A STUDY IN THE ACQUISITION OF LANGUAGE: FREE RESPONSES TO COMMANDS

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This study reports an experiment concerning the spontaneous responses of young children to commands differing in structural format and semantic content. The results indicate that syntactic comprehension exceeds production in 'telegraphic' speakers. Based on these results, conjectures are offered about the techniques which a child might use in coping with his linguistic environment.

Empirical investigation of the development of language has usually focused on the child as a speaker, and primarily on his spontaneous verbalizations. From this work, a picture of the successive stages of speech of the English-speaking child begins to emerge. The recent studies of Braine 1963, Miller & Ervin 1964, Brown & Fraser 1964, and Weir 1962 describe the period in which the child begins to put two or three words together under a unified intonation contour that sounds to experimenters (and mothers) like a rudimentary sentence. Roger Brown has coined the term 'telegraphese' to describe this kind of speech, for the child's utterances contain precisely those items we would want to keep if we were paying by the word.

The psychologists who have chronicled the development of language to this point have attempted to provide a description of the child's organization of linguistic material by inference from these spontaneous telegraphic utterances. For example, these psychologists reason that even at this very primitive stage of speech, the child's utterances seem to be internally structured. The words in the child's utterances are not haphazardly ordered. Words differ in their positional privileges; i.e., the child who says *ball throw* does not, in general, alternatively say *throw ball*. Thus, from the evidence of spontaneous speech alone, psychologists infer that there are already classes of words at this stage, though these classes may differ from those of the mature speaker.

It seems clear, however, that the study of spontaneous speech does not provide a sufficient basis for understanding what the child 'knows' about language at various stages of development. There is ample evidence, from three decades of failure by the Bloomfieldian linguists, that a study of spontaneous speech, however objective and comprehensive, forms a poor basis even for the study of adult language. Chomsky 1964 has pointed out that the use of this dubious basis for studying children's language multiplies these difficulties by a rather large factor. Therefore, a study of children's verbalizations may not provide the kinds of information needed in developing a theoretical description of the course and process of language acquisition. Linguistic inquiry has succeeded only when,

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abandoning the attempt to collect and codify natural speech, it began to ask about the individual's organization of language—what has come to be called his 'linguistic competence'.

Do the primitive utterances of young children reflect an incomplete knowledge of the language, a 'telegraphic competence'? Certainly, when the adult's tongue slips, we do not thereupon question his knowledge of English. Perhaps the childishness of children's speech is similarly the effect of performance difficulties—e.g., poor articulatory control, distractibility, limited memory-span—distinguishable in principle from deficits in linguistic organization. The child may be linguistically sophisticated in a way that he is unable to display in actual performance.

In the work we will describe here we have tried to discover whether the child's spontaneous utterances can be taken as direct indications of his linguistic competence; or whether, as is the case for adults, spontaneous speech is a limited and biased source of information. Like the psychologists cited earlier, we are studying the child at the stage in which he speaks telegraphic English, roughly the period between 15 and 30 months of age. By studying the appropriateness of children's reactions to various syntactic and semantic structures, we hope to begin to extricate the question of competence in the child from his performance in speech.

The distinction between performance and competence in the child is a critical one for understanding how language emerges in the individual. Chomsky 1965 and others (e.g., Lenneberg 1967, McNeill 1966) have taken a strong nativistic stand on this issue: language is assumed to emerge as a function of neurophysiological maturation, and aspects of underlying linguistic structure are taken to be inherent in cognitive organization. In support of this view, linguists have argued that the onset of language is regular and tied to other aspects of maturation—that it appears more or less independently of practice, in spite of environmental and physical handicaps, and has a critical period. Chomsky 1959 has shown that the acquisition of language cannot be accounted for in the terms of Skinnerian learning theory. Particularly, transformational linguists have asserted that the speech of adults is so chaotic (interlaced with errors, interruptions, changes of direction, etc.) as to make learning by inductive generalization virtually impossible: the learner's data simply will not support the kinds of inductions he is called upon to make. Thus the Chomskyan linguists take the position that the child comes equipped with very specific principles concerning the nature of syntactic structure—from which, given a corpus of natural speech, he can deduce the details of the language he happens to be exposed to.

Most developmental psychologists studying language acquisition suppose, on the contrary, that the child is endowed with more general organizational and procedural abilities (by no means specific to language) that enable him to form inductive generalizations from regularities that exist in the speech he hears (see particularly Braine, MS). They suggest certain features in the child's language environment that might, for example, give hints as to how to form lexical classes: differential stress (adjectives are spoken more loudly than articles); positional restrictions (nouns often appear in last position in an utterance, while articles and adjectives rarely do); and semantic consistencies (a noun is very often the

name of a person, place or thing, while a verb is often an action). Thus these psychologists suggest that the child might be more successful than linguists have been in abstracting the structure of language from a consideration of regularities in the stream of speech.

In the empirical work reported here, we try to ask about the child's underlying knowledge when his spontaneous speech is at various stages of 'telegraphese'. Specifically, we ask whether the child notices semantic and syntactic anomalies that would suggest a level of knowledge not reflected in his speech. Further, we try to approach the question of the ways children process novel material: What does the child do when he hears speech that is not meaningful to him, or that is structurally anomalous? To investigate these matters, we study the child's responses to speech that is systematically varied. We cannot ask for overt judgments of acceptability, meaningfulness, or grammaticalness, as is frequently (and fruitfully) done in the study of adult linguistic organization. Instead we must infer the child's organization of what he hears from other behavior, from the APPROPRIATENESS of his responses to various verbal stimuli. In this experiment the verbal stimuli are commands and the appropriate response is, of course, obedience. In this indirect way we try to ask our subjects, as linguists do: 'Is the following a grammatical sentence in your dialect?'

PLAN OF THE EXPERIMENT

1. The plan of the experiment was to give to very young children a number of commands, varied systematically in syntax and content, to see if they might not react in visibly different ways to the constructional types. Different responses to stimuli whose semantic content was identical, but whose syntactic structure differed, might be taken as an indication that the child found one of these sequences in some way bizarre or illegitimate. Similarly, sentences with apparently normal structure which contained some meaningless (nonsense-word) material might elicit some special sorts of response.

Our technique was simply to deliver the various utterance types to the child under apparently normal circumstances, and to gauge his responses. This technique has obvious analogies to the linguist's elicitation procedures in which he merely asks 'Would you say this?' or 'Is this sentence acceptable to you?' On the other hand, there are obvious and inescapable differences, for here we are implicitly asking: 'Would you expect me to say this?' or 'Is this sentence acceptable from me to you?'

Given that this approach to discovering the child's linguistic competence is a plausible one, there are, nonetheless, enormous difficulties in collecting data of these kinds from young children, partly because of the nature of the subjects themselves, partly because of the lack of available techniques for sensible child-watching. We believe we have had some success in these ventures, but not without much time and some pain. It seems appropriate, both because of the difficulties and the final fruitfulness of the techniques we used, to present the method and procedure of these experiments in somewhat greater detail than usual.

