Syntactic and Semantic Aspects of the Utterances of Language-Impaired Children: The Same Can Be Less

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Although language-impaired children have been observed to follow many normal language acquisition patterns, research to date has not fully explored the relationships between various linguistic domains. The hypotheses investigated in this study are that language-impaired children produce fewer logical propositions per utterance and evidence less control of formal syntactic markers. Language samples from 10 language-impaired children (M C.A. = 59.35 months) and 10 normal children (M C.A. = 36 months) matched for MLU (4.17-5.48) were analyzed for semantic and syntactic characteristics. Both hypotheses were confirmed. Despite similar utterance length, the language-impaired children expressed fewer propositions per utterance and made more syntactic errors than the younger normal group. Because, in many other respects, children in the two groups produced equivalent language, the data imply asynchronous development across linguistic domains for the language-impaired group. They also suggest difficulties with sentence formulation, symbolic thought, and the learning of syntactic elements. Finally, the data raise important questions about the validity of an MLU-match.

Research studies to date have revealed surprisingly few differences between the language development patterns of language-impaired and normal children (see Johnston, 1982, for a review). Although language-impaired children learn to talk slowly and late, they learn phrase structure rules, morphological forms, and relational terms in sequences which can be predicted from research with normal children. They express the same sorts of relational meanings as do control groups matched for mean length of utterance (MLU) and are frequently responsive and effective conversationalists.

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This research perspective on the language-impaired child may distort reality. Clinical impressions that language-impaired children talk differently than normal children are global judgments that are based upon a listener's simultaneous response to all aspects of language use. Research studies have not yet set as their explicit goal the description of performance across linguistic domains, comparing, for example, mastery of grammatical morphology with knowledge of conversational rules or lexical meanings. Such comparisons have been only implicit in research designs which use MLU-matched normal and language-impaired groups. Studies which report that language-impaired children reach 90% mastery of grammatical morphology at later than normal language stages (Johnston & Schery, 1976; Steckol & Leonard, 1979) have compared in effect, overall grammatical complexity as indexed by MLU with facility for specific morphological forms and found asynchrony in development. The present study was designed to compare syntactic and semantic variables in the utterances of language-impaired children in order to look more directly at this possibility of asynchronous development. Even if language-impaired children follow normal sequences of development within each area of language growth, they may acquire different sorts of linguistic abilities at different rates. Such a pattern of language development would yield, of course, utterances which are unlike those of normal children at any age.

The child language studies of Parisi and his colleagues (Antinucci & Parisi, 1973; Parisi & Giannelli, 1979) suggested an approach to semantic description which would allow a meaningful comparison of syntactic and semantic variables. Their analyses were derived from within the framework of generative semantics (Parisi & Antinucci, 1976) and focused on the logical units of meaning which underlie words and utterances, rather than on the description of spoken forms. From this perspective, the sentence “Harry moved the piano yesterday” would be analyzed as expressing two underlying propositions (It was yesterday that something happened; Harry moved the piano) as well as the relationship of subordination between them. The fact that one proposition is expressed by an adverb and the other by a subject-verb-object sentence would be disregarded.

The advantage of such a logical approach is that it allows us to look at the semantic complexity of utterances apart from particular sentence patterns or degree of grammaticality. Research reports by Slobin (1979), Antinucci and Parisi (1973), Parisi and Giannelli (1979), and Haas and Wepman (1974) suggest that propositional analysis can capture important developmental trends in sentence formulation and communicative competence. It reflects available vocabulary, but is otherwise free enough of grammatical properties to provide a useful contrast for syntactic variables. (Further background discussion of propositional analysis appears in the Appendix.)

Our general research strategy was to collect quasi-naturalistic language samples from normal and language-impaired children matched for MLU (Brown's Stages IV and V), then to subject these samples to a variety of linguistic analyses, focusing on the use of specific grammatical forms and underlying propositional complexity. Findings from these linguistic analyses would be used to address three research questions: (a) Do language-impaired children produce less complex language than normal children with equivalent mean length of utterance? (b) Do language-impaired children exhibit more difficulty in the use of grammatical forms than normal children with equivalent mean length of utterance? and (c) Do language-impaired children express fewer or different sorts of propositions per sentence than normal children with equivalent mean length of utterance?

