THE EFFECTS OF CHILDREN'S LANGUAGE COMPREHENSION LEVEL ON ADULTS' CHILD-DIRECTED TALK

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The present study attempted to test quasi-experimentally the hypothesis that children's language comprehension level is the major determinant of the modifications characteristic of child-directed talk (CDT). Language comprehension level was varied by selecting four-year-old, language-impaired children with two levels of comprehension. Data on 21 measures of structural and pragmatic aspects of CDT were obtained from videotapes of 20 half-hour, freeplay sessions in which each of ten adults talked individually with one child from each level. A t test for paired samples generated four significant differences ($p < 0.05$). Language addressed to the high comprehending children contained (1) more frequent use of the semantic category state, (2) greater lexical diversity, (3) more frequent reference to nonpresent objects, persons, and events, and (4) less frequent nonverbal cueing. Variation in the children's comprehension strategies appears to provide a better explanation for these differences than variation in their comprehension of language structure. An alternate explanation of the results, the conversational model, proved of limited value in explaining structural CDT modifications.

When adults talk to young children, their utterances are generally shorter, slower, higher-pitched, more controlling, and more concrete than when they talk to other adults (for a review of studies see Slobin, 1975). As young children develop, talk addressed to them becomes increasingly more like talk addressed to adults; utterances become longer, less redundant, more divorced from the here-and-now, etc. It would be useful to know if this change in adult talk is a necessary or even a facilitating condition for a child's acquisition of language. In order to address this question, however, it is first necessary to examine what causes adults to change the way they talk to children.

Systematic changes in child-directed talk (CDT) are influenced by such variables as cultural influence (Blount, 1972; Farwell, 1973; Ferguson, 1964) and communicative situation (Broen, 1972; Buium, Rynders, and Turnure, 1974; Siegel, 1963; Siegel and Harkins, 1963; Snow, 1972). However, many changes appear to be adjusted to developing aspects of young children themselves. These changes occur in both structural and pragmatic features of CDT. Structurally, mean length of utterance (MLU),

a measure considered to reflect the general semantic-syntactic complexity of CDT, was significantly longer to older children in eight of nine studies (Cross, 1975; Fraser and Roberts, 1975; Glanzer and Dodd, 1975; Longhurst and Stepanich, 1975; Moerk, 1975; Newport, 1976; Phillips, 1971, 1973; Shatz and Gelman, 1973; Snow, 1972). Pragmatically, linguistic redundancy (repetitions, imitations, etc.) decreases in CDT to older children (Cross, 1975; Newport, 1976; Schacter, Fosha, Stemp, Brotman, & Ganger, 1976).

At least part of the change in CDT described above appears to be in response to change in the feedback from the child being addressed (Snow, 1972). Age, however, covaries with numerous aspects of development. Children simultaneously develop physically, socially, mentally, and linguistically. Changes in a child's physical size, social skills (including the child's knowledge of language as a social act or pragmatics), nonverbal cognitive skills, and production or comprehension (or both) of language structure are potential influences interacting with age. What then are the specific aspects of the child's development that shape CDT modifications? The two most frequently discussed hypothetical models suggest different specific child variables. These different variables necessitate differing views of the role of the linguistic environment in the language acquisition process. The first model we shall call the comprehension model; the second, the conversational model.

COMPREHENSION MODEL OF CDT MODIFICATIONS

According to the comprehension view, child-directed talk (CDT) is adjusted to the language comprehension level of the child. The adult's goal is to produce language the child can understand. Hence, adults use the child's apparent comprehension of language as feedback in shaping their CDT (Bohannon and Marquis, 1977; Cross, 1977; Ervin-Tripp, 1971; Glanzer and Dodd, 1975; Lord, 1975; Wedell-Monnig and Westerman, 1977). This means that children exercise control over their own linguistic environment. For example, by giving more comprehension cues to structurally simpler utterances, the child shapes the structural complexity of the linguistic input he receives. By giving more comprehension cues to CDT with greater redundancy, the child shapes the redundancy aspect of CDT pragmatics. Other structural and pragmatic aspects of the linguistic environment are shaped in a similar fashion.

The comprehension model supports a relatively strong role for the linguistic environment in the child's acquisition of language structure. Because the structural complexity of CDT is tuned to the child's apparent comprehension of language structure, the discrepancy between what the child knows and what he hears is minimized. To the extent that CDT is organized by the adult to match the child's existing knowledge of lan-

guage structure, the child's task of organizing the linguistic data (CDT) he receives is lightened. If the input (CDT) is tuned to the child's knowledge of language structure, the child is helped in analyzing incoming linguistic data, in determining generalities, and in further building his knowledge of language structure.