1.1. SUBJECTS. The subjects were eleven children, seven boys and four girls, ranging in age from 18 to 33 months. All came from middle-class professional or academic families. All children exhibited some instances of telegraphese in their natural speech. Subjects were

ranked by their 'verbal maturity' from a sample of their natural speech, median utterance length being the index selected (the rationale for this choice is given in full in the Appendix).[1] The ranking derived from this index conformed to our subjective impressions of how well these children spoke English. On the basis of median utterance length, as well as from other indices such as the use of function words, inflectional endings, intelligibility etc., it was clear that the subjects fell into two groups. The TELEGRAPHIC group (seven subjects) spoke classical telegraphese: their median utterance length ranged from 1.4 to 1.85 words. It is this group whose responses are of greatest relevance to the experiment, these being the speakers who themselves produce the kinds of utterances used as stimuli. A second group consisted of four HOLOPHRASTIC speakers whose ability to combine words at all was in question. Although there were instances of two-word utterances in these children's speech, these were so rare as to suggest that they may represent merely benefit-of-the-doubt decisions by the transcriber. Median utterance length for these children ranged from 1.06 to 1.16 words. In discussing the results, we will distinguish the telegraphic from the holophrastic group because behavior across the groups in response to the stimuli was quite different, while behavior within the groups was orderly.[2]

1.2. STIMULI. In pre-experimental sessions with each child, six toys were selected that he could name. For each of these toys a different command (imperative sentence) was constructed with a different verb. Whenever appropriate for the toys, three referentially specific verbs such as *throw* (for *ball*), *blow* (for *horn*), and *bang* (for *drum*), and three vague verbs such as *find* or *show* or *give* were used. A set of stimuli was constructed with eight utterance types that varied along two dimensions: the syntactic form of the utterance, and the familiarity of the words in the utterance. Each toy name appeared in a command of each utterance type. The utterance types constructed for each subject were as given below.

1.21. STIMULUS CATEGORIES: ALL-ENGLISH FORMS.

(a) The well-formed command (VFN). A well-formed or 'grammatical' command consists of a monosyllabic verb, two 'function-words' (a preposition or pronoun, followed by *the*), and the noun toy-name; for example

Throw me the ball!
V F N

(b) The telegraphic command (VN). A telegraphed command approximates some of the spontaneous speech of our subjects by eliminating the function words. It thus consists of a verb followed by a noun; e.g.

Throw ball!
V N

(c) The lengthened telegraphic command (LVN). This format increases the length of the telegraphed command to at least the length of the well-formed command by preceding the former with *please*, and the child's name; e.g.

Please, Johnnie, throw ball!
L V N

[1] Of course we never know, for any child, or any single utterance, exactly how many 'words' have occurred within the sentence. *All gone* may be two words, or it may be a holophrase. However, the large and consistent differences among children make it possible to distinguish the groups in a natural and consistent fashion.

[2] Data for two children whose speech was more advanced are excluded from the results reported here, since they are obviously inappropriate subjects for a study of primitive speakers. We have included data for these subjects, however, in the study of natural speech reported in the appendix. One other child of the minimum age was dropped after several sessions because he gave neither verbal nor behavioral responses to any of the stimuli. Three of the children had participated for several sessions in pilot studies, but at least six months elapsed between participation in the pilot studies and the main experiment. There was no sign that participation in the pilot study led to differences in performance in the main experiment.

(d) The isolated noun command (N). This format again reproduces utterance types noted in the subjects' natural speech. It consists merely of the toy-name itself; e.g.

Ball!
N

1.22. PARTIAL-NONSENSE FORMS. For the following stimulus-types, we replace either the verb or the function words (or both) with nonsense forms of identical syllable count. Each nonsense form reflects English phonological rules, and follows the word-stress pattern of the English it replaces. The nonsense forms are indicated by upper-case letters (X, Z).

(a) Well-formed command with nonsense function words (VZN). The function words are replaced by a bisyllabic nonsense word stressed on its first syllable; e.g.

Throw ronta ball!
V Z N

(b) Well-formed command with nonsense verb (XFN). The verb is replaced by a nonsense monosyllable; e.g.

Gor me the ball!
X F N

(c) Well-formed command with nonsense function words and nonsense verb (XZN). Here both function words and verb are replaced by the same nonsense material developed for (a) and (b) above; e.g.

Gor ronta ball!
X Z N

(d) Telegraphic command with nonsense verb (XN). The verb of the telegraphed command is replaced by the nonsense verb; e.g.

Gor ball!
X N

A list of 48 stimuli was constructed for each child. (Recall that since the toys may differ for the different children, the nouns and verbs also differ. The nonsense words differ as well, for we had to avoid inconvenient morphophonemic effects that might interfere with intelligibility). Toy-names (nouns) were randomized in blocks of six, utterance-types in blocks of eight.

1.3. PROCEDURE. We had hoped to pre-record the stimuli and present them on tape, so as to achieve a greater degree of control over delivery. However, pilot work showed that the children rarely responded to the recorded stimuli (though they were beguiled by the machine itself). Stimuli therefore were presented live. Since the mother was obviously the most familiar source of speech to the child, she presented the stimuli. Mothers were pretrained in the child's absence until their delivery of the various stimulus-types was judged to be natural and consistent.

It was our intention that all stimuli be delivered with mild imperative intonation. We cannot really know, however, precisely how well this intention can be implemented with the syntactic and morphological deformations introduced. Clearly there are gross intonational differences between, e.g., the well-formed command and the lengthened telegraphic command, if both are pronounced 'normally'. Later we will describe some partial evaluation techniques for the effects of delivery of the various stimulus types.

The experimenter spent one or two preliminary sessions with each subject in his home, and at this time selected the experimental toys and learned the child's name for each. Tape recordings of these sessions also provided the samples of natural speech. Experimental sessions were also conducted in the child's home.

Since these children were too young for a highly structured choice situation, a FREE-RESPONSE technique was developed. Three adults were present: the mother, the experimenter, and an additional observer. They engaged in normal conversation with one another and with the child as well if he was interested. All toys except those used in the experiment were removed from the room. The experimental toys were placed on the floor two to three feet

apart, within a triangle formed by the three adults. On occasion the mother delivered a stimulus. The child had no set task that he knew of to perform, other than what the stimulus prompted him to do.

The child's behavior after each stimulus was delivered was recorded in various ways. All experimental sessions were recorded on tape, and the experimenter and the observer made independent written records of each trial. These records included reports of objects looked at, touched, and played with, as well as verbalizations within the 90-second interval after the stimulus. Similar information was also solicited from the mother after the two independent records were completed. The experimenter further recorded the time of occurrence of the child's responses (looked, pointed, ran, picked up, etc.) by tapping on the recorder microphone, and kept a written record of the sequence of movements represented by the taps.

Appropriate opportunities for presenting a stimulus arose from three to twelve times during each 40- to 60-minute session. We made every effort to ensure that the child noticed the stimuli; they were not presented while he was engrossed or while he was holding one of the toys. Before giving a stimulus, the mother addressed the child by name. If she thought he responded to his name she then gave the stimulus immediately; if she judged he did not attend to his name, she said something irrelevant and waited for another opportunity. At least three minutes elapsed between stimuli, usually much longer.