**METHOD**

**Subjects**

Subjects for this study were 10 language-impaired (LI) children (9 boys and 1 girl) and 10 normal children (7 boys and 3 girls). The normal children were individually matched to the LI children for MLU such that the differences between MLU values for any pair did not exceed ± .25. Mean MLU values for the pairs ranged from 4.2 to 5.4. Mean age for the LI group was 4 years and 11 months and for the normal group, 3 years (see Table 1). Children in the LI group had been previously diagnosed by a certified speech and language pathologist as suffering from a primary language disorder, based in part on test scores from one or more standardized measures of language proficiency. The language impairment...
in these children was not the result of a globally depressed intellectual functioning, severe emotional disturbance, hearing loss, or structural defects. Therefore, the etiology of the language deficiency was unspecified. The normal children were all native speakers of English, with no previously diagnosed speech, hearing, language, or neurological disorders.

All of the LI children scored within normal range (85–115 IQ) on the Arthur Adaptation of the Leiter International Performance Scale (1952); mean IQ for the group was 104.3. The normal group was judged by teachers to have age-appropriate intelligence. Our primary intention was not to match children by IQ, but merely to demonstrate that the LI children were not globally retarded. Nevertheless, Leiter scores were obtained for five of the normal children and confirmed the teacher's judgments. (The remaining five children refused the Leiter and no other nonverbal scale in the 3 to 6 year age range is available.) The LI children had a mental age advantage of 14 months over the normal children (see Table 1). Therefore, if we were to find some linguistic superiority in the normal group, it could not be easily attributed to differences in rate or extent of general intellectual growth.

Language Sampling Procedures

Spontaneous language samples were obtained from each child in three situational contexts: (a) while playing with a doll house; (b) while viewing a children's story book; and, (c) while performing various cognitive tasks, such as the Leiter, number conservation, and object sorting.

For each child, a sample of approximately 100 utterances was designated for later linguistic analyses according to the following a priori selection and segmentation rules:

1. Exclude one-word utterances and simple labeling responses, e.g., “That/this is a dog,” to insure that all sentences contain a syntactic relation and to eliminate the influence of labeling routines.
2. Exclude question responses which do not contain a surface subject and predicate, to control for possible inconsistencies in the examiner's questioning behavior.
3. Include no more than two tokens per utterance and only non-adjacent tokens, to maximize intrasample variation but still reflect the repetitive aspects of young children's speech.
4. Treat compound sentences as one utterance if they are marked as such by intonation, but allow no more than two clauses conjoined by and per utterance.

In other respects, utterance selection and morpheme counting

criteria were those commonly used in child language research (Brown, 1973). It should be noted, however, that the effect of the utterance selection criteria just outlined is to yield higher MLU values than do the less selective criteria generally applied. Preliminary data suggest that the magnitude of this effect lies in the order of .5 to 1.0 morphemes.\(^1\)

Linguistic Measures

Syntactic analyses. Two approaches were used to assess the syntactic maturity of children's utterances: First was the DSS procedure (Lee, 1974), which provides a quantitative index of linguistic complexity by assigning weighted scores to correctly used grammatical forms in each of eight categories: indefinite pronouns, personal pronouns, main verbs, secondary verbs, negatives, conjunctions, interrogative reversals, and WH-questions. These scores are summed across forms for each utterance and an additional sentence point is awarded if the utterance is grammatically correct. The composite DSS score consists of the average score per utterance for a sample of 50 utterances, each of which must include a subject and finite verb. The 50 utterances were selected to represent both the play and story-telling contexts and to reflect each child's most advanced language while meeting the usual constraint of consecutiveness. Three other DSS-derived measures were also utilized. For each of the eight grammatical categories we computed: (a) a total score, the sum of all weighted values; (b) a mean score, the average of all weighted values; and, (c) the frequency of errors, expressed as a percentage of the occasions on which the child used or attempted to use forms of that category.

