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ABSTRACT
              This paper reports on a study conducted to determine
the abilities of children to make optional transformations in
sentences conjoined with "and." The subjects were 35 middle-class
children between the ages of five and eight, who demonstrated average
school achievement, spoke standard American English, and had normal
speech and hearing. A repetition-of-sentence test, including 64
sentences each composed of two constituent transitive sentences
conjoined with "and," was selected as the most efficient method of
eliciting sentences representing specific structures. The main
conclusions of the study are summarized as follows: (1) Children from
5 to 8 repeat or modify the structure of a dictated sentence on the
basis of their grammatical competence; (2) Children's success in
repeating a sentence depends on the specific transformations used in
deriving the surface structure; (3) The ability of children to make
deletions and substitutions progresses, in a general way, from 5 to 7
years and reaches a plateau between 7 and 8 years; (4) Children's
acquisition of optional transformations on sentences conjoined with
"and" proceeds in a sequence from deletions involving only the verb
phrase, to deletions involving a combination of constituents from
noun and verb phrase, to deletions or pronoun substitutions involving
only the noun phrase. (Author/PMP)

Evaluation of Children's Linguistic Competence:
Acquisition of Transformations

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The theory of generative grammar can serve as a practical model for the linguist and the speech pathologist. While linguists who use such a model are developing a finite set of rules to account for the infinite number of sentences in a language, speech pathologists who base their work with children on a model of generative grammar are focusing on children's acquisition of the syntactical component of grammar and the obvious semantic relationships.

Those interested in the linguistic behavior of children need to be able to identify normal linguistic competence and performance at various age levels. Although determination of the linguistic competence of children is the crucial issue, estimates of competence can be made only through the study of performance.

An investigator has a choice of methods to elicit a linguistic performance. Many investigators prefer using samples of children's spontaneous speech to evaluate linguistic development. However, Chomsky (1964) warned that any attempt to construct a grammar on the basis of description of spontaneous verbal output alone is unwise, saying:

> It seems clear that the description which is of greatest psychological relevance is the account of competence, not that of performance....The deeper question concerns the kinds of structures the person has succeeded in mastering and internalizing, whether or not he utilizes them, in practice, without interference from the many other factors that play a role in actual behavior. For anyone concerned with intellectual processes, or any question that goes beyond mere data arranging, it is the question of competence that is fundamental. Obviously one can find out about competence only by studying performance, but this study must be carried out in devious and clever ways, if any serious result is 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... (p. 36).

In the same discussion, Chomsky said that, although analysis of spontaneous verbal output may be a good starting place, he hoped that future research would be directed toward the tapping of underlying abilities. He pointed out that competence will extend beyond what the child uses in everyday speech. Therefore, he said, studies are needed on comprehension and use of sentences, detection of deviance, application of rules to new situations, and concept formation. He mentioned that one way to gain information

might be to have a child repeat sentences and nonsentences.

Research methods have been devised to begin to tap children's linguistic knowledge by means other than spontaneous speech. Repetition of sentences as a method of eliciting language for evaluation of linguistic competence has been used by several researchers. Children's performances in sentence repetition tasks have indicated that children's ability to repeat sentences depends on the rules they have acquired. When a child has processed the sentence, modifications are made on the structure, but the meaning is preserved (Baratz, 1969; Lenneberg, 1967; Menyuk, 1963, 1969; Slobin and Welsh, 1971). Sentence repetition seems to be an expedient method for eliciting specific linguistic information.

Various methods of elicitation have shown that children's language is different from adults' language. The evidence points to rule-governed features, often idiosyncratically structured in children's language. Children seem to begin speaking a language by learning simple base structure rules. A gradual change from rules restricted to children's language to rules of adult language occurs. The point at which transformations emerge in children's language is difficult to determine, but a steady progression has been observed in children's use of transformations (Bar-Adon and Leopold, 1971; Menyuk, 1971).

The purpose of this investigation was to determine the abilities of children to make optional transformations in sentences conjoined with "and." A model of generative grammar was used in determining this facet of children's linguistic competence, as competence is demonstrated through performance.

The subjects were 35 children, five at each of seven age levels (5-0, 5-6, 6-0, 6-6, 7-0, 7-6, and 8-0) who demonstrated average school achievement, spoke Standard American English, had normal speech and hearing, and came from families of middle socioeconomic level.

A repetition-of-sentence test was chosen as the most efficient method of eliciting sentences representing specific structures. The repetition-of-sentence test included 64 sentences, each composed of two constituent transitive sentences conjoined with "and." Generative grammar rules were used to evolve groups of paraphrased conjoined sentences that included 13 samples of nonreduced structure and at least three examples of each of 16 redundancy deletions or pronoun substitutions.