After a stimulus was presented, the adults did not initiate conversation for 90 seconds, although they responded to overtures from the child as they normally would. This condition was imposed so that secondary responses, elicited by the mother's further encouraging remarks and actions, would not contaminate response to the linguistic stimulus.

We had planned to replicate the experiment (reversing the order of the list of stimuli) with all subjects. However, scheduling problems or sickness prevented this with three subjects.

1.4. RESPONSE CLASSIFICATION. A simplified description of the child's behavior following each stimulus presentation was derived (1) from the written reports of the experimenter and the observer, along with the supplementary comments from the mother, and (2) from the tape recordings of the experimental sessions.[3] We selected behavioral criteria which seemed to offer intuitively plausible evidence of how the child regarded the various stimulus types. We found it possible to make a reliable classification of the child's behavior into a limited number of categories.

On most trials the child said or did something; but occasionally he was inert. Further, some of his behavior was judged to be unrelated to the stimulus—e.g., looking at or playing with objects not mentioned in the stimulus, talking about the tape recorder or the experimenter, etc. All behavior not obviously related to the stimulus is omitted from this analysis. The response categories which we derived are given below.

1.41. RESPONSE CATEGORIES: ACTION RESPONSES.

(a) Touch. Sometimes the children did what the command implied: they came into physical contact with the toy named in the command. Any behavior that involved such

[3] If the adults disagreed about the occurrence of a particular response (e.g., the experimenter said the subject touched the toy, but the observer said the subject did not), then the response was not counted. However, if one adult made a report that was not made by the others (but was not contested), then the report was accepted and the response included for analysis. This decision was made because uncontested solitary reports were expected: occasionally only one adult could see the child.

To test the legitimacy of this decision, we compared trials where the experimenter's report of the subject's behavior was unsupported, but uncontested by either of the other adults, with trials where the experimenter and the observer reported the same behavior. There was no sign of a bias in the experimenter's unsupported reports (e.g., there was no tendency for the experimenter to report more or less looking at the toy for stimuli which contained nonsense).

contact with the toy we called 'touch', and we took this behavior as an indication that the child had accepted the utterance as a 'good' command and was making the natural response; i.e. he was obeying.[4]

(b) Look. Often the child looked at the toy named in the stimulus, without touching it. With the three adults in their strategic positions around the room, it was possible to score this response with fair certainty, though obviously with less reliability than for the gross activity implied by 'touch', or for verbal responses which we could re-observe by listening to tapes of the experimental sessions.

1.42. VERBAL RESPONSES. We could readily distinguish two kinds of verbal response that seemed related to the experimental procedure. Of course the children said other things (just as they DID other things) that were irrelevant to the experiment.

(a) Reply. Occasionally, the child said something that might be taken as a sensible reply or a query about the stimulus. For example, in response to *Give me the truck*, the child might say *Mommy get it* or *Whereza truck?* Sometimes the sensibleness of the reply was in question: in response to the same command, the child might say *Red truck*. We called all these responses 'reply', because we could not legitimately distinguish among them.

(b) Repetition. We distinguish between replies and repetitions of the commands. A verbal response is scored as a repetition in case the subject repeats all or part of the command in the word order given in the stimulus, and without adding any new material. No attempt is made to guess the intent of the child; some 'repetitions' may be questions, others comments, but all are scored the same. Cues to intent, such as question intonation, could not be scored reliably.

1.43. THE RELEVANT RESPONSE. It is useful both conceptually and statistically to have a 'cover' response category for all responses that indicate that the child was aware of the stimulus. When we say the child has made a relevant response, he has either touched or looked at the toy, or repeated or replied to the command. The 'relevant response' thus indicates that the child heard at least the noun in the stimulus.

1.5. EVALUATION OF DELIVERY. It is possible that a child responds to differences in the mother's delivery of the stimuli, rather than to differences in the stimuli themselves. Given that the mother believes some stimuli are odd, she may communicate this belief to the child. However, there is internal evidence that makes it most unlikely that the children were discriminating certain cues from the mother rather than differences in the stimuli: Since the mothers could not know the appropriate response patterns for the various groups (they were in fact unaware of the existence of two groups), one must suppose that whatever cues they might give the child would be the same, or only haphazardly different, for all children. Thus, for example, suppose that mothers deliver structurally anomalous stimuli in such a way as to indicate to the child that the utterances are indeed bizarre; this would not lead to the consistent group differences we find.

Nevertheless, we conducted a further test for biases in delivery. Blind judgments of the mother's delivery of the noun portion of the stimulus were made for selected stimuli for two subjects. For Carl, VFN and XFN were used; for Helen, LVN and VN. These pairs of utterance types were selected because the material adjacent to the noun is the same in each pair. These subjects were selected because they exhibited large differences in frequency of touch-responses for the two utterance types. The appropriate portion of each stimulus, the toy-name, was clipped, and a tape was constructed of the mother uttering the toy-name only. Two judges were told that subjects obeyed on one-half the trials, as indeed they did. They then listened to the tape of toy-names and decided independently for each noun whether or not they thought the child obeyed the command that contained that noun. The results are

[4] It might be argued that merely touching the toy ought to be distinguished from action that indicates that the verb, too, was understood. For example, if the stimulus is *Blow on the horn!*, one might distinguish between blowing on it and throwing it. However, many of the stimuli lack a verb, so this distinction is not appropriate. It will be shown that this further distinction is in any case quite irrelevant to the responses of these subjects: the appropriate action is independent of the presence of a verb.

Subject	Syntactic Structure: Adult-form VFN	Child-form VN	Child-form N
Telegraphic Group			
Carl	58	33	33
Dottie	36	27	15
Eric	38	28	25
Fran	64	54	21
Gregory	57	25	37
Helen	62	38	33
Ira	54	33	50
Group average	53	34	31
Holophrastic group			
Jeremy	0	33	16
Karen	83	75	80
Linus	42	16	46
Mike	16	50	33
Group average	35	44	44

Table 1. Obedience and verbal maturity.

The percent of trials with a touch for well-formed stimuli (VFN) and child-forms (N and VN). Within the groups the subjects are ranked on the basis of their spontaneous speech.

unambiguous. The judges' predictions of what the child actually did were no better than chance.

Results and discussion

2.1. Effects of syntactic structure. The relation between the verbal sophistication of the subjects and their tendency to obey commands delivered in various structural formats is shown in Table 1. For the group of telegraphic speakers the effect is uniform: each of these seven children obeys well-formed commands more frequently than he obeys either two-word or one-word commands. (Each of these comparisons is significant at the .016 level by a binomial test, two-tailed.) For the holophrastic group, there is an opposing trend: those children who do not yet combine words consistently, if at all, tend as a group to obey the child-form commands more frequently than they obey the well-formed commands.

