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# Syntactic Categories in the Speech of Young Children

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This article demonstrates that very young children have knowledge of a range of syntactic categories. Speech samples from six children aged 2 years to 2 years, 5 months, with Mean Lengths of Utterance (MLUs) ranging from 2.93 to 4.14, were examined for evidence of six syntactic categories: Determiner, Adjective, Noun, Noun Phrase, Preposition, and Prepositional Phrase. Performance was evaluated by the conformance of the children's speech to criteria developed for each category. Known syntactic diagnostics served as models for the criteria developed; the criteria exploited distributional regularities. All children showed evidence of all categories, except for the lowest MLU child, whose performance was borderline on Adjectives and Prepositional Phrases. The results suggest that children are sensitive very early in life to abstract, formal properties of the speech they hear and must be credited with syntactic knowledge at an earlier point than heretofore generally thought. The results argue against various semantic hypotheses about the origin of syntactic knowledge. Finally, the methods and results may be applicable to future investigations of why children's early utterances are short, of the nature of children's semantic categories, and of the nature of the deviance in the speech of language-deviant children and adults.

The grammars of mature speakers consist of rules and principles that capture generalizations about the language. Languages have (minimally) semantic, syntactic, and phonological regularities, and mature grammars represent all three levels of regularities. Three enduring questions of language acquisition are to what extent a child's grammar resembles a mature grammar, how a child's grammar develops over time, and how the components of the child's grammar are interrelated. Since syntactic regularities are stated in terms of syntactic categories like Adjective, Noun, and Noun Phrase, categories are particularly important entities. If the child's grammar lacks syntactic categories, it also lacks a level of syntactic description, and thus differs from a mature grammar in a crucial way.

By what point in development has the child acquired the basics of formal grammatical categories like Adjective and Noun? The present study addresses a special case of this question by examining corpora of 2-year-olds for evidence of formal regularities characterizing six categories. The results bear on several theoretical concerns about acquisition.

First, from a semantic viewpoint, treatments of semantic roles presuppose a phrasal segmentation of the sentence, with the senses of Noun Phrases identifying roles like agent of the action or recipient of the action (e.g., Hardy & Braine, 1981; Levin, 1985). Unless children can select the proper phrasal categories they will be unable to determine semantic roles. For instance, if a child were asked to act out a sentence like "The large woman pushed the small pencil," using items from an array consisting of women and pencils of different sizes, the child can succeed only if he or she can group together the correct Determiners, Adjectives, and Nouns into units.

Second, from a syntactic viewpoint, most treatments of grammatical relations, such as subject of the sentence or direct object of the verb, define such relations over syntactic categories. Unless children can identify Noun Phrases they cannot determine subjects and objects. Similarly, grammatical rules are written in terms of grammatical categories. Without categories the child cannot form rules.

Third, from a developmental point of view, category acquisition puts temporal constraints on theories of *how* syntactic knowledge is acquired. For example, the earlier category acquisition can be demonstrated, the more plausible it is that the child grammar uses the same theoretical vocabulary as the adult grammar, even though it includes fewer accurate generalizations. The earlier the child demonstrates knowledge of formal categories, the more likely it is that the child is learning simultaneously about all levels of the language—phonology, syntax, and semantics—from the onset of acquisition. In addition, many models of acquisition presuppose category knowledge on the child's part, ranging from Wexler and Culicover's (1980) learnability model to our hypothesis-testing model (Erreich, Valian, & Winzemer, 1980; Mayer, Erreich, & Valian, 1978; Valian, Winzemer, & Erreich, 1981). Providing evidence of early category knowledge increases the plausibility of such models.

Semantic and syntactic relations have concerned investigators more than syntactic categories, but there are several studies of the development of syntactic categories and sub-categories, and a few estimates of when children acquire categories. Vari-

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ous fine-grained analyses of child knowledge of distinctions in the adult grammar have shown, for example, that some German-speaking children can handle syntactic gender by age 3 (MacWhinney, 1978), and that English-speaking children are at least partially aware of the count-mass distinction by age 2 (Gordon, 1985). Other analyses have examined regularities in child speech that partially, though not completely, overlap with distinctions in the adult grammar. For example, early work by Brown and colleagues (Brown & Bellugi, 1964; Brown, Cazden, & Bellugi, 1969; Brown & Fraser, 1964; Brown, Fraser, & Bellugi, 1964; Miller & Ervin, 1964) demonstrated regularities in very early child speech, such as that different sets of prenominal words in the speech of children at Mean Length of Utterance (MLU) 2 patterned nonrandomly. Similarly, Bloom and her colleagues (Bloom, Lightbown, & Hood, 1975) demonstrated structural–semantic regularities in early child speech.

The picture emerging from such studies has not, however, afforded a clear answer to the question of by what point category acquisition is well underway. In one review Maratsos (1982, p. 256) puts the upper limit at the end of the preschool years or earlier. One reason for the uncertainty may be that the fine-grained analyses, although precise and focused on knowledge of adult distinctions, have necessarily been limited in scope; the broader analyses, on the other hand, have often demonstrated regularities that are not proper parts of the adult grammar, and thus the point at which acquisition of adult concepts takes place remains unclear.

The present study seeks a clearer answer by synthesizing different features of previous research methods. The scope is six syntactic categories—Determiner, Adjective, Noun, Noun Phrase, Preposition, and Prepositional Phrase—which are used in most descriptions of the adult language. The method involves (a) the development of category criteria against which children's spontaneous production can be evaluated and (b) the comparison of the children's performance to the criteria. Contributing to the method are Brown's distributional analysis of child corpora (e.g., Brown & Bellugi, 1964), Bloom's "rich interpretation" (1970), and Chomsky's work on the limits of taxonomic analysis (1975).

As mentioned above, Brown and his colleagues used a strict distributional approach, with the result that although protocategories could be identified, frequently the protocategories did not completely converge on traditional syntactic categories. For example, there were several different sub-types of Determiners, which patterned differently. That result is not unexpected, given Chomsky's comments on the limits of distributional analysis (1975, pp. 30–33). Chomsky claimed that it is in principle impossible to arrive at the formal categories of a language through purely taxonomic means and that linguists should not confine themselves to corpora examination (see also Chomsky, 1964).

In practice, linguists make use of information from numerous sources, including informant judgments, informant productions, and known features of individual languages. For example, to investigate whether a particular language distinguishes between Determiners and Adjectives, one could ask whether regularities that hold in other languages also hold in the language in question. In English, Determiners must precede Adjectives, and Adjectives can be repeated in a string whereas Determiners cannot. If similar differences exist in the new language there are grounds of positing a Determiner–Adjective distinction.

What complicates the enterprise in investigating child language is the unavailability of informant judgments. Here Bloom's (1970) method of rich interpretation can be used to advantage. Her method allows the observer to use the surrounding linguistic and social context to *tentatively* classify lexical items and phrases as examples of, say, Determiners or Adjectives. Linguistic tests, exploiting distributional regularities for those categories in the adult English grammar, can then be used to determine whether the tentative classification holds up, by seeing whether the items pattern in the children's corpora as they would be expected to on the basis of the tentative classification.

The present study, then, analyzes the corpora of six children to determine whether items that appear, on the basis of surrounding linguistic and social context, to be members of particular syntactic categories do in fact obey distributional regularities characteristic of such categories in English. If so, then the children's knowledge of those categories will be inferred. Notice that such an inference is an inference to the best explanation and not a logical inference. Only if there is no better explanation does the inference hold. Thus, it is important to raise the question of whether the distributional regularities could be adventitiously or artifactually mimicked by a child whose productions were guided purely by cognitive, pragmatic, or semantic notions. Although such a concern cannot be definitively eliminated, great care was taken to maximize the use of regularities with no known semantic correlate (see Methods).

It is also important to raise the question of how the joint contributions of semantic and syntactic knowledge to children's productions can best be determined. One suggestion of the present study is that it is first necessary to determine whether children exhibit regularities that have classically been associated with syntactic categories. Without such regularities there is no even putative syntactic performance to explain.

## Method

### *Subjects*

Data from six children were collected by four observers. One child (N) was recorded by his parents while in his crib. For another child (S) the observer, in addition to playing normally with the child, mimed various actions in an attempt to elicit questions from the child. The other four children were all in play/conversation situations.

A summary of the samples is presented in Table 1. The children ranged in age from 2 years to 2 years, 5 months, in MLU from 2.93 to 4.14, and in number of utterances used for analysis from 52 to 689. Some samples consist of data from one session, and some (D, S, and E) from two sessions.

### *Recording and Transcribing*

Each sample was tape recorded and transcribed by the observer who had played with the child; the child recorded by his parents was transcribed by the author. Standard English orthography was used, and unclear portions were placed in parentheses. Three utterance types were not used for analysis; direct imitations—utterances that immediately followed an adult's utterance and were either exact repetitions or repetitions with deletions; routines—utterances that were spoken frequently

Table 1
*Descriptive Summary of Speech Samples*

| Child | Age | Sex | MLU | Utterances | Recording situation |
|---|---|---|---|---|---|
| A | 2;0 | M | 2.93 | 420 | Child + mother + female observer |
| D | 2;3 | M | 3.21 | 532 | Child + father + male observer |
| I | 2;5 | M | 3.31 | 200 | Child + female observer |
| S | 2;5 | F | 3.47 | 689 | Child + female observer |
| E | 2;5 | F | 3.58 | 358 | Child + mother + male observer |
| N | 2;0 | M | 4.14 | 52 | Child mostly alone in crib |

with zero alteration from one repetition to the next; uninformative one-word utterances—utterances such as *yes, no, uh,* and so on.