Nonstandard measures was the second approach that was used to assess syntactic maturity. Since a goal of this study was to contrast grammaticality with underlying propositional complexity, more selective measures of grammaticality than the composite DSS were needed. For these measures, we examined a set of forms which have obligatory contexts and can differentiate between grammatical and nongrammatical versions of given utterances: noun and verb endings (e.g., plural -s, past tense -ed), the auxiliary verb system (excluding modals, e.g., can, but including the copula, e.g., He is hot), infinitive

\(^1\)If we were to adjust our observed MLU values (M = 4.8) by this factor, they would center within the 3.8–4.13 interval. Although some authors have questioned the reliability of MLU values above 4 (e.g., Chabon, Kent-Udolf, & Egolf, 1982), a large sample study (N = 123) by Miller and Chapman (1981) demonstrates the validity of this developmental index for values 1 through 6 and for normal children aged 1½ to 5. In their data, age accounted for 78% of the variance in MLU and the relationship was essentially linear.
markers (e.g., He likes to play, but not reduced catenative forms such as hatta), and the complementizer that (e.g., I know that Henry will win). (These forms will be referred to throughout this report as grammatical markers.) The first selective measure, the grammatical marker Need Index, indicated the typical number of grammatical markers which were required by a given child's utterances. It was calculated by dividing the total number of obligatory contexts for these forms by the number of surface sentences in the sample. The second measure, the grammatical marker Error Index, indicated the proportion of errors made on these grammatical forms. Both measures were based on the larger, 100 utterance sample rather than the more restricted DSS sample. (The unit surface sentence essentially corresponded to that of the utterance and will be defined more completely in the next section.)

Semantic analyses. Our semantic variables were of two sorts. First, for each 100 utterance sample, we calculated a Propositional Complexity Index (PCI) consisting of the mean number of propositions per surface sentence. This measure indicated the number of propositional judgments which a child typically combined into a single utterance. Although we were not concerned here with particular syntactic structures, we were interested in the child's ability to use some sort of syntactic "glue" to join propositions. Use of the conjunction and may serve this purpose, but it does so with such total lack of syntactic constraint that we decided to separate all clauses linked by and and treat them independently. With this one exception, the unit surface sentence corresponded to the unit utterance.

For our second set of semantic variables, we calculated the distribution of propositions across three major types of subordination, i.e., adverbial, embedded, and associated relations. Adverbial propositions in some way modify the primary, or focused, proposition, e.g., "Yesterday, I baked cookies." Associated propositions modify some participant in another proposition, e.g., "Miss Marple stared at the crying boy." Embedded propositions act as one of the participants in another proposition, e.g., "Henry knew he was in trouble." (See Appendix for further definitions.)

Interjudge Consistency in Scoring

All samples were assigned DSS weighted scores by two independent judges, the second author and a psychometrist, who had experience with this measure. Interjudge agreement for each sample ranged from 93.5% to 96.4%; disagreements were resolved through discussion or by correspondence with the author of this procedure.

An interjudge consistency measure for the Propositional Complexity Index was obtained by comparing the two authors on their independent codings of four samples. Interjudge agreement for the required 659 decision points was 92.6%; again, disagreements were resolved by discussion.

RESULTS

DSS Analyses

Linguistic differences between groups were assessed first by looking at the DSS composite score. Since DSS scores involve ordinal scale measurement, nonparametric procedures were used for this, and all DSS-derived comparisons. The Mann-Whitney U Test indicated that DSS composite scores were significantly different between groups (p < .05). As can be seen in Table 2, children in the normal group earned higher values.

Next we attempted to identify the specific linguistic categories which contributed to the composite group difference. Table 2 presents group means for total scores and mean scores for each of the nine DSS categories. Because the total score is the sum of all weighted values earned within a category, it reflects both the number of entries and their absolute values. Five of the total score comparisons revealed significant group differences: main verb, secondary verb, negatives, interrogative reversals, and sentence point. In all cases, the normal group earned higher scores. Unlike the total scores, mean scores are not sensitive to the number of entries in a category but reflect the average difficulty, or "developmental level," of forms successfully used. Within each category forms that are typically learned later receive higher weighted values. No group comparison between mean scores reached significance.

The observed group differences in category total scores indicated that the language-impaired children were not using main verbs, secondary verbs, negatives, and questions in an age-appropriate fashion. Further analyses were necessary to identify the exact nature of these linguistic problems since total scores could be relatively low because children either (a) produced forms of a developmentally lower level, (b) infrequently attempted the pertinent forms, or (c) made frequent grammatical errors. Because there were no significant differences in the developmental level of the forms produced by the two groups (mean scores), one or both of the remaining two factors must have
Table 3. Frequency of Production, Percentage of Errors, and Number of Subjects Making Errors on Four DSS Categories by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Main Verb</th>
<th>Secondary Verb</th>
<th>Negative Reversal</th>
<th>Interrogative Reversal</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>LI</td>
<td>521</td>
<td>57</td>
<td>53</td>
<td>54</td>
<td>54.7</td>
</tr>
<tr>
<td>Normal</td>
<td>475</td>
<td>49</td>
<td>84</td>
<td>7</td>
<td>22.4</td>
</tr>
</tbody>
</table>

*p < .05, Mann-Whitney U group comparison.