If we restrict our analysis to trials on which we are sure the child attended to the stimulus (i.e., where he made a relevant response), we find no overlap between the two groups of children: all holophrastic speakers obey more often with single word commands than with well-formed commands, and all telegraphic speakers obey more often with well-formed commands than with single word commands. (This finding is significant at the .01 level by a chi-square test.) The results for VN are similar but less sharp.[5]

[5] Similar results, although in general less strong, are obtained from the other measures of comprehension we used: All the children whose speech was telegraphic also replied more often to VFN than to VN, and five of these seven replied more often to VFN than to N. The results for the reply category were not clear-cut for the holophrastic group, who in general replied less often (Table 2). Moreover, latency reflects the structure of the command in a similar way. Five of the seven telegraphic children obeyed more quickly after

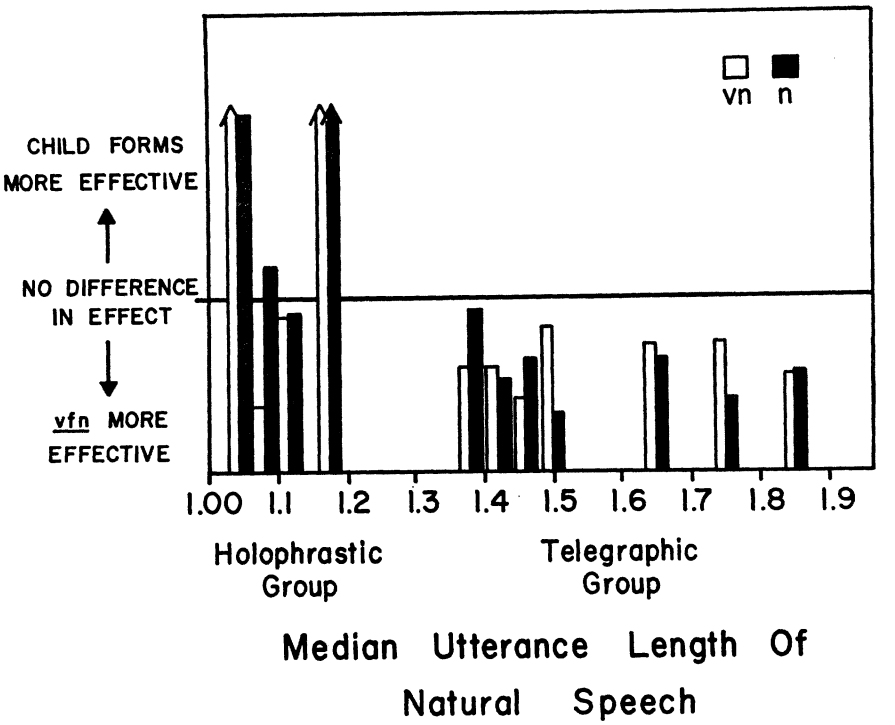

FIGURE 1. Syntactic structure and obedience at different levels of verbal maturity. The relative effectiveness of the two child-forms of commands (VN and N) compared to well-formed commands (VFN) for each child. The height of the bar represents the percent of child-form commands which elicited a touch, divided by the percent of VFN commands which elicited a touch. The data for the individual subjects are ordered from Carl on the extreme right to Mike on the extreme left.

Figure 1 summarizes the results. The effectiveness of child-forms (N and VN) in eliciting obedience is compared to the effectiveness of well-formed commands (VFN). Individual differences in responsiveness (the tendency to respond on every trial), which are considerable, have been eliminated by presenting the data as ratios.[6] Clearly the two groups are affected differently by syntactic structure.

These data suggest that well-formed commands are more effective than child-forms in eliciting obedience for the children whose speech is clearly telegraphic. Thus any characterization of these children's linguistic knowledge by an examination of their speech alone clearly fails to account for the fact that they discriminate more speech forms than they use. That children distinguish between utterance types that they use and other utterance types is perhaps not surprising.

VFN than after N or VN, while only one of the four holophrastic children obeyed more quickly after VFN than after N or VN.

[6] Over-all responsiveness seems largely to be a personality variable rather than a linguistic variable; there was complete overlap of the groups. Over-all responsiveness (percent of all trials with a touch) among these subjects ranged from 11% (Dottie) to 72% (Karen).

What is surprising is that JUST THOSE UTTERANCE TYPES THEY THEMSELVES DID NOT USE WERE MORE EFFECTIVE AS COMMANDS: the telegraphic children responded most readily to the well-formed sentences.

The data for children below this telegraphic level of natural speech suggest a natural progression. Those who appear to be at the single-word, or holophrastic, stage in production prefer to respond to speech at or just above their own productive limit (the VN and N commands).

These results imply that linguistic competence will be underestimated, perhaps with bias, when inferred simply from spontaneous speech—a result necessarily anticipated by those who take an innatist view of the emergence of language. Of course, the fact that comprehension precedes production, in this sense, poses no particular difficulty for a learning-theoretic view. Some support for the view that language is learned may come from the finding that the effectiveness of well-formed commands increases with verbal maturity, implying that there may well be stages of competence which developmentally precede the ability to reflect them in speech. The suggestion in our data that child-forms are more effective commands for the less verbally mature points to an intermediate stage on the way to the competence of the adult speaker.

It is possible to argue that the difference between the child's responses to child-forms and adult-forms is accounted for if we suppose he merely discriminates the gross foreshortening of the child-form stimuli. Length (in words or syllables) and well-formedness are confounded in Table 1 and Figure 1. It will be recalled that we developed a lengthened form of the telegraphic command (i.e., a long but not well-formed command) to test this possibility. Table 2 summarizes the effects of syntactic structure for the two groups of subjects, and shows that the lengthened telegraphic sentence (LVN) is no more liable to lead to obedience (touch) than the child-form commands, N and VN. Does this result conclusively counter the objection that a discrimination of sheer length is all we have shown? The answer is of course subject to the reservations expressed earlier; there are consistent intonational differences between the well-formed sentence and the lengthened telegraphic sentence.

RESPONSE-TYPE	SYNTACTIC STRUCTURE			
	ADULT-FORM	CHILD-FORM		
	VFN	VN	N	LVN
TOUCH				
Telegraphic group	53	34	31	32
Holophrastic group	35	44	44	37
REPLY				
Telegraphic group	38	28	39	32
Holophrastic group	34	21	19	15
REPETITION				
Telegraphic group	5	16	16	10
Holophrastic group	17	15	13	19

TABLE 2. THE EFFECTS OF SYNTACTIC STRUCTURE ON THE OCCURRENCE OF VARIOUS RESPONSE-TYPES FOR TELEGRAPHIC AND HOLOPHRASTIC SPEAKERS.

Cell entries represent the percent of trials on which each response-type was observed, averaged over subjects.

Further examination of Table 2 shows that one of the responses, repetition, does not show the same pattern. If anything, repetitions are rarer with well-formed commands for the telegraphic group. The data here are too sparse to support conclusive interpretation, but they are consistent with the conjecture that children repeat what is to them anomalous: repetitions of well-formed sentences are relatively frequent for the holophrastic group, while repetitions of child-forms are more frequent for the telegraphic group. We reserve further discussion of the function of repetition until we discuss the effects of semantic anomaly.

2.2. EFFECTS OF SEMANTIC PROPERTIES OF THE STIMULI. It will be recalled that approximately half the stimuli contain some nonsense material, in addition to the toy-name. We were interested in asking how the child responded to commands whose semantic properties were not transparent. Notice that this stimulus-situation is probably quite unlike that faced by college sophomores when they perform a task involving nonsense words: the college sophomore is in a position, as an expert at English, to decide that the unknown material is indeed meaningless. For the 18-month old child, many English words are novel, and therefore no rational child of that age should conclude that there is anything inherently peculiar about these unfamiliar stimuli.