"Utterance" was determined by intonation and syntax. A syntactically complete string (subject and predicate) was labeled an utterance. When there was a syntactic fragment (e.g., a noun phrase), falling or rising intonation was used to demarcate an utterance. (Speech hesitations were thus not counted as separate utterances.) When using others' transcriptions I interpreted periods and semi-colons as utterance boundaries, but not commas or dashes unless the material so demarcated comprised a syntactically complete string. The method used for division into utterances was materially relevant only when assessing whether Determiners were ever uttered alone as the sole content of an utterance. Otherwise, the method simply allowed uniform cataloguing of the data.

No attempt was made to standardize the recording situations because one aim of the study was to develop criteria that could be used on any sample collected by any investigator. The particular age and MLU range was limited at the upper end by the need to exclude children who had mastered English and at the lower end by the need to include sufficient combinatorial data so that distributional analysis could proceed.

## *Preliminary Category Assignment*

Preliminary assignment of words to syntactic categories was carried out by using linguistic and social context as guides. If a word would have been assigned to a given category in adult speech it was assigned that same category in the child's speech. The diagnostics described below were then used to determine whether the tentative preliminary categorizations met the criteria.

One result of the procedure is that one error a child could make would go undetected or be misdescribed. As shown below in the results for Adjectives, some children seemed occasionally to treat an Adjective as an Noun, by placing a Determiner before the Adjective but no Noun after the Adjective. It is possible that such cases actually reflect the child's thinking a particular word *was* a Noun, rather than an Adjective. The procedures used here would describe the child's error as lack of complete knowledge of how Adjectives behave in English. That is, the child's error of not knowing which category a word belonged to would be misdescribed as the child's having deficient understanding of how Adjectives pattern. (The two errors are in fact related in a complicated way.) The direction of error, then, will be in undercrediting the child's category knowledge.

## *Procedures Used to Test Category Assignment*

The categories examined are Determiner (Det), Adjective (Adj), Noun (N), Noun Phrase (NP), Preposition (Prep or P), and Prepositional Phrase (Prep Phrase or PP). The procedures include those used by taxonomic and generative grammarians in analyzing a corpus or in determining the status of a verbal expression. See discussions by Zwicky (1977; 1978) and by Wells (1947), Harris (1951), and Gleason (1955), among others. The procedures have also been used in distributional analyses of child language (see Brown & Bellugi, 1964; Brown et al., 1969; Brown & Fraser, 1964; Brown et al., 1964; Miller & Ervin, 1964). The tests have sometimes been adapted directly here, sometimes modified, and in a few cases the tests in the literature were merely suggestive. They are, by and large, theory-neutral. Any linguist, working within any linguistic theory, could make use of them to make decisions about constituents.

It is recognized that there is no test that will pick out all the members of a category, and no category member that will "pass" all the tests (Zwicky, 1978). The reason is that all tests have subproperties that will result in the exclusion of some true category members, and all category members have sub-properties that will cause them to be excluded by some test. For example, plural Nouns generally have an *s* ending, but in some cases the singular and plural form are the same (*sheep*), and in other cases the plural has a different ending altogether (*oxen*).

The following general procedures were used.

1. One procedure is to observe what expressions another expression can precede and follow; it is used for Det, Adj, NP, and PP. If a term occurs in all and only the places that members of a given category do, then the term is a member of that category.

2. A second procedure is use of the single-word or single-expression "substitutability" test. If a child substitutes a single word for a larger constituent (e.g., a NP), that means that the larger constituent exists as a unit. The "single word" criterion is familiar from taxonomic grammar. Gleason (1955) writes: "Any sequence of words which can be shown to be equivalent to a single word is a constituent, since all single words may be assumed to be constituents. If . . . the single word is also a single morpheme, the conclusion is quite safe" p. 134. For example, if a child substitutes *it* for *the green car,* that indicates that *the green car* is a unit or constituent, in this case a NP. Brown and Bellugi (1964) use the same criterion.

Bowerman (1973) has criticized a slightly similar use of the substitutability test, namely Brown's attempt to demonstrate the category Verb Phrase (VP). Brown argued as follows. The child in question sometimes places Verb (V) and sometimes V-N after initial N; therefore a VP node is required to dominate V and its optional accompanying N.

Bowerman (1973) points out that one could then argue that because the child in question also allows either N or N-V before final N, he or she also has a higher level category, call it X, which would dominate both initial N and its optional accompanying V. The test here avoids the problem Bowerman mentions. It is more stringent than Brown's because it requires a single word or expression to substitute for the full expression. With the VP example, the existence of sentences like *Jane liked apples and Bill did too,* where *did too* substitutes for *liked apples,* would demonstrate that *liked apples* is a constituent. If the child used the *do so* or *do too* construction that would be evidence for the category VP, and since there is no single word or expression that could substitute for N-V, that sequence would not be labeled a constituent.

3. A third test is the multiple-appearances test. A category should, all other things being equal, show up in all its existing syntactic variations in each location where it is allowed. Brown et al. (1969) also used this test. All NP varieties, for example, can occur pre-V, post-V, or post-Prep. There is no restriction in English on the syntactic form of the NP as a function of sentence position (except for the case marking of ProNs). Nothing limits full simple NPs to pre-V position or ProNs to post-V position. Thus, evidence for NPs would exist if there were syntactic variety in each position that NPs can occupy. Passage of the test does not demand equal numbers of each NP type in each position, since cognitive and thematic factors will play a large role in determining what syntactic type will be used where. For the same reason, passing the test is strong evidence in favor of a category, but failing it is not informative.

Table 2
*Criteria for Category Assignment*

Determiner
- Must appear, if present in NP, pre-Adj or pre-Noun or pre-both.
- Must not stand alone as sole content of an utterance or phrase.
- Must not be sequenced (exceptions: certain quantifiers).

Adjective
- Must appear, if present in NP, post-Det, and pre-Noun.
- Can form acceptable but not grammatical utterance as sole content of utterance or phrase.
- Can be sequenced: repetitions of same Adj, or different Adjs.
- Can appear as predicate Adj.

Noun
- Singular/plural distinction (via restriction of Det to subclass).
- Count/mass distinction.
- N/ProN distinction.
- Single Det used with all N subclasses.

Noun Phrase
- Substitution by *it* for full NP.
- Appearance of all NP subtypes in all legal positions.

Preposition
- Takes NP objects but does not inflect for Tense.
- Must appear, if present, pre-Det, pre-Adj, pre-N, or pre-NP.

Prepositional Phrase
- Occurs after NP, Adj, or Adverb within a Verb Phrase.
- Occurs in construction with Ns or Verbs.

For example, an extremely egocentric child could begin every sentence with *I* but have knowledge of the category NP and its ability to appear pre-Verbally.

4. A fourth test uses subcategories, which represent greater differentiation of a category, such as the count-mass distinction for Nouns. Subcategories can be inferred in a variety of ways. The main method used here is the restriction of different words to different subclasses, such as the restriction of *a* to singular Ns. The determination of subcategories requires that they be treated alike in respects definitive of the category and differently in other respects.

Although the criteria presented below can all be classified into one or another of the procedures just detailed, specific properties of the categories in English have been exploited. For example, Adjectives can be predicate Adjectives, whereas there is no corresponding property for Determiners. Thus, one test that will determine whether the children make the Adjective/Determiner distinction is if they use Adjectives but not Determiners after a Verb (with no following Noun). The first procedure mentioned above is sufficiently general that it encompasses such a test.

## *Specific Category Criteria*

Table 2 presents a summary of the criteria developed for six basic syntactic categories: Determiners, Adjectives, Nouns, Noun Phrases, Prepositions, and Prepositional Phrases. Using a range of categories assures automatic cross-checking. If each group of putative category members conforms to its own criteria, it will not conform to the criteria for other categories. The absence of Verbs from the present analysis reduces the cross-checking, but it may be noted here that there was separate evidence for Verbs (they at least occasionally received *ed* or *ing* endings and no other category did; Auxiliary and Verb occurred in sequence but Verb and Verb seldom did unless the second Verb was in infinitival form), and that the children showed no tendency to use Nouns as Verbs or the reverse. There were a few words, used idiosyncratically by two children, that seemed to have no fixed category: *boom, zoom, rrrm.* Those words were not given even a preliminary category assignment.

In assessing any one category, all the others are temporarily assumed to be nonproblematic. Because the categories are in fact interdependent, and since they can only be discussed one at a time, there is no alternative. Since each category is covered in turn, the practice does not seem viciously circular. In assessing Dets and Adjs I treat Ns as nonproblematic and occasionally refer to Ns in discussing how Dets and Adjs behave. Once having established that all the children have the category Det and that all but one have the category Adj, I treat those categories as demonstrably nonproblematic for the relevant children and freely refer to them in assessing the category N.

The criteria were limited by two factors. One factor was the need to have examples with some frequency of occurrence, thereby ruling out constructions like the passive and the dative, which would give evidence for NP but which occurred too infrequently to be of use. Thus, most of the criteria are quite basic. The other factor was the existence in the adult grammatical literature of similar criteria, because that lent face validity to the criteria used here.

*Determiners.* Determiners precede Adjs or Ns and cannot precede other Dets (with certain exceptions, usually involving quantifiers) or ProNouns, whether the ProNoun functions as a N or Adj. Determiners do not form a grammatical or acceptable utterance if they appear alone as the sole content of an utterance (**the*)[1], nor is there a predicate Determiner construction. (Again, there are exceptions, usually involving quantifiers.)