Review of the literature showed that "and" is a conjoining link that is used early and continues to be used frequently (Menyuk, 1964, 1969; Slobin and Welsh, 1971). However, little research has been conducted on the optional transformations that children use in conjoined sentences. Redundancy deletions and pronoun substitutions make sentences more economical to produce but are more complicated linguistically and thus require additional storage of information. The findings are discussed first on the basis of implications of the incorrect responses and then on the basis of the significance of the correct responses in terms of paraphrase groups, sentence length, and structure.

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The number of incorrect responses at all age levels demonstrated that children from five to eight years of age, in the task of repeating sentences, seemed to modify the structure of a sentence according to the rules they had acquired. Some of the children even increased the length of a sentence to use a structure they knew. The modifications of structures, which resulted in incorrect responses, indicated children's knowledge of linguistic rules; and consistent modifications were typical of structures that elicited a high percentage of correct responses.

Even when they were incorrect, the responses of the children indicated rule-governed behavior. The remainder of the responses are discussed primarily in relation to correct responses made by the subjects.

The sentences in the repetition-of-sentence test were divided into paraphrase groups. In each group, all the sentences had the same deep structure; and optional transformations of redundancy deletion and pronoun substitution were used to derive different surface structures. Katz and Postal (1964) commented on the importance of this type of paraphrase, saying:

> It has always been clear that syntactic structure somehow plays a crucial role in a speaker's understanding of what sentences of his language mean. This role is most evident in cases where two sentences have the same meaning by virtue not only of their lexical content but also of the syntactic relation between them...(p.19).

Therefore, within each paraphrase group the meaning was held constant; and the surface structure changed. The responses to each group of paraphrased sentences showed that, even with direct stimulation, the children demonstrated definite structural preference for certain ways of saying a sentence. However, the children usually accepted more than one sentence within each paraphrase group. In other words, the subjects demonstrated that successful repetition depended on the specific transformations used for the derivation of the surface structure of a sentence.

The sentences in the repetition-of-sentence test varied from 6 to 15 words in length. Analyses of the responses to the length of the sentence were conducted across and within paraphrase groups. Analysis of the responses to short versus long sentences and to sentences of the same length conducted across paraphrase groups indicated that successful repetition did not depend on length. Probably the most valid method for testing the effect of length versus structure was to analyze the responses within paraphrase groups. Whether these data were analyzed in terms of the same meaning and same length or same meaning and different length, the results indicated that length was not the determining factor in successful repetition.

All of these analyses indicated that the structure of the sentence seemed to be the crucial issue. Therefore, the major consideration was the structures the children used in conjoined sentences.

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After the number and percentage of correct responses to each structure was computed for each of the seven age groups, a five-point scale was devised to aid in drawing conclusions from the study. This scale will be used to report data in the present study and in the next study reported at this meeting. Learning involves the stages between the time that a rule begins to emerge in children's language and the time that the rule is mastered. These stages of learning can be shown on the following scale. This scale postulates a level at which the rule has not been learned, three levels during which learning is taking place, and a level of mastery.

U (unlearned). When 0 through 12 percent of the responses are acceptable, the children give little or no evidence of having learned the rule.

B (beginning to emerge). When 13 through 32 percent of the responses are acceptable, the children indicate some awareness of the rule, but little more.

E (emerging). When 33 through 72 percent of the responses are acceptable, the children demonstrate that knowledge of the rule is emerging but is not approaching mastery.

A (approaching mastery). When 73 through 92 percent of the responses are acceptable, the children may be considered to have some knowledge of the rule, but the rule is not mastered.

M (mastery). When 93 through 100 percent of the responses are acceptable, the children in the age group may be considered to have mastered the transformational rule.

Table 1 shows, by means of the scale (UBEAM), the optional transformations that children from five to eight years of age used in conjoined sentences. Although transformational rules are not stated in their entirety, Table 1 indicates the specific redundancy deletion or pronoun substitution called for in the dictated sentences.

Table 2 provides sample sentences from the repetition-of-sentence test as an example of each structure. The test is not included in entirety, nor are the sentences listed in the order of presentation. The numerical order and structures in Table 2 correspond to like representation in Table 1.

When the only change in structure was the substitution of a pronoun for the noun phrase object, noun phrase subject, or both the object and the subject, the responses indicated that children from five to eight years of age had not acquired these rules, which were still emerging at eight years. See items 1, 2, and 3. The children seemed to prefer to use full structure or delete the subject plus constituents of the verb phrase.

Deletion of the noun phrase subject, of the noun phrase object, and of both the noun phrase object and the noun phrase subject were rules.