Some major effects of semantic anomaly are the same for all subjects, regardless of their differing verbal sophistication (Table 3). This is not surprising, since the nonsense words were no more well-known to one group than to another; but, as we have shown, the various structural types were better known to the more advanced subjects. We can therefore discuss over-all effects of semantic anomaly for all subjects before turning to a discussion of those effects as related to verbal maturity.

RESPONSE-TYPE	COMMAND TYPE: CHILD-FORM ALL-ENGLISH	CHILD-FORM NONSENSE-CONTAINING	ADULT-FORM ALL-ENGLISH	ADULT-FORM NONSENSE-CONTAINING
TOUCH				
Telegraphic group	32	22	52	33
Holophrastic group	42	22	35	34
Significance level	$p < .01$		$p < .01$	
REPLY				
Telegraphic group	32	20	38	32
Holophrastic group	18	10	34	18
Significance level	$p < .05$		$p < .05$	
RELEVANT RESPONSE				
Telegraphic group	66	55	74	62
Holophrastic group	71	64	74	57
Significance level	Not sig.		$p < .05$	

TABLE 3. THE EFFECT OF NONSENSE ON THE OCCURRENCE OF VARIOUS RESPONSE-TYPES FOR TELEGRAPHIC AND HOLOPHRASTIC SPEAKERS.

Child-forms of commands (N, VN, LVN compared to XN) and adult-forms (VFN compared to XFN, VZN, XZN) are considered separately. Cell entries are the percent of trials on which a given response-type was observed averaged over subjects. Significance levels are based on t-tests in which the data for the two groups were combined.

2.21. RESPONSES INDICATING COMPREHENSION OF THE NOUN. All subjects save one gave a relevant response less often when the stimulus contained nonsense. (This finding is significant at the .012 level by the binomial test, two-tailed.) Figure 2 presents for each subject individually the effectiveness of the nonsense-containing commands, relative to the effectiveness of the commands without nonsense, in eliciting a touch. It is apparent here that the two groups are similar.

At first glance, it might seem that the subject inclines to do nothing with nonsense-containing stimuli because there is no intelligible command for him to obey. But this explanation cannot account for the results: there is as much intelligible material in the stimulus *Dog!* as there is in the stimulus *Gor ronta dog!*; yet the subjects did make a relevant response to the former more often than to the latter. Relevant responses occurred on 67% of the trials with N, but on only 55% of the trials with XZN (averaged over subjects).

Nonsense at the beginning of the stimulus (XFN, XZN, and XN) interfered with a relevant response (Table 4). Note, though, that all such stimuli lack a verb. Perhaps initial nonsense interfered most tellingly with a relevant response because much semantic information (*Throw* ...) was lost; but if the second item was nonsense, very little semantic information (... *me the* ...) was missing. This supposition loses plausibility when we note that the verbless but nonsenseless

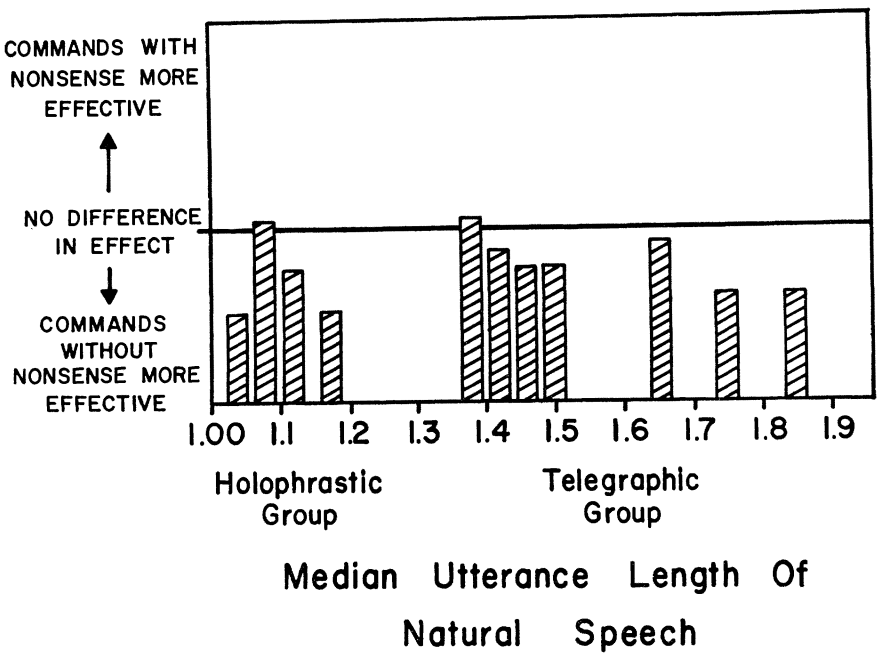

FIGURE 2. The effect of nonsense on obedience at different levels of verbal maturity. The relative effectiveness of commands with nonsense (XN, vZN, XFN and XZN) compared to commands without nonsense (N, VN, LVN and VFN) for each child. The height of the bar represents the percent of commands with nonsense which elicited a touch, divided by the percent of commands without nonsense which elicited a touch. The data for the individual subjects are ordered from Carl on the extreme right to Mike on the extreme left.

Semantic properties of the stimulus	Stimuli with an English verb	Stimuli without an English verb
	vN, LvN, vfN	N
All-English stimuli	70	67
	vZN	XfN, XZN, XN
Stimuli containing nonsense	65	58

Table 4. The effect of the presence of an English verb and of the presence of nonsense on the occurrence of a relevant response.

Cell entries are the percent of trials on which a relevant response was observed averaged over all subjects.

Ball! elicited the relevant response more often than did stimuli with a nonsense verb (Table 4). The conjecture is further weakened when the effect of the verb on the subject's behavior is examined: if the verb was present, was the subject more likely to do what it implied? The data are clear here: given that the child touched the toy at all, a verb-related action was less likely when the verb was there than when it was not! With a verb in the stimulus, verb-related action occurred on 61% of the trials; without a verb, verb-related action occurred on 70% of the trials: a ball is to throw. A child told to *Horn!* blew on the horn more often, if anything, than when told *Blow the on horn!*, provided he came in contact with the toy at all. Thus absence of the verb is a poor explanation for why initial nonsense (and deletion of the verb) reduced the likelihood of a relevant response.

The problem with nonsense-containing stimuli was obviously not that something was MISSING, but that something was THERE, something that was unintelligible and that somehow gave the subject pause. We suggest that unknown material may have 'turned the child off'—or perhaps, failed to turn him on. We cannot, from what we have done, say why: perhaps he was distracted by trying to understand the nonsense; perhaps he found complicated talk onerous, or assumed it was not addressed to him. In any case, if the subject 'tuned out' before the stimulus ended, he could not hear the noun, he would be unaware of the stimulus toy, and thus he could not (except by chance) make any relevant response.