Note that the criteria here, and below, are independent, in that passage of one criterion does not entail passage of any other. A child could place Dets in the correct position relative to Adjs and Ns but simultaneously produce utterances composed solely of a Det.

*Adjectives.* Adjectives are similar to Dets as Noun specifiers. They appear post-Det and pre-N unless they are used as predicate Adjs, in which case they appear following Verbs (that class of Verbs is limited to those that allow *there*-insertion) without either a preceding Det or following N. Unlike Dets, Adjs can be sequenced: the same Adj can be used repeatedly in construction, and different Adjs can be strung together in construction. Adjs can often form an acceptable utterance when used alone (e.g., *red* as an answer to the question *What color cheese is that?*), even though such an utterance is not a grammatical sentence. There appear to be no uniform semantic differences between Dets and Adjs that would predict the differences in their distributional regularities.

*Nouns.* Nouns follow Dets and Adjs. Nouns can be count or mass, and count Ns can be singular or plural. Although most of children's early count nouns refer to individual concrete objects, many do not (e.g., from the present corpus, *floor, airport, name, walk, fire, lullaby, hole*). Thus, the children's count *N*s were not restricted to any obvious reference class. Ns are distinct from nominal ProNs in that the former can be preceded by Dets or Adjs, whereas the latter cannot (a syntactic limitation); Ns are like nominal ProNs in that both can occur directly pre-V, post-V, or post-Prep. As Table 3 shows, some Dets are restricted to N subcategories (*a* with singular Ns), whereas others can appear with all N subcategories (*the* with count and mass Ns).

*Noun Phrases.* Noun Phrases, whether composed of a N alone, or Det N, or Det Adj N, can be substituted for by *it*. A second feature of NPs is that all subtypes (N, Det N, Det Adj N, ProN, and proper name) can be placed pre-Verb, post-Verb, and post-Prep.

*Prepositions.* The prepositions considered here are true prepositions used with NPs. Thus excluded are controversial cases of verb-particle constructions (e.g., *call up* as in *call the girl up*) and prepositions used

[1] An asterisk is a linguistic convention to signal that an ungrammatical expression follows.

as adverbs (e.g., *up*, as in *look up* [*at the camera*]). Prepositions resemble Verbs in taking NP objects, but they differ from Verbs in not taking Tense or verbal complements. Prepositions resemble Determiners in occurring in construction with Ns, but differ from Dets in that Ps, but not Dets, can precede a Det.

*Prepositional Phrases.* The primary syntactic distinction between Noun Phrases and Prepositional Phrases is the presence of a Preposition. In addition, in English there are syntactic ordering restrictions: a Prep Phrase must follow a NP or Adj or Adverb within a Verb Phrase. For example, the string *put some water in there* cannot be grammatically reordered as *put in there some water*, even though the latter is semantically clear. The order of constituents is not guided by semantic role. All roles can be played by both NPs and PPs, so that a child could not distinguish between NPs and PPs on the basis of role. Furthermore, there are frequent cases in V NP NP constructions (especially the "reduced" dative) where the recipient occurs before the affected object. A child who marks the NP-PP distinction should also be able to order them correctly within a VP.

A second feature of PPs is that they can occur either in construction with Vs (e.g., *walk on me; he got worms on it*) or NPs (e.g., *top of the dog, a piece of sand*). The presence of both types of PP in the child's speech is thus a second criterion.

## Results and Discussion

### *Determiners*

#### *General Descriptive Data*

*Determiner types and tokens.* Two Det types, *the* (used 334 times) and *a* (used 280 times), account for 72% of all Det tokens (859). Adding the next two most frequently occurring Dets, *my* (76 times) and *this/that* (55 times), brings the total to 87%. Thus, a small set of Dets is used most of the time. Table A1 in the Appendix lists the types of Dets found in all the children's speech and the number of times each type appears in each child's corpus. Superficially similar types were collapsed, yielding a total of 19 types. There is no increase with advancing MLU in the number of Dets per utterance.

What might account for the overwhelming frequency of *the* and *a*? Table 3, which lists some permissible Det-N combinations in English, is suggestive. *The* is the Det that goes with everything; it is the least restrictive Det. Personal possessive ProNs are equally free syntactically but are subject to semantic and pragmatic constraints. *A*, on the other hand, is one of the most restrictive Dets; it can only be used with singular Ns. Because children use primarily singular Ns (see, for example, data presented by Miller & Ervin 1964; Brown & Fraser 1964; and Brown, Fraser & Bellugi 1964, as well as data presented here), it might be expected that they would easily acquire the distributional restriction of *a*.[2]

Table 3
*Some Permissible Det–N Combinations*

| |
|---|
| Only with singular count: *a, another* |
| Only with plural count: *all, these, those, a few,* numerals |
| Only with mass: *a (little) bit of* |
| With sing count or mass: *this, that* |
| With plural count or mass: ——, (*some*) *more, some, lots of* |
| With count or mass: *the,* possessive ProNs |

Table 4
*Performance on Determiner Criteria*

| Child | MLU | Tokens/ Utterance | *Post-Adj or *Post-N | *Alone | *Two Dets in Sequence |
|---|---|---|---|---|---|
| A | 2.93 | .36 | 0 | 0 | 0 |
| D | 3.21 | .50 | 0 | 0 | 1 |
| I | 3.31 | .37 | 0 | 0 | 0 |
| S | 3.47 | .30 | 0 | 0 | 0 |
| E | 3.58 | .36 | 0 | 0 | 0 |
| N | 4.14 | .42 | 0 | 0 | 0 |

*Note.* See Table 1 and text for explication of criteria. A * signals an ungrammatical condition; any examples represent errors. MLU = Mean Length of Utterance.

#### *Criteria Data*

The children's behavior on the three criteria (correct ordering of Det (Adj) N in an utterance; the absence of two Dets in a row; the absence of Dets in single-word utterances) was error-free and stable across the MLU range. The data are summarized in Table 4.

*Correct positioning of Dets.* No child ever placed a Det after a N rather than before, or after an Adj rather than before. If a Det was present, it was in the right place. (There were few order errors for any category, but the lowest-MLU child made several: *bicycle ride* to mean he was going to ride the bicycle, *going the baby the steps* to mean the baby was walking on the steps. There are similar errors in transcripts in the literature.) Utterances that are possible counter-examples to this claim are discussed in connection with the next criterion. They are utterances where it is more plausible to assume a missing copula than incorrect ordering.

*Absence of Dets in construction.* One child once placed two unallowed Dets in construction (D: *some the*). All the remaining possible examples of two Dets in a row are more plausibly interpreted as (a) cases where a copula is missing (as signalled by *this/that* being the first word, and by intonation), (b) cases of speech hesitations (as signalled by the child's intonation pattern), or (c) as among the few allowed cases of repetition.

The first set of cases includes 20 examples. (See Appendix, Table A2 for a complete list.) The first word is *this* (*one*) or *that* (*one*) and the second is a Det, for example, *this the boy.* These are the only cases where the transcriber did not insert punctuation in the form of a comma or dash between the two putative Dets. Such utterances were often preceded or followed by similar utterances containing a copula. In E's case there was an utterance that contained a self-correction within it: *This a elepha—this is a elephant. This/that* is thus functioning as a NP rather than a Det. *This/that* and the following Det occur in sequence, but they do not appear in construction as a Det phrase (in contrast with *some the,* mentioned earlier). Nor can the Det be interpreted as in the wrong order and serving as the Det for *this/that.* If it were, one could not explain the fact that

[2] Although *the* goes with everything, three of the children essentially restricted its use to singular Nouns (see Appendix, Table A6). Thus, it is possible that they did not register the characteristics of *the.*

there is always a N following the Det. One would expect occasional examples of *this the* with falling intonation, or *it a,* or *this one a,* none of which ever occur. The closest case is *this two,* but since numbers are exceptions and can stand alone, that case also does not qualify.

The second case includes 21 examples. (See Appendix, Table A3 for a complete list.) The examples are cases of hesitations or ostensions, for example, *a, a bell, this, this. This/that* is again heavily represented, and appears again primarily as a NP, not as a Det. Thus, there are no clear cases of a Det in the wrong order and only one case of two Dets improperly in construction.

*Absence of Dets in isolation.* There were 40 possible examples of Dets without a following N. (See Appendix, Table A4 for a complete list.) As in the other cases, *this/that* plays a prominent role and appears to function as a NP and not as a Det. A few numbers and a few quantifiers also appear alone, as is allowed in English. The remaining cases are speech hesitations (repetitions or false starts). It should, however, be noted that the lowest-MLU child's examples from Tables A2, A3, and A4 seem qualitatively different from the other children's.

### *Summary*

The children appear equal in their performance on the Determiner criteria. All children passed all criteria.

## *Adjectives*

### *General Descriptive Data*

*Adjective types and tokens.* The three most frequent Adjs (*big,* used 38 times; *little,* used 17 times, and *blue,* used 17 times) comprise 46% of all Adj tokens, in contrast with Dets, where the three most frequent tokens comprise 80% of all Det tokens. Overall, the children used Adjs 158 times, again in contrast with Dets, which they used 859 times. They used 38 different Adjs. The lower frequency of Adj use is reflected in the number of Adjs per utterance, an average of .08 per utterance, compared to an average of .42 Dets per utterance. Even those children who knew many Adjs (such as D, 21, and E, 15) used them much less frequently than they did Dets. The Appendix, Table A5 lists the types of Adjs found in all the children's speech and the number of times each type appears in each corpus.