When we looked more closely at the specific errors made by each group, additional descriptive trends emerged. First, error rates in the negatives, main verb, and interrogative reversal categories in large part reflected difficulties with the auxiliary system. Secondly, within the secondary verb structures, group differences involved the use of catenatives and infinitive segments. The control group produced over twice as many well-formed secondary verb structures as the LI group; 81% of these were catenative forms such as gotta, gonna, or wanna, as compared to 62% for LI group. This difference in the frequency of catenatives was maintained even when the early wanna form was removed, (t = 3.26, df = 18, p < .01, one-tailed, r² = .32). Additionally, a typical error made by the LI children, omission of the infinitive particle (e.g., “I need go now”), was never made by the normal children.

In summary, the DSS analyses indicate that despite similarities in MLU, the language produced by the LI group was less grammatical than that produced by the control group who were 2 years younger. In particular, the LI group earned lower scores in the main verb, secondary verb, interrogative reversal, and negation categories. Although
they succeeded in producing some grammatical instances of these categories which were appropriate to their developmental level (as indexed by MLU), they made more errors on these forms than did the normal group. Forms which occurred with relative infrequency included catenative verbs; forms which seemed particularly vulnerable to error included the auxiliaries and infinitive markers. The next analyses were designed to look more closely at forms of this latter sort.

Grammatical Marker Indices

The grammatical marker indices were motivated by a desire to focus more narrowly on formal syntactic knowledge in ways which could eventually be contrasted with propositional complexity. Two composite measures were calculated, the Need Index which reflected the frequency with which grammatical markers (noun and verb inflections, auxiliaries, infinitive particle, complementizer that) were required by a child’s utterances; and the Error Index, a measure of the proportion of errors made on these forms.

The LI group produced utterances requiring the use of more grammatical markers ($M = 1.05$, $SD = .19$) than the normal group ($M = .86$, $SD = .19$). The difference was significant, ($t = 2.23$, $df = 18$, $p < .025$, one-tailed, $w^2 = .17$). The LI children also made proportionally more errors in their use of these forms ($M = 49.1$, $SD = 11.4$) than the normal children ($M = 29.4$, $SD = 15.6$). This difference was also significant, ($t = 3.36$, $df = 18$, $p < .025$, one-tailed, $w^2 = .34$). For both groups, the predominant error pattern was that of omission (LI, 80.3%; Normal, 83.3%).

Semantic Complexity

The semantic analyses were designed to investigate the propositional, or ideational, complexity underlying children’s utterances. The first comparison utilized the Propositional Complexity Index (PCI), a composite measure which indicated the average number of propositions incorporated into an utterance. As indicated in Table 4, the normal children in this study expressed more propositions per utterance than did the LI children, ($t = 1.80$, $df = 18$, $p < .05$, one-tailed, $w^2 = .10$).

In addition to measuring the total number of propositions, we also assigned propositions to structural categories according to their hierarchical relationships. As described earlier, these categories consisted of adverbial, associated, and embedded propositions. Table 4 indicates the number of propositions of each type typically occurring in the utterances of the normal and language impaired groups. Children in the normal group used significantly more adverbial propositions, ($t = 2.00$, $df = 18$, $p < .05$, one-tailed, $w^2 = .13$).

How Can the Same Be Less?

The data thus far present an enigmatic picture. Two groups of children matched for utterance length nevertheless demonstrate systematic differences in language performance. The language-impaired children produced a variety of linguistic forms which were comparable in developmental level to those produced by younger, MLU-matched normal children. However, they made more errors in their use of grammatical forms and they expressed fewer propositions per utterance. This difference in propositionality resulted primarily from their infrequent use of catenative verbs and adverbials. Recalling also that the majority of grammatical errors involved the omission of obligatory forms, the enigma is obvious: All significant group differences are of the sort which would seem to yield shorter utterances, yet MLU for the two groups is equivalent. A series of post hoc analyses were designed to identify those characteristics of the LI children’s language which yielded length despite their omission of grammatical markers and their relatively low propositionality.