It might be suggested that if the child listens primarily when he recognizes the beginning of the utterance, thus biasedly reducing his linguistic input, he will create for himself a simplified and less chaotic corpus with which to form those 'inductive generalizations' that learning theorists rely on to explain his acquisition of the language.

2.22. Repetition. Although all responses related to comprehension of the noun in the stimulus decreased when the stimulus contained nonsense (Table 3), there was one response that nonsense did not depress: namely, repetition. Repetitions occurred on MORE trials with nonsense than trials without nonsense (see Table 5). As shown in Table 2, repetition was also more likely to occur with STRUCTURES anomalous to the child.

The relative effectiveness of nonsense in eliciting repetitions INCREASED with verbal maturity, as shown in Figure 3 and Table 5. The telegraphic group re-

	Command type			
	Child-form		Adult-form	
	All-English	Nonsense-containing	All-English	Nonsense-containing
Telegraphic group	15	24	5	15
Holophrastic group	16	18	17	12

Table 5. The effect of nonsense on the occurrence of a repetition for telegraphic and holophrastic speakers.

Child-forms of commands (N, vN, LvN compared to XN) and adult-forms (vFN compared to XFN, vZN, XZN) are considered separately. Cell entries are the per cent of trials on which a repetition was observed averaged over subjects.

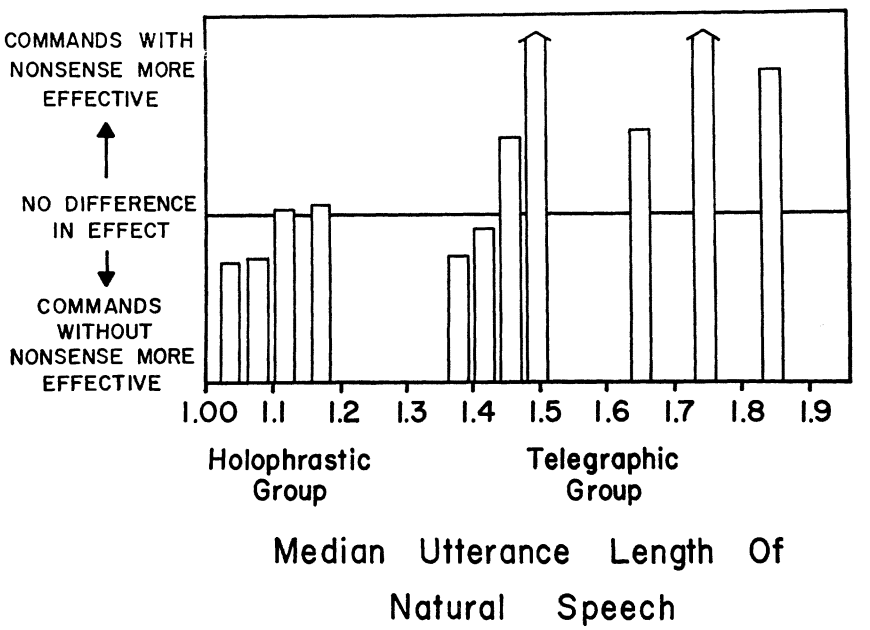

Figure 3. The effect of nonsense on repeating at different levels of verbal maturity. The relative effectiveness of commands with nonsense (XN, vZN, XFN and XZN) compared to commands without nonsense (N, vN, LvN and vFN) for each child. The height of the bar represents the percent of commands with nonsense which elicited a repetition, divided by the percent of commands without nonsense which elicited a repetition. The data for the individual subjects are ordered from Carl on the extreme right to Mike on the extreme left.

peated more often with nonsense stimuli than with no-nonsense stimuli. For the holophrastic group this difference was smaller with child-forms and was in the opposite direction for well-formed commands: there was a clear decrease in repetition when nonsense was introduced. In contrast, it should be noted that the tendency of children to repeat verbal material in ordinary circumstances DECREASES with growing maturity (see, e.g., Brown & Bellugi 1964); similarly, the over-all tendency to repeat decreases as a function of maturity in our subjects for 'normal' speech (i.e. for well-formed, all-English commands). ONLY WHEN THE

STIMULUS CONTAINED NONSENSE DID OUR MORE MATURE SUBJECTS REPEAT AS FREQUENTLY AS THE LESS MATURE SUBJECTS.[7]

What is the function of repetition for these children? Since, for the telegraphic speakers, repetition was increased when the difficulty of the linguistic stimulus was increased, we can conjecture that repetitions play some role in language development: what is not already familiar is practiced. Moreover, when the child repeats, he is more likely to obey (this is true for all subjects). Even though the nonsense material reduced obedience over-all, there was a greater tendency to obey on those trials where a repetition occurred. Thus the practice may have assisted in comprehension.

There is a close analog to this finding in the Russian work on inner speech. Sokolov (as reported in Slobin 1966) measured covert verbalizations (muscular activity in the articulatory system), which are presumably repetitions of the input, for adults reading and listening to their native language and a foreign language. Covert verbalizations are much more frequent for the foreign language; and the more difficult the foreign language, the more frequent they are. For our subjects, it was also the 'foreign' speech which led to greater repetition. Both anomalous words and anomalous constructions led the child to repeat.

But why should semantic anomalies be relatively more effective in prompting the more verbally mature child to repeat, as compared to the less mature? We suspect that the semantically anomalous stimuli were so far beyond the immature children's comprehension as to preclude so organized a response. Children seem to repeat what is just a little bit beyond them, and this would appear to be a rather efficient way of increasing knowledge at an orderly rate. This notion is consistent with the finding that the more mature children are, as a group, more likely to repeat the nonsense in the nonsense stimuli than are the less mature children. The material that is repeated may be determined by what puzzles the child, but it must be sufficiently available to allow repetition.

Summary and conclusions

3. We have raised the question of whether a description of linguistic development may be derived from an examination of the child's natural speech. Our data show that children make discriminations that are not reflected in their speech. Children whose speech is telegraphic readily obey well-formed commands, and less readily obey telegraphic commands. Thus a description of the child's spontaneous utterances does not do justice to his linguistic organization. In some fairly clear sense, comprehension seems to precede the production of well-formed sentences.

[7] In pilot work (six months prior to their participation in the experiment) Gregory and Helen were given some commands which contained nonsense and some which did not. No-nonsense commands were more effective (relative to nonsense commands) in eliciting repetitions when these children were in the pilot study than they were six months later. With increasing age, and presumably increasing verbal maturity, both children showed the same change in the effects of nonsense which appears when we examine different children at different levels of verbal maturity. Thus we have some longitudinal validation of our findings.