CONVERSATIONAL MODEL OF CDT MODIFICATIONS

Further research has evolved an alternate explanation of child-directed talk (CDT) modifications often referred to as a conversational model (Newport, 1976; Newport, Gleitman and Gleitman, 1977; Shatz & Gelman, 1977; Snow, 1977). These investigators deny that the structural complexity of CDT is adjusted to the child's developing knowledge of language (either comprehension or production). They argue that it is feedback concerning the child's "nonsyntactic cognitive deficits" (Newport, 1976) which influences the structural complexity of CDT. Consider the following conversational model.

Adults are interested in maintaining social contact with children. To do so, the adult must get and keep the child's interest by selecting topics attractive to the child. What children notice and do is based upon their nonverbal cognitive understanding of the world. Hence, when an adult uses a child's activities and focus of attention as feedback, the adult adjusts topics in CDT to the child's implicit understanding. These topics determine the semantic content and thus indirectly the syntactic complexity of CDT. The simpler syntax of CDT is thus a by-product of the restrictions on message content.

The conversational model does not support the hypothesis that CDT plays a strong role in facilitating the child's acquisition of language structure. If CDT is not tuned to a child's knowledge of language structure, the discrepancy between what the child knows and what he hears may be very large. This model, then, indirectly supports a version of the nativist view that a child brings innate language-specific structures to the task of learning language. These compensate for large discrepancies between the child's knowledge of language structure and the structure of the language he hears.

METHODOLOGICAL PROBLEMS WITH PREVIOUS STUDIES

Several studies have attempted, with contradictory results, to demonstrate the influence of children's language comprehension level on CDT (Cross, 1977; Snow, 1977; Experiment 1 of Bohannon and Marquis, 1977). Because these studies were observational or correlational or both, they do not establish that any child behavior causes CDT modifications. Two

other experimental studies concluded that the comprehension model had been supported (Bohannon and Marquis, 1977; Wedell-Monnig and Westerman, 1977). Wedell-Monnig and Westerman compared talk addressed to normal-hearing versus hearing-impaired children matched for age and sex. However, their data may have been contaminated by child variables other than language comprehension level because there are other ways besides language comprehension ability in which hearing-impaired children differ from their normal-hearing peers. In Bohannon and Marquis (Experiment 2, 1977) the influence of a child's comprehension feedback was determined for only a very restricted set of CDT utterances and, as such, cannot be generalized to account for the complexity of an entire CDT corpus.

PURPOSE OF THE STUDY

Although current theory in child language development seems to favor the comprehension model, convincing evidence demonstrating that adults modify their talk to children as a function of a child's comprehension level is not available.

The current study was an attempt to overcome the design problems found in previous studies exploring the validity of the comprehension model as an explanation for CDT modifications. More specifically, the study explored the influence of the varying language comprehension levels of language-disordered children on the language addressed to them by previously unacquainted adult women.

METHOD

In reviewing methods of assessing the effects of children's behavior on adults, Bell (1971, 1974) suggested bringing children with varying levels of behaviors along a defined dimension into interaction with adult subjects with whom they have had no previous experience. Bell's suggestion was followed in this study. Adult subjects interacted individually with two children who had different levels of language comprehension. In order to hold all relevant variables constant, except language comprehension, children with language impairments were used to create the experimental conditions described below.

In order to use the approach suggested by Bell, a preliminary investigation was conducted to determine how well adults must know children before they make child-directed talk (CDT) modifications. Furthermore, since some of the 47 measures used in the pilot study (Appendix A) were not used in other CDT research, it was necessary to determine which of these measures would be sensitive to changes in CDT. The preliminary study analyzed the CDT of 16 women in a half-hour free-play interaction with one normally developing 3½ year old and one developmentally de-

layed 3½ year old. The adults were previously unfamiliar with the children.