Table 1

Acquisition of Optional Transformations In Sentences Conjoined with "And"

Structure (See sentences on table 2)	5	5-6	6	6-6	7	7-6	8
1. Pro/NPsubj	B	U	B	E	E	E	E
2. Pro/NPobj	B	U	U	E	E	E	B
3. Pro/NPsubj X Pro/NPobj	B	B	B	E	E	E	E
4. -NPsubj	B	E	E	E	E	E	E
5. -NPobj	B	U	E	E	E	E	E
6. -NPobj X -NPsubj	E	B	E	B	E	E	E
7. -NPsubj X Pro/NPobj	E	B	E	E	E	E	E
8. -NPobj X Pro/NPsubj	E	B	E	E	B	E	E
9. V gapping	E	E	E	E	E	E	E
10. -VP	M	M	M	M	M	M	M
11. -V+NP	M	A	A	M	M	M	M
12. -NP+V	A	E	A	A	A	M	M
13. -NP+V+Det	E	A	A	E	M	E	.
14. -NP+M+A	E	E	M	M	M	M	M
15. -NPobj X -NP+M+A	A	E	E	A	M	A	M
16. -NP+M+A X Pro/NPobj	E	E	A	A	M	M	M
17. Full structure	E	A	A	A	A / A		A

Key:

Pro = pronoun
NP = noun phrase
V = verb
VP = verb phrase
Det = determiner
M = modal
A = aspect
subj = subject
obj = object
/ = "for"
- = deletion of
X = intervening string

U = unlearned (0-12% of correct responses)
B = beginning to emerge (13-32% correct responses)
E = emerging (33-72% correct responses)
A = approaching mastery (73-92% correct responses)
M = mastered (93-100% correct responses)

Table 2

Sample Sentences

Structure	Sample Sentence
1. Pro/NPsubj	The boy will be chasing the girl and he will be catching the girl.
2. Pro/NPobj	The boy will be chasing the girl and the boy will be catching her.
3. Pro/NPsubj X Pro/NPobj	The boy will be chasing the girl and he will be catching her.
4. -NPsubj	The girl likes the hamburger and likes the french fries.
5. -NPobj	The mouse found and the mouse ate the cheese.
6. -NP obj X -NPsubj	The boy will be chasing and will be catching the girl.
7. -NPsubj X Pro/NPobj	The boy will be chasing the girl and will be catching her.
8. -NPobj X Pro/NPsubj	The mouse found and he ate the cheese.
9. V gapping	Sally rides the bicycle and Jane the tricycle.
10. -VP	A girl and a boy will jump rope.
11. -V+NP	A girl will jump rope and a boy will.
12. -NP+V	The girl likes the hamburger and the french fries.
13. -NP+V+Det	The girl likes the hamburger and french fries.
14. -NP+M+A	The boy will be chasing the girl and catching the girl.
15. -NPobj X -NP+M+A	The boy will be chasing and catching the girl.
16. -NP+M+A X Pro/NPobj	The boy will be chasing the girl and catching her.
17. Full structure	The boy will be chasing the girl and the boy will be catching the girl.
	The girl likes the hamburger and the girl likes the french fries.
	The mouse found the cheese and the mouse ate the cheese.
	Sally rides the bicycle and Jane rides the tricycle.
	A girl will jump rope and a boy will jump rope.

that were still emerging at eight years. See items 4, 5, and 6. The children preferred to delete additional constituents or to use full structure. Combinations of noun phrase deletions and pronoun substitution, as shown on items 7 and 8, were still emerging at eight.

Verb gapping deletion was emerging in the language of the children at all age levels but did not approach mastery at any level. See item 9. The subjects were consistent in preferring full structure.

Redundancy deletion of the verb phrase was the only transformation in this investigation that the children had obviously mastered by five years, as shown in item 10. Thus, a transformation allowing deletion of a redundant verb phrase was first-learned redundancy deletion rule in sentences conjoined with "and."

The children in this study had mastered and stabilized deletion of the verb plus noun phrase by six years, six months. See item 11. Analysis of the correct responses indicated that this deletion was mastered at five, but a dip in the percentage of the correct responses occurred at five years, six months and six years of age.

In general, deletions involving only the noun phrase were not used by these children; but deletions involving only the verb phrase, with the exception of verb gapping, were among the earliest mastered and were generally learned by children in the age range of five to eight. The differences in the abilities of children to delete noun phrases and verb phrases may confirm some previously-presented linguistic theories. The findings of this study, showing that children are reluctant to delete the important noun phrase, seem to indicate that Chomsky's 1965 model is realistic, at least insofar as acquisition of language is concerned, and to support current linguistic discussion of the preeminence of the noun phrase. Another possibility, of course, is that first-learned words are the most difficult to delete, nouns representing the majority of first words that children use and being used often as holophrastic sentences.

Further inspection of Table 1 shows that deletion of noun phrase plus verb, item 12, was mastered by seven years, six months. However, the children were approaching mastery of this deletion from the age of five years.