Post Hoc Analyses

The first post hoc analysis explored the possible effect of intra-subject variation in utterance length. We hypothesized that although mean length of utterance for the two groups was comparable, the normal children might have produced more utterances with extreme lengths, thus allowing for higher propositional content. Each child's
standard deviation for utterance length was calculated and mean values for the two groups were compared. No group difference in the distribution of utterance length within language samples was evident.

The second set of post hoc analyses explored the possible effect of pragmatic variables. Since the use of imperatives, ellipsis, or pronouns would reduce utterance length, we hypothesized that the normal children might be using more of these forms within otherwise complex sentences. Statistical analyses, (t test, df = 18, one-tailed), again revealed no significant group differences in the mean percentage of imperative utterances (normal, 7.5%; LI, 4.7%), of utterances involving elliptical omission of sentence constituents (Normal, 12.3%; LI, 15.2%), or of noun phrases encoded as pronouns (Normal, 39.9%; LI, 37.2%).

The final set of post hoc analyses explored the possible influence of semantic variables. Propositions may be analyzed into two sorts of logical components: a predicate, i.e., a judgment about a state or relationship, and one or more arguments, i.e., the entities about which the judgment is made. By definition, some predicates entail only one argument, e.g., big (x), while others entail more, e.g., in (x, y). We hypothesized first that the language-impaired children used more of those predicates which inherently entail a greater number of arguments, thereby increasing sentence length. To investigate this possibility, we coded each predicate according to the number of arguments it could logically accept, i.e., one, one-two, two, two-three, three. Predicates in the one-two or two-three argument categories are those which have arguments which may be optionally expressed. The mean number of predicates falling into each category are listed in Table 5 by group. The language-impaired children used more predicates involving two arguments while the normal children used more predicates involving one or one-two argument(s). Only the group difference for the two-argument predicates was significant, (t = 2.07, df = 18, p < .02, one-tailed, w² = .14).

Given the fact that the language-impaired children used proportionately greater numbers of two-argument predicates, we next investigated the sorts of meanings being expressed. These predicates fell into four broad semantic categories: (a) Simple locational or possessive states and changes of such states, e.g., on, have, fall, lose; (b) actions of agents which alter the physical state of an object or make contact with an object, e.g., fix, eat, lick; and (d) Simple cognitive states or actions intended to achieve such states, e.g., know, see, think, look. Only the second category, self-movement actions or locational states entailing manner of movement or posture, showed differential usage between groups. Language-impaired children expressed such predicates twice as often (M = 20.5% vs. 9.6%, t = 3.64, df = 18, p < .0125, one-tailed, w² = .37).

Finally, we looked at those sentences which expressed notions of time. Linguists divide temporal expressions into two sorts: (a) those concerning the relative position of an event along a time line, e.g., past, future; and (b) those concerning the “temporal contour” of an event, e.g., ongoings, completion, cessation. This latter domain is referred to as temporal aspect and was the one we examined. Most aspectual expressions in English involve the use of three or four morphemes. For example, progressive and perfective aspect are usually expressed with an auxiliary, a verb stem, and a verb ending, e.g., am run-ing or have eat-en. Likewise, aspectual verbs such as stop involve the use of verb complements with endings, e.g., stop-ped cry-ing or keep-s call-ing. Pervasive expression of aspect would hence increase mean length of utterance, all else held constant. Within the samples analyzed here, aspectual verbs were rare (N = 4) and perfective aspect never occurred except as the primitive particle up, e.g., “I ate it up.” The potential effect of aspectual expressions thus resided in the use of progressive forms. We hypothesized that the language-impaired children were encoding progressive aspect more frequently than the normal children. Looking at the proportion of utterances expressing progressive aspect, we found the predicted group difference, (M = 21.8 vs. 9.7, t = 2.35, df = 18, p < .025, one-tailed, w² = .18).

### Table 5. Predicates (per 100) Categorized According to the Number of Arguments Logically Entailed

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>1-2</th>
<th>2</th>
<th>2-3</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>LI</td>
<td>Mean</td>
<td>12.0</td>
<td>14.6</td>
<td>55.5</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>6.8</td>
<td>9.0</td>
<td>10.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Normal</td>
<td>Mean</td>
<td>17.0</td>
<td>19.0</td>
<td>47.0</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>5.3</td>
<td>9.0</td>
<td>8.0</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*p < .02, t-test group comparison.
Even if we consider only those progressive aspect expressions which were fully grammatical, i.e., those in which the auxiliary was not omitted, the language-impaired children produced twice as many, 16%, vs. 8.3%.