The much lower frequency with which Adjs are spoken seems better explained by the different syntactic requirements of the language than by pragmatic considerations. Dets are frequently syntactically required, while Adjs never are; the two seem equally seldom required for adequate communication to take place.

As with Dets, there was no increase in Adj use as a function of longer MLU, but the number of Adjs per utterance is highly correlated with the number of Dets per utterance, $r = .91$, $p < .02$ two-tail. When MLU is partialed out, the correlation remains high at .85, $p < .05$ two-tail. Children who use Adjs frequently also use Dets frequently. There is nothing about the category structure of Adjs or Dets that would demand such correlations, but the similar role both categories play as Noun specifiers may be relevant. (As will be seen in the Preposition section, neither Det nor Adj use correlates with Preposition use.)

Table 5
*Adjectives in Sequence and Predicate Adjectives*

| Child | Adjective sequences | Predicate adjectives |
|---|---|---|
| D | Big long tall; big big | Happy—4; unhappy—1; better—1; Hungry—1; green—1; hot—1; yummy—1 (3 examples in utterances with missing copula) |
| I | | Cool—1; tight—1; silly—1; cold—1 |
| S | Little big | Right—1; bigger—2; soft—1; big—1; little—4; ticklish—3 (4 examples in utterances with missing copula) |
| E | Little tiny | White—1; sick—1; dirty—2; tall—1; brown—1; big—3 |
| N | Green green green | |

### *Criteria Data*

Two major syntactic distinctions between Dets and Adjs are (a) that two or more Adjs can appear in construction together, whereas Dets cannot (with certain exceptions noted above) and (b) that there can be predicate Adjs but not predicate Dets, except for quantifiers. Both distinctions are respected in the speech of the children here. None put Dets in construction and none used a predicate Det; four of the six children put Adjs in construction at least once and four of the six used predicate Adjs at least once.

The relevant data are presented in Table 5, which lists the Adj strings and the predicate Adjs used by each child. Only the lowest MLU child, A, produced neither an Adj string nor a Pred Adj; all the others produced at least one or the other.

*Adjectives in construction.* Det Adj N sequences were fairly common (see Table 9 for average percentages); Table 5, however, lists only cases where two or more Adjs appeared in construction. The existence of such examples is good evidence that the children's failure to place Dets in construction was not due to memory constraints or some other form of cognitive load. Furthermore, it indicates that children have classified Dets and Adjs separately and in accord with English's grammatical regularities.

Although there were few examples of sequenced Adjs in the children's speech, they are also infrequent in adult speech. Yule (1981) found that when adults were asked to describe a drawing consisting of some combination of lines, geometrical figures, letters, numbers, and colors so that another person could reproduce the drawing, the speakers used two sequential Adjs only 5% of the time, and never used three sequential Adjs. Thus, even in a situation designed to elicit Adjs, adults rarely placed them in construction.

*Predicate Adjectives.* The children vary in the extent to which they use predicate Adjs, and the variation is independent of MLU. (The absence of any examples from A probably reflects

Table 6
*Performance on Adjective Criteria*

| Child | MLU | Tokens/ Utterance | *Pre-Det or *Post-N | Two Adjs in Sequence | *Alone | Types/Tokens Pred Adj | *Post-Det + not Pre-N |
|---|---|---|---|---|---|---|---|
| A | 2.93 | .02 | 0 | 0 | 0 | 0 | 1 |
| D | 3.21 | .16 | 0 | 2 | 5 | 7/10 | 1 |
| I | 3.31 | .04 | 0 | 0 | 1 | 4/4 | 0 |
| S | 3.47 | .04 | 0 | 1 | 3 | 5/8 | 0 |
| E | 3.58 | .07 | 0 | 1 | 4 | 6/9 | 1 |
| N | 4.14 | .17 | 0 | 1 | 0 | 0 | 0 |

*Note.* See Table 1 and text for explication of criteria. A * signals an ungrammatical condition; any examples represent errors. MLU = Mean Length of Utterance.

his very limited grasp of Adjs, whereas the absence of any examples from N probably reflects sample size.) There were seven cases where a predicate Adj was attributed to the child despite the absence of a verb. D had three examples where a copula appeared to be missing, and S four (e.g., *it yummy*). Three factors were responsible for the decision to attribute a predicate Adj in those examples, rather than to postulate an incorrect order of N Adj. First, each child produced other sentences with copulas. Second, each produced some predicate Adjs with the verb present, and thus the construction was within the child's repertoire. Third, neither child produced any other possible cases of inverted order between N (or ProN) and Adj.

*Adjective errors.* Outside of predicate Adj constructions no child ever placed a Adj after a N or before a Det. As with Dets, then, there were no order errors. There was, however, a different sort of error which, though infrequent, should not have occurred at all if the children had mastered the Adj category. Three of the six children, including the lowest MLU child, appeared to treat an Adj like a N by preceding it with a Det but failing to follow it with a N. The examples were A's *the happy, happy,* D's *a blue,* and E's *a brown.* For A that error represents 1/7 of his Adj use, for D 1/84, and for E 1/26.

One source for the error might be the similarity between Adjs and Ns in several environments. They can both appear after copulas (and the range of verbs allowing *there* insertion), and 4 of the 6 children place them there. Like Ns, Adjs can also serve as sentence subjects, as in *the bad sleep well.* It is unknown whether children hear such examples, but they probably do hear similar ones where Adjs appear alone without a preceding Det, especially as answers to questions.

If the children are being misled by the cases where Adjs do act like Ns, there is another sort of error they should make, namely that of uttering Adjs alone as single-word utterances. Table 6, a summary table, shows that four of the children did utter Adjs alone, a dubious fifth case being the second *happy* of A's *the happy, happy.* (Remember that the children did not utter Dets alone.) Sometimes the utterances are answers to questions and therefore conform to adult usage, but sometimes they are spontaneous comments and are neither grammatical nor acceptable.

### *Summary*

All six children correctly positioned Adjs within NPs after Dets and before Ns, four used Adjs in predicate Adj position, and four used two or more Adjs in construction. They further distinguished Adjs from Dets by using Adjs less frequently and by using Adjs as the sole content of an utterance. A rare error was the use of an Adj preceded by a Det but not followed by a N. The lowest MLU child's performance was borderline.

## *Nouns*

### *Criteria Data*

*Singular Nouns.* Singular Ns were preliminarily identified as count Ns with no *s* or other plural marking. Most Ns in the sample fell in this category. For A, the lowest MLU child, there were 273 occurrences of Ns, of which 67 (.24) were apparent plurals and 12 (.04) apparent mass Ns; his data are representative. N, the highest MLU child, had atypically many plurals: of a total of 48 Ns, 25 (.52) were plurals and 10 (.21) were mass Ns.

All six children largely reserved *a* for singular Ns. Very occasionally (5 times out of 270 uses) *a* is used with a plural N. Two children, E and N, restricted *another* to singular Ns. Three children, I, S, and E, essentially restricted *the* to singular Ns. (Some children also used *a* or other Dets with proper names, or with *boom* and *zoom;* those uses were not frequent enough to merit separate presentation. One child, A, used Dets when talking about his Sesame Street dolls, e.g., *a Ernie.*) For all children, then, *a* had a privileged occurrence with singular Ns, and for four of the six children at least one other Det was reserved for singular Ns. Such distributional limitations are sufficient to postulate singular N for all six children. (See Appendix, Table A6, for a presentation of the pattern of *a, the,* and personal ProNs with different Noun types.)

*Plural Ns.* The next issue is whether the children also had the subcategory of plural N or merely had the complement of singular Ns, namely, everything else. All the children appeared to pluralize. They all used Ns ending in *s,* and for all the children there was at least one singular and one plural form of the same N. For A there were 7, for D 4, for I 2, for S 3, for E 3, and for N 1. Thus, the children did not behave as if they thought each N came in only one form, either with or without an *s.*[3] The

[3] It is possible, but unlikely, that the plural forms the children used were allomorphs of the singular forms. Only one child, S, failed to provide any distinguishing contexts to separate singular from plural use. Two children reserved particular Dets for plural Ns; one child provided

Table 7
*Performance on Noun Criteria*

| Child | MLU | Sing/Plur Distinction | Count/ Mass Distinction | N/Pro-N Distinction | Det Used with All subclasses |
|---|---|---|---|---|---|
| A | 2.93 | + | 0 | + | + |
| D | 3.21 | + | + | + | + |
| I | 3.31 | + | 0 | + | + |
| S | 3.47 | + | 0 | + | + |
| E | 3.58 | + | 0 | + | 0 |
| N | 4.14 | + | + | + | + |

*Note.* See Table 1 and text for explication of criteria. + = evidence for criterion. 0 = no evidence for criterion.

lack of variation in frequency of plural use as a function of MLU and in particular the presence of 7 Ns in both singular and plural form for the lowest MLU child suggest that the plural N is an early subcategory, even if a sparsely populated one.

For two children, E and N, there is additional, distributional evidence of plural Ns. E restricted *all, any(more),* and *(any)-other* to plural Ns, and N restricted *all* to plural Ns, that is, Ns with an *s* at the end. For all children, then, there seems to be a singular/plural distinction, with especially strong evidence for two of the six.

*Mass Ns.* For two children (D and N) there was evidence of the count/mass distinction. No child, however, restricted a particular Det to mass Ns in sufficient numbers for that to serve as a criterion. Furthermore, most of the children had too few examples of mass Ns to draw any conclusion, even though, when mass Ns were used they were used correctly.