There were two children representing each of these two conditions, but each adult interacted with just one normally developing and one developmentally delayed child. The two normally developing children were judged as performing within normal limits (within one standard deviation of the mean for their chronological age) on several standardized tests covering nonverbal cognitive skills (*Leiter International Performance Scale*, Arthur Adaptation, Arthur, 1952) and expressive (*Developmental Sentence Analysis*, Lee, 1974) and receptive (*Peabody Picture Vocabulary Test*, Dunn, 1959; and the *Test for Auditory Comprehension of Language*, Carrow, 1973) language development. The other two children were judged as being developmentally delayed by a diagnostic team consisting of a nurse, occupational therapist, pediatrician, psychologist, speech and language pathologist, and an audiologist. Both children were functioning between approximately 1½ and 2½ years in gross and fine motor, social and self-help, cognitive and language skills. Expressive language was at a single-word level for both children. Both children had normal physical growth (height and weight within normal limits for chronological age) and ap-

TABLE 1.Means and standard deviations (in parentheses) for measures of language structure which revealed significant differences at $p < 0.05$ in the preliminary experiment ($n = 16$; two-tailed probability) and means and standard deviations on these same measures in the main experiment ($n = 10$; one-tailed probability). The first two measures represent mean values per utterance and the rest represent frequency of occurrence per 100 utterances.

	Preliminary Experiment		*Main Experiment*	
Measures	*Normal Listener Condition*	*Developmentally Delayed Listener Condition*	*High Comprehension Listener Condition*	*Low Comprehension Listener Condition*
1. Mean length of utterance (MLU)	5.5 (0.62)	4.2 (0.97)*	5.4 (0.90)	4.6 (1.0)
2. Mean number of semantic categories/utterance	1.9 (0.24)	1.5 (0.25)*	1.8 (0.26)	1.6 (.31)
3. No verb	27.3 (5.5)	35.4 (10.9)*	30.4 (7.4)	31.8 (8.8)
8. Denial	1.5 (1.2)	0.7 (0.8)*	1.5 (1.8)	0.5 (1.2)
9. Attribution	11.8 (4.3)	5.9 (4.1)*	8.2 (3.8)	5.8 (4.3)
10. Possession	8.0 (4.2)	5.5 (4.2)*	6.5 (4.6)	4.2 (3.4)
13. State	18.5 (6.1)	12.5 (6.3)*	17.5 (6.8)	12.5 (6.8)*
16. Time	7.2 (3.7)	2.3 (2.7)*	5.4 (3.6)	4.5 (3.6)
17. Coordinate	3.7 (2.1)	1.6 (1.9)*	4.4 (2.2)	3.2 (2.3)
18. Causality	1.2 (.83)	0.4 (.50)*	1.2 (1.1)	1.2 (1.1)
21. Epistemic	11.8 (5.7)	4.1 (4.0)*	7.2 (5.0)	4.2 (6.2)
24. Extent	6.7 (3.7)	4.4 (2.3)*	7.1 (3.4)	5.0 (2.7)
27. Lexical diversity (LTTR)	0.47 (0.045)	0.42 (0.054)*	0.47 (0.04)	0.44 (0.06)*

*Results significant at $p < 0.05$.

pearance. None of the children had any major physical, emotional, or sensory deficits.

In the preliminary study, the 21 measures marked with an asterisk in Appendix A revealed significant differences ($p < 0.05$) between CDT addressed to normally developing versus developmentally delayed child-listeners. The means and standard deviations obtained on these 21 measures are given in the preliminary experiment study columns of Tables 1 and 2. These changes occurred in the first half-hour play session, indicating that CDT adjustments occur very quickly.

The children representing these two preliminary experimental conditions differed in all aspects of general development (for example, social, cognitive, and expressive language skills as well as language comprehension level). Because the comprehension hypothesis predicts that language comprehension is the major variable determining CDT modifications, these same 21 measures also were expected to reveal significant differences in the present study in which the only major difference between the children creating the conditions was their ability to comprehend language.

TABLE 2. Means and standard deviations (in parentheses) for pragmatic measures which showed significant differences at $p < 0.05$ in the preliminary experiment ($n = 16$; two-tailed probability) and the means and standard deviations on these same measures in the main experiment ($n = 10$; one-tailed probability). Numbers represent frequency of occurrence per 100 utterances.

	Preliminary Experiment		*Main Experiment*	
Measures	*Normal Listener Condition*	*Developmentally Delayed Listener Condition*	*High Comprehension Listener Condition*	*Low Comprehension Listener Condition*
NONLINGUISTIC CONTEXT				
28. Nonpresent reference	12.6 (18.9)	0.3 (1.0)*	3.9 (3.8)	0.8 (1.4)*
29. Nonverbal cueing —objects	10.8 (5.7)	17.9 (11.0)*	6.8 (4.2)	11.5 (3.6)*
LINGUISTIC CONTEXT				
31. Exact self-repetition	0.19 (.4)	2.8 (3.0)*	2.1 (1.4)	2.1 (1.6)
32. Expansion self	1.1 (2.5)	3.7 (1.7)*	1.6 (2.2)	1.8 (1.5)
33. Reduction self	0.31 (.6)	2.9 (2.3)*	1.0 (.8)	1.8 (2.0)
36. Imitate child	5.2 (2.5)	2.3 (2.3)*	2.5 (2.2)	2.3 (2.5)
FUNCTION				
42. Request confirmation	10.44 (4.6)	3.69 (2.3)*	8.0 (4.5)	8.1 (5.1)
45. General information	1.75 (2.8)	0.12 (0.5)*	0.5 (0.7)	0.5 (1.3)

*Results significant at $p < 0.05$.