**DISCUSSION**

The data as just analyzed present clear answers to our original research questions. When compared with younger, MLU-matched normal children, our language-impaired subjects (a) produced sentences which were on average grammatically less complex; (b) made more errors in their use of grammatical forms; and (c) expressed fewer logical propositions per utterance.

Analysis of the linguistic features contributing to these general trends revealed the influence of three specific and independent semantic differences between groups. First, compared with the normal children, the language-impaired children talked more often about ongoing events and less often about intentions or necessities. Since English uses progressive tense forms to express the asp ectual notion of ongoingness and catenative or modal verbs to express notions of intentionality or necessity, this content difference had consequences for our syntactic, propositional, and utterance length variables.

Second, compared with the normal children, the language-impaired children talked more often about self-movement actions, such as *come, go, run, fly,* and *walk.* Again, this content difference influenced the relationship between propositional and sentence length variables. Since self-movement verbs may entail two noun-phrase arguments, one of which is expressed within a prepositional phrase, e.g., "Mommy went to the store," greater use of such verbs by the LI children contributed to sentence length without increasing propositional complexity.

Third, compared with the normal children, the language-impaired children expressed fewer adverbial predicates. They were less likely to amplify their basic assertions by indicating pertinent time, place, manner, or quantity information. This, of course, contributed to their lower propositional complexity scores.

However pervasive their influence, these semantic differences did not account for the LI group's marked lack of proficiency with the use of grammatical markers. Auxiliary system errors did not just occur in the context of the "progressive tense," nor did the incorrect use of other verb or noun inflections, infinitive particles and *that* complementizers in any way depend upon the use of progressive or catenative forms. In fact, if we remove all progressive and catenative forms and contexts from our grammatical form data, the LI children still make significantly more grammatical errors.

Furthermore, the semantic and syntactic contrasts outlined earlier occurred within a larger context of notably equivalent language use. The language-impaired children successfully produced linguistic forms in all DSS categories which were at the same developmental level as those produced by the MLU-matched control group. They used pragmatically motivated imperatives, pronouns, and ellipsis at equivalent frequencies, and showed similar variation in utterance length. Although the ideational content of their utterances emphasized ongoingness and self-movement, they expressed certain other categories of meaning with frequencies that were comparable to those of the normal group, e.g., actions which change the physical states of objects, simple locational states, cognitive states, actions which bring about cognitive states, and predicates which modify noun phrases.

The implications of these findings are fourfold. First, normal growth processes may be viewed as a progressive distancing or freeing of thought from the here-and-now. From birth to adolescence, thought proceeds from reactions-to-perceived-events to reflections-on-hypothetical-events. One linguistic symptom of this growth is the emergence of the catenative verbs *gonna, hafta,* and *gotta* to express the modal concepts of intentionality and necessity (e.g., Bloom, Tanouye, & Lifter, 1980; Brown, 1973; Szagun, 1978). Children move from commenting on present, ongoing realities to anticipating future events and setting them in contexts of social, motivational, and physical necessity. Viewed from this perspective, the LI group's relatively frequent use of progressive verb forms and infrequent use of catenative verbs reflects some disposition for thinking and talking about ongoing events rather than intended or necessary ones. Insofar as such children dwell on the here-and-now and fail to explore the world of conditions or expectation, they miss one important bridge to mature reasoning.

The second finding of this study which invites comment is the language-impaired children's lower rate of combining propositions within utterances. The mature speaker combines propositions into a single utterance for three primary reasons: (a) to convey ideas economically, (2) to indicate the relationship between propositional judgments conceived within a single conceptual network, and (c) to indicate the relevance of any given assertion to the discourse or physical context within which it is made (Delis & Slater, 1977). Failure to combine propositions within utterances may thus indicate language-processing, conceptual, and/or pragmatic deficiencies.

Given the pattern of late acquisition, slow language growth, and poor facility with grammatical markers which is typical of our language-impaired subjects, we can well imagine that their sentence for-
mulation processes are somehow inadequate. Low propositional values seem to corroborate this judgment. Psycholinguistic research with adults indicates that underlying propositional units play a more important role in sentence processing than do surface clause structure units (Ford & Holms, 1978). Likewise, if we use developmental sequence as an index of complexity, child language research suggests that it is psychologically more demanding to express two propositions in one utterance than to express them one at a time (Antinucci & Parisi, 1973; Haas & Wepman, 1974; Parisi & Gianelli, 1979; Slobin, 1979). Children with poor sentence formulation skills might well be expected to avoid the processing costs of increased propositional complexity.