The correct responses to deletion of noun phrase plus verb plus determiner, as shown in item 13, were exemplified by fluctuation between emergence and approach to mastery at all age levels, although correct responses indicated mastery at seven. However, this rule is apparently not firmly acquired by seven, regression to earlier stages being shown at seven years, six months and eight years. Deletion of the determiner could be considered difficult because the children had mastered deletion of noun phrase plus verb in the same sentences in which they failed to show mastery of deletion of noun phrase plus verb plus determiner.

The children seemed to learn deletion of noun phrase plus modal plus aspect between five years, six months and six years of age. See item 14. This change from emergency to mastery in a six-month period was a decisive and sizeable shift from one stage of acquisition to another.

Item 15 in Table 1 shows that deletion of the noun phrase object and the noun phrase plus modal plus aspect was mastered by seven and eight-year-olds, although a slight dip in correct responses occurred at seven years, six months.

Deletion of noun phrase plus modal plus aspect, with the substitution of a pronoun for the noun phrase object, was the transformation which brought the smoothest progress in correct responses. As item 16 in Table 1 indicates, the rule emerged at five, approached mastery at six, and was mastered at seven.

The analyses of the data indicated that the acquisition of each rule involving redundancy deletions and pronoun substitutions in conjoined sentences must be studied separately, because knowledge of rules for deletions or pronoun substitutions is not learned as a whole. Just as each rule is specific, so the acquisition of each rule seems to be the gaining of a specific bit of knowledge.

The results of the study indicated that, in the testing of children, more than one example of each structure should be included. When a rule was acquired, repetitions were consistently correct. When a rule was unlearned, repetitions were consistently incorrect. However, when the children were in other stages of rule learning, their responses were inconsistent. Therefore, elicitation of only one example of a structure is inconclusive evidence of the stage of acquisition.

The percentage of correct responses to the full structure sentence, shown in item 17, indicated that this sentence structure was emerging at five years, was approaching mastery at all other age levels, but was not mastered at any level. This result was unexpected, because these full structure sentences were the least complicated linguistically. Although the full structure sentences elicited a higher percentage of correct responses than did most of the sentences requiring deletions, a percentage indicating mastery might have been anticipated. Analyses of incorrect responses showed that full structure was often used in preference to other surface structures when another structure was the stimulus. When a child had not acquired a rule, he seemed to process the sentence in its nonreduced structure or in approximation of the abstract underlying structure of the grammar; and he said the sentence in full structure or used a different rule. However, when the stimulus was a full structure sentence, errors in repetition were apparent and seemed to occur because the children used transformational rules, deriving other surface structures. One might speculate that, when the stimulus was a full structure sentence, children recognized the obvious redundancies and knew they were unnecessary. Hence, they attempted deletions of redundancies within the limits of their competence, although they used these redundancies frequently when the stimulus included a transformational rule they had not acquired.

Conclusions

Table 1 charted the apparent sequence in the acquisition of abilities

to make optional transformations in conjoined sentences, as these transformations were used by 35 children ranging in age from five to eight years. Insofar as the subjects in this study were representative of normally-speaking children, certain general conclusions may be drawn about children's abilities to make redundancy deletions and pronoun substitutions in a repetition-of-sentence task involving sentences conjoined with "and."

1. Children from five to eight years of age repeat or modify the structure of a dictated sentence on the basis of their grammatical competence, as competence is demonstrated through performance.

2. Children's success in repeating a sentence depends on the specific transformations used in deriving the surface structure rather than on the underlying structure, the length, or the appearance of the sentence.

3. Children are consistent in their responses, when they have mastered a rule or when they have not yet learned a rule. However, in intervening stages, their responses are inconsistent. Therefore, the elicitation of only one example of a structure is inconclusive evidence of the stage of acquisition.

4. Children's knowledge of rules for redundancy deletions and pronoun substitutions is not acquired as a whole. Therefore, each rule involving redundancy deletions and pronoun substitutions in conjoined sentences must be considered separately in the study of acquisition of transformations.

5. Children present a varied pattern of progression in the acquisition of each specific transformation. While acquisition of some transformations presents a smooth progression, the pattern of acquisition for other structures fluctuates between more and less advanced stages.

6. Although acquisition of the grammatical structures used in this study is not complete by the time children reach eight years of age, their ability to make deletions and substitutions progresses, in a general way, from five years to seven years and reaches a plateau between seven and eight years.

7. In general, children's acquisition of optional transformations in sentences conjoined with "and" proceeds in a sequence from deletions involving only the verb phrase, to deletions involving a combination of constituents from noun and verb phrase, to deletions or pronoun substitutions involving only the noun phrase.

The information disclosed in this study may provide another link in

the chain of knowledge about the acquisition of spoken language. A theoretical model of generative grammar that provides the abstract structures of concern to linguists can be a practical tool for the speech pathologist. Furthermore, a reciprocal relationship between speech pathology and linguistics can be mutually profitable because both fields are deeply involved in the study of that unique human behavior called language.

NOTES

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