D used several mass Ns; he never pluralized them by adding *s,* although he did pluralize some count Ns; he never preceded them by *a,* a Det he used 94 times with singular Ns. Since D treated the Ns in question differently from singular or plural Ns, a third subcategory of mass Ns was inferred. N used *(some)more* with *juice,* and the semantically similar but syntactically distinct *another* with *car,* a word which he also preceded by *a.* It is common for children to use *more* with inappropriate Ns or Vs (see Braine's 1976 data), so that the contrast made by N seems revealing, even though the numbers involved are small.

*Other subclasses.* An omission in the children's data are the two "mixed" subclasses that are possible (see Table 3). *This/that* can precede both singular count Ns and mass Ns, and *some* can precede both plural count Ns and mass Ns. Although the children did use the relevant Dets, they never used them as broadly as is allowed. Instead they restricted them to narrower homogeneous subcategories.

*The category N.* There are two different measures for inferring the larger category N. One is the presence of a Det that is used with all the child's subcategories. Another is limitation of Dets to Ns, rather than both Ns and ProNs, with simultaneous demonstration that Ns and ProNs otherwise occur in similar contexts.

For five of the six children there was a Det (either *the* or a personal ProN) that was used with all that child's subcategories. (See Appendix, Table A6.) Two children, N and D, used *the* with all three subcategories. Another child, A, used *the* with both of his two established subcategories, singular and plural Ns; I and S used possessive ProNs with singular and plural Ns. Only one child, E, had no Det that was used with all subcategories.

All children distinguished between Ns and ProNs. No child ever used a Det with a ProN, and all used Dets with Ns. The children did use Ns and ProNs in the same syntactic contexts, appropriate to their status as NPs, as summarized in Table 9 (and shown separately by child in Appendix, Table A7). Ns and ProNs both occur pre-Verb, post-Verb and post-Preposition.

### *Summary*

All the children show evidence of the category N, and the singular/plural distinction; two of the children show evidence of the count/mass distinction. Table 7 summarizes each child's performance on the criteria.

## *Noun Phrases*

### *Criteria Data*

It *substitution.* Table 8 shows the examples where the children substituted the morpheme *it* for a full Noun Phrase. Every child made at least one such substitution. To count as an example the utterances had to be sequential ones made by the child. Intervening utterances by adults were allowed only if they were noncommittal. There are few examples per child. More often the children repeated a NP, or made minor variations in the NP. *It* was frequently used in other utterance types, either as a dummy form (*it's cold*) or as an ostensive form (*it yummy*). (*That,* however, was used much more commonly for ostension than *it.*)

Even rarer than substitutions of *it* for a singular or mass NP were substitutions of forms of *they* for plural NPs. Two children produced examples of that type. One child, I, produced two examples, that shown in Table 8 and the following confused sequence: *I see a bears, I say hi to them.* Another child, S, produced one example: *That's pants, They're soft.*

The most convincing cases of substitution are those where the NP does not correspond to a physical object in the child's presence, and those where the substitution occurs after several variations of NPs. An example of the first case is S's lullaby sequence (Table 8); an example of the second case is N's green car sequence.

The children never substituted *it* for a plural NP they had uttered. One child, E, did substitute *it* for a plural NP that her mother had uttered. Her mother asked, *What shall we do with all those toys?* E responded, *Um, put it back.*

*Multiple appearance of NP types.* NP types appeared in all the major places where they are syntactically allowed to occur. Three positions, pre-Verb, post-Verb, and post-Preposition,

the following contrast: *a bell, four bells.* Two more children pluralized when using a numerical expression—*two feets, two books*—but singular forms of those words were not also used. Another reason against thinking the forms were allomorphs is that one might then expect the *s* form to be more frequent than it was.

Table 8
*Examples of* It *Substitution*

| Child | Utterance |
|---|---|
| A | A wagon go boom<br>It zoom zoom zoom |
| | Ride it, bicycle, ride |
| | The bicycle, ride<br>A bicycle<br>Ride it |
| | I ride the bike<br>Ride, ride it<br>Ride bicycle |
| D | He misses his medicine<br>He chewed it up<br>It in his stomach |
| | I'm gonna get the birthday cake<br>Gonna sit down and let me eat it |
| I | Is it ambulance on it?<br>Is a ambulance on a fire engine book? |
| | What the kinda truck?<br>Is it ambulance?<br>Is it ambulance?<br>It is |
| | People<br>To airport<br>They go to it |
| | I have got my telephone<br>Look at it hang there |
| S | You sing a lullaby<br>You have sing it |
| | That's a sweater<br>I need that sweater<br>I needa put it on (me) |
| E | Open it<br>Open you hand<br>Open it up |
| N | See, there's a brown car<br>That's the tires and wheels are on it |
| | That's a green, greeen, greeeen car<br>Does the green car have (some) wheels?<br>(Has the green tires) and wheels<br>Goes rrm rrm<br>It goes rrm rrm + +<br>See it has a steering wheel |

were examined. (By Verb and Preposition are meant those words that would be classified as such in adult speech; whether they function as such in the children's speech is irrelevant for distributional purposes.) Table 9 presents composite data from all six children, with each child weighted equally, showing the average percentage of time five different NP types (Det Adj N; Det N; N; ProN; proper name) occurred in the three utterance positions. Separately calculated is the percentage of time each of the five NP types appeared alone, with no other material in the utterance. A total of 1765 NPs occurred in construction, while 377 occurred alone. Some positions are much more highly represented than others, but all cells receive some representation.

The Appendix, Table A7 presents the same information as Table 9, but separately for each child. Each child has at least one missing cell; in most cases the missing cells occur where there is a small column total or small row total or both. The children's distributions are very similar. If each child's percentages per cell are rank-ordered and the resulting orderings used to compute a Kendall coefficient of concordance, the concordance is highly significant, $K = .74$, $p < .001$. A slightly lower coefficient obtains for the distribution of NPs used alone (one child's data, N's, are excluded because he used only three NPs alone), $K = .67$, $p < .01$. The consistency among the children indicates little variation with MLU in the pattern of NP positioning.

## *Prepositions*

### *General Descriptive Data*

*Preposition types and tokens.* The three most frequent Ps (*in*, used 33 times; *on*, used 16 times, and *of*, used 11 times) comprise 61% of all P tokens. Overall the children used Ps 272 times, an average of .12 per utterance. They used 19 different Prepositions. As with Dets and Adjs, there was no increase in P use as a function of longer MLU. Furthermore, while children's frequency of use of Dets and Adjs was correlated, there was no correlation between their use of either Dets, or Adjs, and Ps. Thus, it is not the case that a child who uses one category frequently tends to use all categories frequently. The correlations are selective. The Appendix, Table A8, lists the types of Ps found in all the children's speech, and the number of times each type appears in each corpus.

### *Criteria Data*

The children distinguished between Ps and Verbs in never inflecting Ps for Tense and never using a verbal complement after

Table 9
*Composite Percentage of NP Types in Different Utterance Positions and Alone*

| | Position | | | | |
|---|---|---|---|---|---|
| NP Type | Pre-Verb | Post-Verb | Post-Prep | Σ[a] | Alone[b] |
| Det Adj N | .4 | 2.5 | .4 | 3.2 | 5.0 |
| Det N | 5.4 | 18.9 | 7.8 | 32.1 | 39.5 |
| N | 2.1 | 6.8 | 1.8 | 10.6 | 35.4 |
| ProNoun[c] | 31.4 | 11.8 | 2.6 | 45.7 | 9.3 |
| Proper name | 3.9 | 3.7 | .8 | 8.4 | 10.8 |
| Total | 43.0 | 43.6 | 13.4 | | |

*Note.* NP = Noun phrase.
[a] Six children contributed a total of 1765 NPs; each child's percentages are weighted equally.
[b] Five children contributed a total of 377 NPs; each child's percentages are weighted equally. N's data were eliminated because he produced only 3 NPs alone.
[c] ProNouns included *this/that* and variants as well as personal ProNouns.

Table 10
*Distribution of Prepositional Phrase Types*

| Child | V{NP/AP}P | | V PP | | NP PP | | Alone | | Other | | Σ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | P | F | P | F | P | F | P | F | P | |
| A *n*(utt) = 420 | 0 | | 12 | .28 | 1 | .02 | 21 | .49 | 9 | .21 | 43 |
| D *n*(utt) = 532 | 19 | .23 | 30 | .37 | 7 | .09 | 20 | .24 | 5 | .06 | 81 |
| E *n*(utt) = 200 | 13 | .29 | 19 | .42 | 3 | .07 | 7 | .16 | 3 | .07 | 45 |
| S *n*(utt) = 689 | 13 | .23 | 32 | .57 | 3 | .05 | 6 | .04 | 2 | .04 | 56 |
| E *n*(utt) = 358 | 12 | .32 | 11 | .30 | 9 | .24 | 5 | .14 | 0 | | 37 |
| N *n*(utt) = 52 | 1 | .33 | 2 | .67 | 0 | | 0 | | 0 | | 3 |

*Note.* V = Verb; PP = Prepositional Phrase; NP = Noun Phrase; AP = Adjective Phrase; F = frequency; P = proportion.

a P. They distinguished between Ps and Dets by sequencing Ps and Dets in constructions, whereas they never sequenced Dets in constructions. An infrequent error was failure to use a P when required. The two lowest-MLU children used *go* a total of three times with an object NP (e.g., *go that*) instead of a PP, and *come out* once without a P. Otherwise, however, there were no detectable errors of failure to use a P, thus contrasting again with Dets, where there were many such examples.