Lower propositional values also may reveal qualities of thought, in particular an inability to hold simultaneously in mind several judgments so as to conceptualize their interrelationships. Preliminary studies of hierarchical planning reported by Cromer (1981) suggest that this may be the case. One way of determining whether linguistic or nonlinguistic mental processes are most responsible for lower propositionality would be to look for successive utterances which seem to be conceptually linked. Large numbers of such sequences, particularly if uttered with intonation patterns suggestive of preplanning, would indicate that a child was trying to express a complex conceptual network but lacked either knowledge of the linguistic means or the sentence formulation skills to do so in a single utterance.

It also seems feasible that the LI children earned lower propositional values because of some insensitivity to the conversational rule of relevance. Some occurrences of adverbial predicates in the LI samples did seem to be motivated by discourse needs. One child, for example, said, "They go in swimming pool. That one already in it." Here the adverbial already indicates how the assertion that someone is in the pool pertains to the discourse topic-of-the-moment, i.e., that people are moving into the pool. More often, language samples from the LI children seemed to consist of disjointed series of unmarked topic shifts. Because our elicitation procedures were not designed to investigate conversational skills, however, it is not possible to draw any conclusions about topic-following abilities or the relationship between discourse demands and the use of adverbial predicates. In short, our language-impaired children combined fewer propositions into given utterances than did younger normal children, but further research is needed before we will understand how this difference relates to possible deficiencies in sentence formulation, conceptualization, or conversational skills.

The third result of this investigation which raises important questions, is the finding that our language-impaired children lacked facility in the use of grammatical markers. This, of course, is not a new observation. Other research studies have reported specific difficulties in the use of auxiliaries and other grammatical morphemes (Ingram, 1972; Johnston & Schery, 1976; Steckel & Leonard, 1979), and clinicians frequently emphasize these forms in their intervention programming. The importance of this fact is not that it is new, but that it alone of all our findings implicates deficiencies which are unambiguously linguistic in nature.

As adults with training in traditional grammatical description, we tend to think of sentence rules in syntactic terms, i.e., as operating on grammatical categories such as Nouns, Verbs, or Subjects. At the earliest stages of language growth, however, it is possible to generate sentences with rules that operate on semantically defined constituents such as Agents or Actions (see, for example, Bowerman, 1973). One important aspect of language growth in the early years would seem to be, then, the gradual syntacticalization of language knowledge, the recognition of formal similarities across more restricted semantically based rules (Braine, 1976; Ingram, 1981). The mature use of grammatical forms invites, and may even require, such syntactic knowledge. Plural inflections are added not just to Agents or to Experiencers but to Nouns. The present tense main verb be expresses no particular meaning but merely fulfills the English requirement that sentences include a verb, and so forth. The consistent and appropriate use of grammatical forms may require an understanding of language which is one step removed from thought, an appreciation of the structural properties of language as a formal object apart from any direct ties to specific meaning.

Our recent efforts to reinterpret language learning within a broader cognitive and social framework have provided valuable insights into the nature of language disorders, but the data on grammatical forms pulls us back into the unique world of linguistic knowledge. The fact that language-impaired children find grammatical forms especially difficult to master suggests that at least some of their problems are specifically linguistic in character.

Finally, the language-impaired children in this study appeared to be developing some aspects of linguistic ability more rapidly than others. The resultant picture is one of asynchrony across linguistic domains. Specific semantic and syntactic characteristics of their language combined in complex ways to create utterances of a given length. This fact may well explain the discrepant views of language disorder emerging from the research and clinical literatures. If some aspects of language use are mastered more quickly than others, the language-impaired child could follow normal sequences of
development within given domains and still produce abnormal utterances.

For language-impaired children, the notion of language level may be meaningless. If we ask whether the language-impaired children in the present study were at the same language level as their MLU-matched controls, the answer will vary depending upon the sorts of linguistic, processing, or functional criteria we use. It would be better to ask whether our language-impaired subjects had discovered comparable sentence patterns, had equal access to this knowledge, or used language for similar communicative and reasoning purposes.