But this is not the puzzle in our findings; no doubt, production involves some skills in addition to those required in comprehension, a fact chronicled again and again in the literature on learning and perception. What is truly surprising is that those utterances which a description of natural speech would specify as TYPICAL for the child are just those utterances which are LESS EFFECTIVE to him as commands. Could he understand what he himself says less well than he understands what others say? Presumably not, but he seems to understand that there is something more natural—at least for the adult—in what the adult says. The well-formed utterances which the child never uses are nonetheless the more effective and compelling commands. Thus it seems necessary to posit some knowledge in the child about the structure of adult-forms, knowledge that will make the adult-form a 'better command' than the child-form for the child. A description of natural speech leaves this implicit system entirely out of account. Therefore, in no sense can recent descriptions of children's speech—no matter how closely the format of these descriptions conforms to transformational accounts—be taken as GRAMMARS of child language.[8]

We have shown so far that the child is more 'competent' with language than his early speech would by itself imply. But to what extent is he competent from the beginning? i.e., in what sense may his knowledge of language be taken as the product of unlearned cognitive functions? Our data suggest that competence, as well as performance, seems to change and grow. Not only speech, but the perception of what is well-formed, changes with increasing verbal maturity: the immature group prefers to respond to child-forms, while the telegraphic group prefers to respond to adult-forms. Such facts can of course be encompassed either within maturational or learning-theoretic approaches equally well, at least at the present state of our knowledge. The nativist position is not sufficiently articulated to allow predictions about the kinds of speech and perceptual organization that ought to show up relatively early in development. For the present, at least, the predictions concerning the course and process of acquisition are not obviously different for nativists and empiricists; indeed, the nativist, just like the empiricist, suggests that the child constructs limited interim grammars (see, e.g., Chomsky 1965) on his way to linguistic competence.

The argument for innate linguistic competence is made on the basis of quite different kinds of observation; no one expects the child to be born speaking English, or to speak it at all without a good deal of exposure to the speech of others. The question is: how much of what is learned can be accounted for by inherent regularities in the input itself (i.e. in heard speech), and how much must be accounted for by granting the learner dispositions to deal with the input in specific ways? Chomsky has argued with much justice that a comparison between a haphazard sample of speech and the grammar itself (presumably the way language is ultimately organized in the mind) leaves little doubt that the task in inferring the latter from the former is difficult to the point of improbability. On such

[8] We are making the usual assumption of linguists that the same grammar is relevant both to comprehension and production of speech. While such an assumption seems clearly parsimonious when mature speakers are considered, it is perhaps less compelling as applied to children.

grounds, it is argued that the child must bring a great deal of apparatus into the learning situation. Nor would psychologists in general disagree with this estimate; but there is some question whether what the child brings to the situation is knowledge about language, or certain general methods for organizing various kinds of sensory input.

Our data allow some tentative speculations on these matters. Our subjects' responses to novelty, both syntactic and semantic, suggest some general techniques through which they may approach the buzzing confusion of the ambient linguistic environment. If, for example, the child does not 'tune in' to excessively complex or unfamiliar speech, this selective listening may provide him with a tractable corpus. Such filtering need imply very little in the way of prior linguistic knowledge. Long sentences, sentences that begin in an unfamiliar way, can perhaps be ignored. There is little doubt, in addition, that the mother does some filtering of her own; lexically and constructionally complex requests are unlikely to lead to any overt response from the child, and mothers surely know this. Convenience dictates that we provide children with a simplified linguistic situation. To this extent the child's effective linguistic environment is not the total, indefinitely variable, corpus of adult speech, nor a haphazard sample of that total. Thus the child need not begin his grammar construction with unselected data.

In the same vein, the child appears to use repetition as another method for approaching the linguistic environment selectively. He repeats what is just a bit beyond him in natural speech, what is just a little bit odd. We need not assume that the child is 'trying to learn' when he makes this selection; how could he know what to pick out to try to learn unless he knew it all in advance? Whatever the child's intent or capacity, he is apparently unable to repeat long complicated material that is far beyond his comprehension. Thus what can be chosen for repetition—for recontemplation or rehearsal—is also highly selected. In short, we suspect that the child comes equipped with a set of capacities, and also incapacities, which assure that he will respond selectively to the linguistic environment. It seems to us premature to speculate about the specificity of such predispositions to language.

In sum, we have tried to create a situation in which the child could display his current linguistic knowledge, even if he could not do so by producing well-formed sentences. The results suggest that the child makes distinctions not evident in speech at some stages, and that these distinctions vary with linguistic maturity. Further, the child seems to have ways of biasing his linguistic input so that the flow of new information can be controlled.

There is general agreement among psychologists and linguists that the differences between spontaneous speech and knowledge in young children may be very extreme. Psychologists studying natural speech have worried about this problem, not only because the impression one gets of children's language from children's speech may be an underestimate, but because it may be biased in unknown directions. We believe our experimental technique is a step forward in this connection. Perhaps more important, we are convinced that there must be techniques for systematic observation. Otherwise, little that is substantive can be added to or subtracted from the linguist's philosophical assertion that linguistic competence is innate.

Appendix: natural speech

4. For each child, 100 intelligible utterances were transcribed from tape recordings of preliminary sessions. Exact immediate repetitions of his own utterances by the child were not counted, and are excluded from the analysis. A single transcriber worked with the natural speech samples of all thirteen subjects and provided the data used in this analysis. Thus, if any transcriber bias exists, it enters into the data of all subjects equally. In an attempt to evaluate the reliability of the transcriptions, the transcriber made a second transcription some months later of the tape of Linus' utterances. This child was selected because of the low intelligibility of his speech. Although the specific utterances judged intelligible differed markedly in the two transcriptions, the percent of intelligible utterances is remarkably similar (67% and 70%), as is the median utterance length (1.09 and 1.12).

The transcriber was instructed to be generous in counting words: if there was a suggestion of two words, two words were counted even if they were elided; e.g., *wanna* in *wanna drink* would be scored as two words. The transcriber was instructed to err on the side of omission with respect to grammatical features such as suffixes in the child's speech. Features were transcribed as present in an utterance only if clearly heard.

We next examined utterance length, intelligibility, and the frequency of certain grammatical features in a search for a realistic measure of verbal maturity.

4.1. Utterance length. Characterization of natural speech in terms of utterance length involved several decisions. First, there is the question of which utterances should be included. (Note that we have omitted all immediate repetitions of the child's own utterance.) Some investigators (e.g., Brown & Fraser) have omitted all single word utterances; since these are often answers to questions, their frequency may reflect the frequency of questions addressed to the child rather than the child's tendency to use one-word utterances in preference to more complicated ones. We chose to include single-word utterances because the experimenter seldom directed questions to the child in these sessions; instead, she played with toys, and the child's speech was ordinarily comment about or participation in the play.

A second problem is the measure used to characterize utterance length. The mode did not discriminate among our subjects, so median utterance length was selected as the measure. Median utterance lengths for the thirteen children are shown in Table 6. It can be seen that, on the basis of this measure, the subjects fell naturally into three groups. Two children formed a group of mature speakers, and utterances of three or more words were as common in the speech of these children as shorter utterances. Further, many of their utterances were well-formed sentences. Seven children formed a group of intermediate or telegraphic speakers, whose speech tended to be fairly evenly divided between single-word utterances and longer utterances. The four children in the group of least-mature speakers had few if any utterances longer than one word. Those few utterances counted as containing more than a single word may represent the transcriber's benefit-of-the-doubt decisions. Thus we have called these children holophrastic speakers.

4.2. Intelligibility. An index of intelligibility was obtained by counting the number of consecutive utterances examined in order to find 100 completely intelligible ones. We see in Table 7 that the children varied greatly in this respect and that there was overlap among the three groups established on the basis of median utterance length.