## *Prepositional Phrases*

### *Criteria Data*

Table 10 shows the frequency and proportion of different PP types for each child. In all, the children produced 58 examples of a Verb followed by a NP or Adj Phrase followed by a PP, and 0 examples of a Verb followed by a PP followed by a NP or Adj Phrase. Thus, the children always correctly ordered a PP relative to a NP. The lowest-MLU child, however, produced no examples of either sequence. (He also produced the highest proportion of PPs as the sole content of an utterance and, as Table 4 shows, produced no examples of predicate Adjs, and no examples of two Adjs in sequence.) The Verbs the children used in V{NP/AP}PP sequences included 12 Verbs that required an object NP or Adj for full grammaticality (e.g., *bring, give, put, throw*) and 6 Verbs where an object was optional (e.g., *be, play, read*). (Three children each once used *put* without an object NP, e.g., *put in there.*) All children produced examples of V followed by PP.

The children produced many more VP PPs than NP PPs, but all produced at least one (except for the highest-MLU child, who only produced a total of three PPs).

### Underusage of Determiners

A common error of child speech is the failure to use a Determiner where one is required. Five of the six children committed the error, two often: 37% of A's Noun tokens incorrectly lacked a preceding Det, as did 27% of I's. Thus, although the two children produced Dets frequently (an average of .36 per utterance), and more frequently than they produced Adjs (.08 per utterance) or Ps (.17 per utterance), they also frequently failed to use them when context required them.

The children's high level of performance on the category criteria used here suggests that the absence of Dets cannot be explained by deficient category knowledge. It is not a criterion for Dets that they occur if a N occurs, but that they cannot occur unless a N occurs. The children met that criterion. Defective understanding of the category N is ruled out because it is not a criterion for Ns that they must be preceded by a Det. Some Ns must be in some contexts. Defective understanding of the category NP is ruled out because Dets and Adjs are optionally represented in NPs; it is exactly that optionality that is a potential source for the error.

The structure of the categories and the children's knowledge of that structure suggests an alternative hypothesis—the optionality hypothesis—to account for the frequent absence of Determiners. The optionality of Dets and Adjs in NPs creates problems for the child. Plural and mass Ns frequently appear without Dets, but require them in some contexts. Singular Ns seldom appear without Dets, but can in some contexts, such as *go to bed, have breakfast, on TV* (see Quirk & Greenbaum 1973, pp. 73–75 for other examples). The child's general knowledge about categories is correct, but the child's particular knowledge about lexical specification is insufficient. The child does not know the particular syntactic contexts in which particular Ns can be inserted.

The only other possibility to contrast with the optionality hypothesis is that the children are misclassifying certain words as ProNouns rather than Ns, and, since no child ever preceded a ProN by a Det or Adj, the children produce Ns without Dets. If the ProN hypothesis is correct, then when a particular N occurs without a Det it should always occur without a Det. If the optionality hypothesis is correct, then there should be a mixture, for any given N, of cases where Dets are and are not used. For Ns used only once, the ProN hypothesis makes no prediction,

but the optionality hypothesis predicts that the percentage of Ns without Dets will reflect the overall percentage of time Ns were improperly used without Dets.

The ProNoun and optionality hypothesis were tested using pooled data from A and I. The average percentage of Ns appearing incorrectly without a Det was 33. For the 40 Ns that occurred only once, 33% incorrectly appeared without a Det, the same as the average percentage. For the 22 Ns occurring twice, 32% were ungrammatically never preceded by a Det, 32% were always preceded by a Det, and the remainder were a mixture or appeared properly without a Det. For the 40 Ns occurring three or more times only 8% (3) were ungrammatically never preceded by a Det and 20% (8) were always preceded by a Det, while the remainder were a mixture or appeared properly without a Det. The optionality hypothesis was thus confirmed.

Since the children gave independent evidence of the NP category (as the NP section demonstrated), it is in one sense not surprising that the optionality hypothesis was confirmed. In another sense, however, it is surprising, because it is counter to one contemporary view in language acquisition that specific information is learned before general information; underusage of Dets represents the opposite phenomenon.

## General Discussion

The results support the inference that by age 2 years, 6 months and between MLUs 3 and 4, children have knowledge of many of the lexical and phrasal grammatical categories used in the adult grammar, thereby putting the upper point by which acquisition takes place earlier than had heretofore been estimated. Correlatively, children are sensitive to many of the distributional regularities that hold for the traditional categories of standard adult English.

Several issues are worth further consideration. How secure is the syntactic inference; is a semantic inference as well supported? How might the present results bear on the relation between syntactic categories and semantic roles or semantic categories? What is the time course and mechanism of category acquisition? How might the methods and results be used to shed light on related problems in language acquisition?

To recall the reasoning behind the study, a prerequisite for demonstrating children's knowledge of the categories used in the adult grammar is that the children's behavior match the predicted patterns. If it does, then there is a phenomenon that prima facie seems best explained syntactically. But at least two factors suggest caution. First, the most convincing demonstration of syntactic knowledge occurs when there is syntactic uniformity amid semantic variety. For example, if all the Nouns in a corpus refer to concrete objects, there is no way of knowing whether the child is operating with the syntactic category Noun but a limited variety of examples, or is operating with the cognitive notion concrete object, or indeed has no operating notion at all, but is interested only in concrete objects. Although the children's Nouns in the present study included nonconcrete examples, they were the minority. Second, even if the categories had a syntactic status by MLU 3, it is still possible that the initial acquisition may have been semantically based.

There are several reasons, however, to prefer a syntactically oriented account of the present data. First, for most of the criteria there was no obvious semantic correlate, whether of semantic roles or cognitive–semantic distinctions. Second, every category was tested with at least two criteria; even when children did not meet all the criteria for a category, nothing in their pattern of responses indicated a semantic basis.

Third, other investigators have consistently failed to find a semantic basis for syntactic or phonological distinctions, even where such a basis would be most expected. Chien and Lust (1985) have shown that 2-year-olds acquiring Mandarin Chinese differentiate between grammatical subject and topic, even though topic is a prominent feature of Chinese. Gathercole (1985) showed that children treat the count–mass distinction as a surface distributional distinction rather than a semantic one, and Gordon (1985) ruled out the notion of continuous substance as a conceptual basis for the count–mass distinction. Levy (1983) ruled out recognition of the sex of an object as a basis for learning linguistic gender in several languages. I am unaware of any documented cases where a semantic distinction has been shown to be the *basis* of a syntactic distinction. (There are cases where the application of a syntactic distinction seems restricted to a particular semantic or cognitive subclass, e.g., Bloom, Lifter, & Hafitz, 1980, but the reasons for such restrictions are unclear in the light of other examples showing that children generalize across a range of semantic types, e.g., de Villiers, 1984, and in light of the difficulty of providing a characterization of the restriction.)

Since, as noted in the introduction, semantic roles are defined over syntactic categories, a semantic basis for the children's category knowledge should not be expected. Instead, category knowledge can be seen as a prerequisite for representing semantic roles in speech. That a child can identify, before age 2, the performer of an action, seems inescapable, but that is a separate question from the child's ability to linguistically represent agency. Howe (1981) raised exactly this question and demonstrated that children with MLU 1.56 and age 1 year, 10 months could not represent the benefactive or locative, whereas children with MLU 2.69 and age 2 years, 4 months could. The successful children were thus at approximately the same age and MLU as the children in the present study. Similarly, Angiolillo and Goldin-Meadow (1982) demonstrated that children with MLU between 3.00 and 4.40 (but not one child with MLU 2.20) differentially used word order to mark agent and patient. An important implication of the present study is that children might use their syntactic knowledge of categories and distributional regularities to learn how to express their concepts in language. Syntax might help in the acquisition of semantics.

From the present study the acquisition of syntactic categories appears to consist of the gradual acquisition of the separate characteristics of a category. (Sudhalter & Braine, 1985, make the same suggestion to account for acquisition of the passive, and Brown, 1973, makes a similar suggestion in discussing the child's gradual mastery of morpheme usage.) Some categories are acquired before others, and within a category some criteria are met before others. The performance of the lowest-MLU child (A at 2.90), who performed marginally on Adjectives and Prepositional Phrases, suggests that the transition to MLU 3 may be a particularly important one. Category acquisition is probably stretched out over a period of years, beginning earlier

and finishing later than the age and MLU range investigated here.

In that regard, it is instructive to compare the present data with Brown and Bellugi's (1964) findings from two children below the MLU range studied here. They found, for example, early but incorrect use of Dets: *a* incorrectly occurred with both singular and plural forms; *a* was incorrectly combined with possessive ProNs; numerals were incorrectly used with singular Ns. They also found that one child used *it* followed immediately by the NP it was "replacing." Brown et al. (1969) report that the same children used different NPs in different syntactic positions. Thus, it appears that from the onset of combinatorial speech children are alert to function words as well as content words, attempt to include both in their speech, and try to work out the complicated distributional patterns they are part of.

The child acquiring language is acquiring a system of different components and subcomponents, all of which interconnect, but each of which has its own properties. That componential property of language has an effect on learning. Learning is componential as well. That means both that, as mentioned above, children will learn about the different characteristics of a category separately and also that across-the-board explanations, unless they reflect very abstract principles, are not likely candidates for explaining either how children learn language or for unraveling features of children's utterances.

