes.
__21. Don't comb your hair unless it's red.
__22. Shake your hand if it's green.
__23. Unless it's yellow, don't cover your eyes.
__24. Unless it's red, bend your arms.
__25. Wiggle your fingers unless it's black.
__26. Unless it's green, don't touch your shoes.
__27. Don't bend your arm unless it's red.
__28. Unless it's yellow, shake your hand.
__29. If it isn't black, cover your eyes.
__30. Tie your shoes if it isn't red.
__31. If it's yellow, comb yourhair.
__32. Raise your hand if it's green.
__33. Pull your hair if it's black.
__34. Clap your hands unless it's red.
__35. If it's green, close your eyes.
__36. Unless it's yellow, don't count your fingers.
__37. Shake your hand if it isn't yellow.
__38. If it isn't black, count your fingers.
__39. Unless it's green, bend your arm.
__40. Don't cover your eyes unless it's red.
__41. If it's black, tie your shoes.
__42. Don't comb your hair unless it's green.
__43. Clap your hands unless it's yellow.
__44. Unless it's red, don't wiggle your fingers.
__45. Close your eyes if it's green.
__46. Raise your hand if it isn't black.
__47. Unless it's red, pull yourhair.
__48. If it isn't yellow, touch your shoes.

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