Intelligibility enters in two ways into a consideration of verbal maturity. First, since adult speakers are more intelligible than children, intelligibility might be considered an independent index of verbal maturity in our sample of subjects. Second, it may be more difficult to detect the presence of grammatical features in the less intelligible children, and we may therefore systematically underestimate their linguistic sophistication. The positive correlations of intelligibility (Table 8) with the various grammatical features (see below) support both these possibilities. On the one hand, intelligibility correlates significantly with the presence of verbs; since it is relatively easy to hear verbs, this does suggest that intelligibility might be a separate measure for these subjects. However, intelligibility correlates most highly with those features which are hard to hear (noun and verb suffixes).

SUBJECT'S AGE IN MONTHS	SUBJECT	MEDIAN LENGTH
	MATURE GROUP	
30	Andy	3.50
33	Billy	2.50
	TELEGRAPHIC GROUP	
23	Carl	1.85
19	Dottie	1.75
25	Eric	1.65
29	Fran	1.48
28	Gregory	1.43
21	Helen	1.41
32	Ira	1.40
	HOLOPHRASTIC GROUP	
24	Jeremy	1.16
20	Karen	1.10
24	Linus	1.09
18	Mike	1.06

TABLE 6. MEDIAN LENGTH OF UTTERANCES IN NATURAL SPEECH SAMPLE.

SUBJECTS	INTELLIGIBILITY	VERBS	VERB AUX.	PRONOUNS	VERB SUFFIX	NOUN SUFFIX	ARTICLES
MATURE GROUP							
Andy	4.5	1	1	1	1	3	5
Billy	1.5	2	2	2	2	4	2.5
TELEGRAPHIC GROUP							
Carl	9	5	3	3	—	—	7.5
Dottie	1.5	8	—	10	5	2	1
Eric	8	7	4	5	3	—	—
Fran	3	9	—	4	4	1	4
Gregory	4.5	4	5	8	6	6.5	9
Helen	7	3	—	7	—	—	7.5
Ira	10.5	6	—	6	7	—	6
HOLOPHRASTIC GROUP							
Jeremy	10.5	12	—	11	8	5	2.5
Karen	12	11	—	—	—	—	—
Linus	6	10	—	—	—	6.5	—
Mike	13	13	—	9	—	—	—

TABLE 7. GRAMMATICAL FEATURES AND INTELLIGIBILITY.

The rank of each subject is based on the frequency of occurrence of the grammatical feature in a sample of natural speech. (The rank of 1 indicates the subject with the most instances of the feature). High intelligibility is indicated by a low number (e.g. a rank of 1.5). Dashes indicate no instances were found.

When we instructed the transcriber to beware of attributing a grammatical feature unless it was clearly heard, we guaranteed that children who were hard to understand would also be low in the incidence of various grammatical features. If we remove the effects of intelligibility statistically, we may have a purer picture of what features go together in children's speech than if we are at the mercy of the transcriber's ear for subtle cues to sophisticated speech.

4.3. GRAMMATICAL FEATURES. We examined the children's speech for the presence of certain grammatical features: verbs, verb auxiliaries, verb suffixes, noun suffixes, articles, pronouns, and transformational constants. For each child we determined the number of utterances in the speech sample which contained an instance of a grammatical feature.

	Age	Intell.	Verbs	Verb aux.	Pronouns	Verb suffix	Noun suffix	Articles
Median length	.38	.56	.59	.71	.66	.65	.39	.38
Age		.39	.41	.38	.45	.55	.24	.30
Intelligibility			.47	.31	.29	.53	.62	.50
Verbs				.62	.54	.38	.13	.22
Verb auxiliaries					.68	.51	.11	.08
Pronouns						.54	.13	.30
Verb suffix							.58	.42
Noun suffix								.55

Table 8. Inter-correlations of natural speech measures and the correlation of each measure with age (Kendall Rank Order Correlation Coefficient).

All correlations are positive; correlations larger than .41 are significant at the .05 level or better.

Transformational constants were found in the speech of only two children (Andy and Billy, the most advanced speakers on most counts), and are not considered further. For each grammatical feature, the children were ranked on the basis of the frequency of the feature in the speech sample; the rankings are given in Table 7. It seems clear that the children fall into the same three groups on the basis of the frequency of the various grammatical features as they do on the basis of median utterance length.

This tendency for the various grammatical features to appear together in the children's speech can be expressed by correlations between rankings on the different features. Table 8 shows such correlations: note that all are positive. To evaluate the effect of intelligibility as an artifactual basis for the obtained positive inter-correlations of the grammatical features, partial correlations were performed holding intelligibility constant. Although the correlations among the grammatical features are reduced when intelligibility is held constant, all correlations remain positive and five remain significant. Thus intelligibility is not the sole basis for the positive intercorrelations.

The inter-correlations among the grammatical features are suggestive. There appear (Table 8) to be two important groups of features or factors: (a) verbs, verb auxiliaries, and pronouns; and (b) noun suffixes and articles. Although the correlations are relatively high (and are significant) for features in the same feature-group, they are near zero for features in different groups. Verb suffix, the sixth feature, correlates fairly highly with all other grammatical features. When intelligibility is statistically held constant, the significant correlations among factors in the first group, and also those between the factors in the first group and the verb suffixes, are still significant. Thus the first factor, perhaps a verb-phrase factor, is in no sense an artifact of intelligibility, as the latter factor may be.

The inter-correlations of the grammatical features suggest that, for some children, the noun-phrase may develop first: children who use articles also tend to inflect nouns. For other children the verb-phrase appears to develop first: the use of verbs and verb auxiliaries (obviously) go together. The correlation of pronouns with these verb features suggests that pronouns may be used in place of more complex noun phrases by children who have elaborated the verb phrase.

There is a suggestion of a sex difference in natural speech. Males tend to use more verb-phrase features: the five children who use verb auxiliaries are male. Females tend to use noun-phrase features, especially articles; three of four females, compared to four of nine males, use articles. Perhaps the apparently greater proficiency of males in the verb aspect of language is related to their greater motor activity.

4.4 Selection of the measure of verbal maturity. Given the various analyses of the natural speech samples, how are we to decide on a measure of the sophistication of the speech of these children? There is obviously no principled answer to this question, for in

general we cannot decide what features of speech are somehow more important in deciding which child's speech is more adult-like. For this latter reason, we could not combine the various indices (thus equating their importance) to derive a composite ranking of the subjects. As a compromise solution, we chose median utterance length as the index on various grounds.

It is clear that utterance length is a better index than age, since for each grammatical feature the correlation with utterance length is higher than the correlation with age (Table 8). We reject intelligibility as the index, since it is at least in part the effect of a motor skill which may be independent of other linguistic knowledge. We reject the grammatical features as our index for two partially related reasons: we cannot combine these features to derive a single index, for we do not know whether they are equally important; and we cannot choose any one of them because of the obtained variation in the order in which these features emerge in speech. These decisions leave only the index of utterance length.

The relatively high correlation of both grammatical features and intelligibility with utterance length suggests that these indices at least in part are measuring the same thing. Moreover, agreement between two transcriptions—even for the least intelligible of the subjects—suggests that the utterance-length index is a reliable one.

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