Consider the issue of why early child utterances are short, an issue that is still unresolved. Memory limitations, or some other performance limitation, may be partially responsible, but not fully. That is because the upper bound on children's length of utterances is fairly high, even when their average is only 3-4 morphemes (Braine, 1974). Another reason for doubting memory constraints alone is the selectivity in what children leave out. For example, children frequently leave out Determiners when Determiners are required, but they almost never leave out a Preposition when a Preposition is required. (At the same time, children produce many more Determiners than Prepositions, because they produce more Ns that require Determiners than NPs that require Prepositions.)

Following up on related suggestions by Brown (1973), I suggest that children's utterances are short because their utterances reflect their rules. In some cases, as with Determiners, their rules allow optional use of a category. In other cases their rules are limited or nonexistent. Child A in the present study did not have a rule that would produce V NP PP, nor a rule to produce Adj Adj, nor a rule to produce V Adj. Because his grammar did not contain those rules, the utterances generated by his grammar were shorter than the utterances of his peers whose grammars did contain those rules. A feature like short length is thus not likely to be a unitary phenomenon, even though it looks like one on the surface. Rather, the child lacks different constituents for different reasons. This is one example of how a category analysis can shed light on other early phenomena of child speech.

The central role of distributional regularities in the present study, taken together with previous work by Brown and his colleagues (Brown & Bellugi, 1964; Brown & Fraser, 1964; Brown et al. 1969; Miller & Ervin, 1964) and Bloom and her colleagues (Bloom et al. 1975), and proposals by Maratsos (Maratsos, 1982; Maratsos & Chalkley, 1980), reinforces the idea that one component of the acquisition mechanism is the child's early awareness of distributional regularities as diagnostics for determining category membership. Just as we the investigators look for regularities such as word order, agreement, and concord, so does the child. That, in turn, fits in nicely with the idea of the child as hypothesis-tester.

The problem remains of how the child can mark the presence of such regularities without a prior set of categories. The ability to notice that Verbs take different kinds of endings requires a prior preliminary identification of Verbs. The source of the initial identification is not elucidated by the current results. One suggestion, made in different forms by Grimshaw (1981), Pinker (1984), and Roeper (1981) is that the child could try to exploit certain rough correlations between a word's syntactic properties and its referent. Imagine that the child knows antecedently that there will be Nouns, and needs to figure out just which of the words she hears are Nouns. One way she could start is by assuming that when an adult points to an object and says a word or phrase, that the adult is naming and referring to the object, and that object names are Nouns. Then, having identified at least a few Nouns, the child could use her sensitivity to distributional regularities to observe what kinds of words or word endings co-occur with Nouns in her language.

Theoretically, the child could correlate an object with the category Noun even before she begins to speak, or before she begins to produce words in combination; if that were so, data between MLU 3-4 would be irrelevant. However, if the child did not identify categories until after speech begins, there are certain confusions one might expect that do not occur. For example, one might expect the child to confuse Nouns, ProNouns, and Noun Phrases, because parents use all three in referring to people and objects. The referential similarities between Nouns, ProNouns, and Noun Phrases should make them difficult to distinguish syntactically. Yet, as the current data show, children easily distinguish them. Similarly, adults use Determiners and Adjectives in very similar referential situations, but children distinguish them. Maratsos (1982) has noted that children do not confuse Verbs and Adjectives, both of which can be used to refer to activities that objects or people are engaged in, and Gordon (1985) notes that some formal distinctions children make, such as gender, have no referential correlates. Thus, the referential proposal seems problematic.

The hypothesis-testing model suggests the possibility that the child initially projects crude approximations of different categories, based on their abstract universal specifications, and successively refines them on the basis of distributional information. The child uses linguistic evidence, in the form of devices like inflection and word order, to reject earlier, cruder hypotheses, in favor of later, better articulated ones. That possibility is as yet, however, too sketchy to serve as a model. The present data serve more to challenge existing proposals of category acquisition than to provide new ones.

The methods used in the present study may be usefully extended in two directions. First, diagnostic tests could also be developed to clarify children's semantic and pragmatic knowledge. That would involve determining what regularities should be present in child speech if the child were operating with one or another semantic or pragmatic notion. Second, the demonstrated feasibility of using distributional methods to analyze the

speech of 2-year-olds suggests applications to other groups of speakers. The methods might be helpful in establishing the locus of difficulty in nonnormal speech.

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*(Appendix follows on next page)*

## Appendix

Table A1
*Determiner Types and Tokens*

| Types | Tokens per child | | | | | | Σ | % all tokens | Cumulative % |
|---|---|---|---|---|---|---|---|---|---|
| | A | D | I | S | E | N | | | |
| the | 117 | 138 | 33 | 27 | 16 | 3 | 334 | 39 | 39 |
| a/an | 26 | 94 | 16 | 79 | 57 | 8 | 280 | 33 | 72 |
| my | 3 | 1 | 11 | 54 | 6 | 1 | 76 | 9 | 80 |
| this/that | 1 | 3 | 7 | 26 | 18 | | 55 | 6 | 87 |
| (a/an/any/the) other | | 11 | 1 | 8 | 22 | 3 | 45 | 5 | 92 |
| your/you | | 2 | 3 | 11 | 3 | | 19 | 2 | 94 |
| (some) more | | 3 | | | 1 | 9 | 13 | 1 | 96 |
| all (the/my) | | 1 | | | 2 | 8 | 11 | 1 | 97 |
| some the | | 1 | | | | | 1 | .1 | |
| his | | 2 | | 1 | 1 | 1 | 5 | .6 | |
| any (more) | | | | | 3 | | 3 | .4 | |
| a (little) bit/piece of | | 2 | | | 1 | | 3 | .4 | |
| a glass/a pair/lots/ (a) big bunch of | | 2 | 1 | 1 | | | 4 | .5 | |
| those/these | | | 1 | 1 | | | 2 | .2 | |
| two | 1 | | 1 | | | | 2 | .2 | |
| four | | 2 | | | | | 2 | .2 | |
| one | 1 | | | | | | 1 | .1 | |
| a few | | 1 | | | | | 1 | .1 | |
| no | | 2 | | | | | 2 | .2 | |
| Types | 6 | 15 | 9 | 9 | 11 | 7 | | | |
| Tokens | 149 | 265 | 74 | 208 | 130 | 33 | 859 | | |
| Tokens/Utterance | .36 | .50 | .37 | .30 | .36 | .64 | | | |
| MLU | 2.93 | 3.21 | 3.31 | 3.47 | 3.58 | 4.14 | | | |

*Note.* MLU = Mean Length of Utterance.

Table A2
*All Possible Examples of Two Different Determiners in Sequence*

| Child | Utterance |
|---|---|
| A | This the boy |
| | This one a baby |
| | This a street, the street |
| | This two |
| S | That the Weeble |
| | That the Weeble |
| E | That one (this) |
| | That a elephant |
| | That a toy |
| | That a horse |
| | This a elepha - this is a elephant |
| | No, that a kitty cat |
| | Because this a horse |
| | And this a zebra |
| | (This a) other zebra? |
| | That the last one! |
| | That a (-) |
| | That the end |
| | (Cayunda) this the right one? |
| | That a pink one |

Table A3
*All Possible Examples of Determiner Repetition*

| Child | Utterance |
|---|---|
| A | This, that's a baby bungle |
| | This, this |
| | This is a bicycle, two, two |
| | Two, two |
| | Those, those |
| D | A, a bell! |
| | The, firemen and from the hose wagon |
| I | That, that, that |
| | I want this, this to be cold |
| S | That, that's Robbie's |
| | A lullaby (is uh), a, is a lullaby |
| | The, the ducky's in the bath |
| | That's a, that's a hole |
| | And this, that's a, what is this? |
| | That, that's a rabbit and a rabbit (-) |
| | This, this, this is a boo-boo |
| E | A—(a zebra) |
| | Want to ask Seth any, any, any (songs) I know, okay? |
| | A, a alligator come out |
| | Can I play with this, this, this little (housey) one? |
| | And they, they all my, all my, all my, all my, all my things into (here) |

Table A4
*All Possible Examples of Determiners without a Noun*

| Child | Utterance |
|---|---|
| A | This |
| | This, boom |
| | This is, this |
| | The Count, two |
| I | That + |
| S | That + + |
| | And this—sliding |
| | (And know) that's a—baby fox |
| | That's a—it's biting |
| | This |
| | That—what is that? + + |
| | And that's a—what is that? |
| | That's a—water |
| | That's a—chickie |
| | That's my—let's take my shoes off |
| | You don't—this—they're little |
| | Put your—put my sock—on |
| | I don't want that—tickle that bead |
| | Tickle me—tickle me—tickle my elbow |
| E | Just one |
| | Two + + |
| | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 18, 19, 17, 18! |
| | Um, just one |
| | That? |
| | A—what are these? |
| | One |
| | Three |
| | And two |
| | Uh, from the, from the, from the, from the . . . |
| | By a, by a, by a . . . |
| | What, what that house, what did that, what did that, what did that— |
| | That one is, that's a, that's a yellow one |
| | Just a lot |

*Note.* A + signals a later repetition of the utterance.