This picture of asynchronous development raises serious questions about the meaning of an MLU-match. If our interest as researchers or clinicians is with some global or composite estimation of language acquisition level, utterance length remains a viable index. But such global assessments may no longer serve all questions of concern. To investigate asynchronous language development we may need instead to control for one sort of language ability while examining variation in others. Creating specific indices for various domains of language performance to replace MLU as the independent variable will be a demanding task, but one which should eventually enrich our picture of both language-disordered and normal children.

REFERENCES


SYNTACTIC AND SEMANTIC ASPECTS


APPENDIX

PROPOSITIONAL ANALYSIS

Propositions are judgments about the states of objects or the happenings and relationships between objects. We use object here in its broadest sense to refer to various entities, such as things, beings, ideas, or events. Propositions are thus idea-units composed of two parts: (a) a judgment, or predicate, and (b) one or more objects, or arguments. Everyday propositional judgments about object states would include deciding that a cloud looks dark or noticing that there is a fly in the soup. The first judgment concerns a cloud (argument) which is judged to be dark (predicate), in shorthand notation, dark: cloud. The second concerns a fly and some soup (two arguments) which are judged to be spatially related, one object in (predicate) the other, i.e., in: fly, soup. Such propositional judgments may be ex-
pressed in language, "That cloud is dark," or "There's a fly in the soup," but propositions need not themselves be viewed as linguistic entities.

Predicates (judgments) inherently involve different numbers of arguments (objects), depending upon their meanings. The specific nature of the arguments also depends upon meaning; some predicates concern ideas and events, others concern things. The predicate again, for example, entails only one argument, but that argument is an event and hence is itself a proposition. The sentence "John read the book again" thus may be analyzed as having two underlying propositions, i.e., (again: (read: john, book)). Likewise, the predicate think is a two-argument predicate which entails an ideational and hence propositional argument, i.e., (think: Mary (need: soup, salt)), or in sentential form, "Mary thinks that the soup needs salt." Individual propositional judgments can thus be combined into larger networks of thought. Once one proposition is designated as the focus or nucleus of the network, other types of predicates may be defined according to their distinct hierarchical relationships to this nuclear proposition: (a) an adverbial proposition is one which has the nuclear proposition as one of its arguments; (b) an embedded proposition is one which functions as an argument of the nuclear proposition; and (c) an associated proposition is one which has an argument which is co-referential with the argument of some other proposition in the network. To illustrate these relationships, consider the propositional network underlying the sentence "Immediately, Lou decided to trace her biological parent," (immediate: (decide: Lou, (trace: Lou, parents))) + (biological: parents) + (her: parents). If we designate decide as the nuclear predicate, immediate is an adverbial predicate, trace is an embedded predicate, biological and her are associated predicates. Throughout the semantic analyses in this report, the finite verb, i.e., the one indicating tense, is assumed to express the nuclear predicate.

Propositions relate to sentences in complex ways. First, although we can express propositional judgments in language, there are few necessary relationships between components of propositions and linguistic categories. In the illustrations thus far, predicates have been expressed via prepositions, adverbs, main verbs, embedded verbs, and adjectives. Predicates may also surface as modal verbs or conjunctions. The task of the speaker is to formulate sentences which make ideas and the relationships between them both clear and pertinent to the listener. The same set of underlying propositions could yield different sentences depending upon the needed emphasis of a particular moment. The ideas producing "Immediately, Lou decided to trace her biological parent," could also yield "Lou's decision to trace her biological parents was immediate." Secondly, the length of a sentence has no direct relationship to its underlying propositional structure. Two sentences of equivalent length and surface syntax can nevertheless express differing numbers of propositions depending upon the types of predicates they encode. Both Sentence 1 and Sentence 2:

(1) Mommy ate it at the office.
(2) Mommy put it on the shelf.
(3) He's big.

have Subject + Verb + Direct Object + Prepositional Phrase form. They are each six morphemes long and each includes three noun phrases. Sentence 1, however, expresses two propositions while sentence 2 expresses only one. This difference results from the fact that eat entails only two arguments, the agent and the object, while put entails three arguments, the agent, the object and the location. The preposition at in sentence 1 is actually a second, adverbial, predicate indicating where the eating event took place. Sentence 3, on the other hand, like sentence 2 encodes one proposition, but it is considerably shorter than 2 because the predicate big entails only one argument instead of three. Clark and Clark (1977, pp. 10–20) provide further useful discussion of propositions and sentences.