Table A5
*Adjective Types and Tokens*

| Types | Tokens per child | | | | | | Σ | % all tokens | Cumulative % |
|---|---|---|---|---|---|---|---|---|---|
| | A | D | I | S | E | N | | | |
| big | 1 | 31 | 1 | 2 | 3 | | 38 | 24 | 24 |
| little | | 2 | | 10 | 5 | | 17 | 11 | 35 |
| blue | | 13 | 1 | 1 | 1 | 1 | 17 | 11 | 46 |
| green | | 4 | | | | 5 | 9 | 6 | 51 |
| brown | | | | | 4 | 2 | 6 | 4 | 61 |
| yellow | | 2 | | | 1 | 1 | 4 | 3 | 64 |
| red | | 2 | | | 1 | | 3 | 2 | 66 |
| black | | 2 | | | 1 | | 3 | 2 | 68 |
| white | | 1 | | | 1 | | 2 | 1 | 69 |
| pink | | | | | 2 | | 2 | 1 | 70 |
| purple | | 1 | | | | | 1 | .6 | |
| happy | 2 | 6 | | | 1 | | 9 | 6 | |
| unhappy | | 1 | | | | | 1 | .6 | |
| new | 1 | 4 | | | | | 5 | 3 | |
| brand new | | 2 | | | | | 2 | 1 | |
| old | | 1 | | | | | 1 | .6 | |
| nice | 3 | | | 1 | | | 4 | 3 | |

(*table continued*)

Table A5 (*continued*)

| Types | Tokens per child | | | | | | Σ | % all tokens | Cumulative % |
|---|---|---|---|---|---|---|---|---|---|
| | A | D | I | S | E | N | | | |
| good | | | 1 | | | | 1 | .6 | |
| better | | 1 | | | | | 1 | .6 | |
| long | | 1 | | | | | 1 | .6 | |
| tall | | 1 | | | 1 | | 2 | 1 | |
| bigger | | | | 3 | | | 3 | 2 | |
| biggie | | | | 1 | | | 1 | .6 | |
| tiny | | | | | 1 | | 1 | .6 | |
| hot | | 3 | | | | | 3 | 2 | |
| cool | | | 1 | | | | 1 | .6 | |
| cold | | | 1 | | | | 1 | .6 | |
| sharp | | 2 | | | | | 2 | 1 | |
| soft | | | | 1 | | | 1 | .6 | |
| wrong | | | | 1 | | | 1 | .6 | |
| right | | | | 2 | 1 | | 3 | 2 | |
| hungry | | 1 | | | | | 1 | .6 | |
| silly | | | 1 | | | | 1 | .6 | |
| sick | | | | | 1 | | 1 | .6 | |
| ticklish | | | | 3 | | | 3 | 2 | |
| yummy | | 3 | | | | | 3 | 2 | |
| tight | | | 1 | | | | 1 | .6 | |
| dirty | | | | | 2 | | 2 | 1 | |
| Types | 4 | 21 | 7 | 10 | 15 | 4 | 38 (duplications removed) | | |
| Tokens | 7 | 84 | 7 | 25 | 26 | 9 | 158 | | |
| Tokens/Utterance | .02 | .16 | .04 | .04 | .07 | .17 | | | |
| MLU | 2.93 | 3.21 | 3.31 | 3.47 | 3.58 | 4.14 | | | |

*Note.* MLU = Mean Length of Utterance.

Table A6
*Determiner Distribution as a Function of Noun Subclass*

| Child | Singular count | Plural count | Mass |
|---|---|---|---|
| *a* | | | |
| A | 16 | 1 | 0 |
| D | 94 | 0 | 0 |
| I | 13 | 2 | 0 |
| S | 77 | 2[a] | 0 |
| E | 57 | 0 | 0 |
| N | 8 | 0 | 0 |
| *the* | | | |
| A | 85 | 23 | 3 |
| D | 100 | 4 | 27 |
| I | 33 | 0 | 0 |
| S | 24 | 0 | 1 |
| E | 14 | 1 | 1 |
| N | 1 | 1 | 1 |
| Personal ProNouns | | | |
| A | 1 | 1 | 0 |
| D | 2 | 0 | 1 |
| I | 8 | 4 | 2 |
| S | 29 | 37 | 0 |
| E | 7 | 1 | 0 |
| N | 2 | 0 | 0 |

[a] Observer: "You have quite a few, don't you?"
S: "I have quite a boo-boos." Repeated later in transcript.

Table A7
*Individual Percentages of NP Types in Different Utterance Positions and Alone*

| | Position | | | | |
|---|---|---|---|---|---|
| | Pre-Verb | Post-Verb | Post-Prep | Σ | Alone |
| A | | | | | |
| Det Adj N | | .4 | | .4 | |
| Det N | .8 | 21.7 | 7.4 | 29.8 | 25.9 |
| N | 1.2 | 15.1 | 2.3 | 18.6 | 48.9 |
| ProNoun | 24.8 | 9.7 | .4 | 34.9 | 3.5 |
| Proper name | 3.5 | 11.2 | 1.6 | 16.3 | 21.7 |
| Total | 30.2 | 58.1 | 11.6 | N = 258 | N = 143 |
| D | | | | | |
| Det Adj N | | 4.4 | .9 | 5.4 | 16.3 |
| Det N | 8.2 | 16.1 | 10.4 | 34.8 | 54.5 |
| N | 1.3 | 6.0 | 2.9 | 10.1 | 22.8 |
| ProNoun | 25.0 | 11.7 | 2.9 | 39.6 | |
| Proper name | 6.6 | 1.9 | 1.6 | 10.1 | 6.5 |
| Total | 41.1 | 40.2 | 18.7 | N = 316 | N = 123 |
| I | | | | | |
| Det Adj N | | 2.2 | 1.1 | 3.3 | |
| Det N | 6.7 | 23.3 | 22.2 | 52.2 | 21.4 |
| N | 5.6 | 7.8 | 4.4 | 17.8 | 38.1 |
| ProNoun | 7.8 | 3.3 | 4.4 | 15.6 | 16.7 |
| Proper name | 7.8 | 3.3 | | 11.1 | 23.8 |
| Total | 27.8 | 40.0 | 32.2 | N = 90 | N = 42 |
| S | | | | | |
| Det Adj N | | 1.1 | .1 | 1.2 | 4.3 |
| Det N | 1.7 | 19.2 | 1.9 | 22.8 | 34.8 |
| N | .3 | 2.2 | .4 | 2.9 | 34.8 |
| ProNoun | 51.6 | 16.9 | 2.9 | 71.4 | 26.1 |
| Proper name | .4 | 1.2 | | 1.7 | |
| Total | 53.9 | 40.7 | 5.4 | N = 723 | N = 23 |
| E | | | | | |
| Det Adj N | .3 | 1.2 | | 1.5 | 4.3 |
| Det N | 2.2 | 16.4 | 1.5 | 20.1 | 60.9 |
| N | .3 | 2.5 | .6 | 3.4 | 32.6 |
| ProNoun | 55.4 | 10.8 | 3.1 | 69.3 | |
| Proper name | 1.2 | 4.3 | | 5.6 | 2.2 |
| Total | 59.4 | 35.3 | 5.3 | N = 323 | N = 46 |
| N | | | | | |
| Det Adj N | 1.8 | 5.4 | | 7.3 | 33.3 |
| Det N | 12.7 | 16.4 | 3.6 | 32.7 | |
| N | 3.6 | 7.3 | | 10.9 | |
| ProNoun | 23.6 | 18.2 | 1.8 | 43.6 | |
| Proper name | 3.6 | | 1.8 | 5.4 | 66.7 |
| Total | 45.4 | 47.3 | 7.3 | N = 55 | N = 3 |

*Note.* See Table 1 and text for explanation of criteria.

Table A8
*Preposition Types and Tokens*

| Types | Tokens per child | | | | | | Σ | % all tokens | Cumulative % |
|---|---|---|---|---|---|---|---|---|---|
| | A | D | I | S | E | N | | | |
| in | 20 | 35 | 9 | 23 | 4 | 1 | 92 | 34 | 34 |
| on | 1 | 5 | 14 | 20 | 2 | 1 | 43 | 16 | 50 |
| of | 1 | 14 | 3 | 2 | 10 | 0 | 30 | 11 | 61 |
| to | 8 | 8 | 8 | 1 | 2 | 0 | 27 | 10 | 71 |
| at | 0 | 2 | 8 | 7 | 1 | 0 | 18 | 7 | 77 |
| for | 1 | 5 | 1 | 4 | 2 | 1 | 14 | 5 | 82 |
| with | 1 | 7 | 0 | 1 | 5 | 0 | 14 | 5 | 87 |
| down | 13 | 0 | 0 | 0 | 0 | 0 | 13 | 5 | 92 |
| over | 0 | 3 | 0 | 1 | 1 | 0 | 5 | 2 | 94 |
| under | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 1 | 95 |
| into | 0 | 1 | 0 | 1 | 1 | 0 | 3 | 1 | 96 |
| from | 0 | 1 | 0 | 0 | 1 | 0 | 2 | 1 | |
| by | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 1 | |
| about | 0 | 1 | 0 | 0 | 0 | 0 | 1 | .4 | |
| upon | 0 | 1 | 0 | 0 | 0 | 0 | 1 | .4 | |
| inside | 0 | 0 | 0 | 0 | 1 | 0 | 1 | .4 | |
| off | 0 | 0 | 0 | 0 | 1 | 0 | 1 | .4 | |
| out of | 0 | 1 | 0 | 0 | 0 | 0 | 1 | .4 | |
| round | 0 | 1 | 0 | 0 | 0 | 0 | 1 | .4 | |
| types | 7 | 14 | 7 | 10 | 13 | 3 | 19 (duplications removed) | | |
| tokens | 45 | 85 | 46 | 61 | 32 | 3 | 272 | | |
| tokens/utterance | .11 | .16 | .23 | .09 | .09 | .09 | | | |
| MLU | 2.93 | 3.21 | 3.31 | 3.47 | 3.58 | 4.14 | | | |

*Note.* MLU = Mean Length of Utterance.

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