Hypothesis

It was predicted that the 21 measures of child-directed talk (CDT) in the preliminary experiment adjusted to children's different general developmental levels would also be adjusted in the main experiment to children's different levels of language comprehension. CDT used with high comprehension level children was expected to be similar to language addressed to the normal children in the preliminary experiment, because all these children had equivalent language comprehension levels. Likewise, CDT used with low comprehension level children was expected to have the same modifications observed in CDT addressed to developmentally delayed children in the preliminary experiment.

Subjects

Subjects were 10 volunteer mothers from the Seattle area who had previously participated in the preliminary investigation. Each adult had a child between 2 and 4 years of age, exhibited no major sensory or intellectual deficits, and was a native speaker of standard American English. The adults were required to have children because of Snow's (1972) finding that mothers were somewhat better at adjusting their language to young children than were nonmothers.

Conditions

Adult subjects interacted with children under two conditions. The conditions were the *high comprehension listener condition* and the *low comprehension listener condition.* Children of varying comprehension levels were used to create these experimental conditions to which adult subjects were exposed. Thus, level of comprehension was the quasi-independent variable with operationalization of the variable accomplished by using children who varied in their level of language comprehension. The language used by the adult subjects in these experimental conditions constituted the dependent variable.

Four children were used to create the two experimental conditions. They were males, between 4 and 5 years of age, having nonverbal cognitive and social skills within normal limits. Table 3 contains the measures used for assessing nonverbal cognitive and social skills. All four children were substantially delayed in expressive language, being at a single-word level. None of the children had obvious major physical, emotional, or sensory deficits. The native language of each child's home was standard American English.

As Table 3 indicates, the children comprising the *high comprehension listener* and *low comprehension listener* conditions varied substantially in their receptive language level. Four standardized tests, each of which taps a somewhat different aspect of receptive language, were used to establish

TABLE 3. Tests used to determine receptive language, nonverbal cognition, and social skills of the children creating the experimental conditions. Test performances are expressed in terms of a z score or interpretive comments where z scores were not available.

Test	*High Comprehension Listener Condition (Child A/ Child B)*	*Low Comprehension Listener Condition (Child C/ Child D)*
I. Chronological age	4;0/ 4;11	4;8/ 4;7
II. Receptive lexicon		
A. *Peabody Picture Vocabulary Test* (Dunn, 1959)	−0.66/ −1.33	−2.13/ −2.20
B. Auditory Reception Subtest of *Illinois Test of Psycho-Linguistic Ability* (Kirk, McCarthy, and Kirk, 1968)	−1.0/ −1.0	no basal/ no basal
III. Receptive syntax		
A. *Test for Auditory Comprehension of Language* (Carrow, 1973)	−0.9/ 0.87	−3.05/ −3.05
B. *Northwestern Syntax Screening Test* (Lee, 1971)	−0.85/ −0.64	−3.19/ −2.55
C. *Assessment of Children's Language Comprehension* (Foster, Giddan, and Stark, 1973)	No standard deviations available. Children in the high comprehension listener condition had scores within the 4 year range; children in the low comprehension listener condition had scores at or below the 3 year range.	
IV. Nonverbal cognition *Leiter International Performance Scale, Arthur Adaptation* (Arthur, 1952)	1.3/ 0.00	−0.56/ −0.93
V. Social skills *Vineland Social Maturity Scale* (Doll, 1965)	An estimate of social maturity was based on all items except the communication items. Excepting these items, each child passed all items at or above the level expected for his chronological age.	

comprehension levels. Supplementing the results of these standardized measures of receptive language were supporting impressions obtained from an informal object manipulation task and a formal test of receptive language which does not provide standard deviations in its norms (*Assessment of Children's Language Comprehension*, Foster, Giddan, and Stark, 1973). The two children creating the *high comprehension listener* condition performed within one standard deviation of the mean for their chronological age on the four standardized tests of receptive language, with the exception that one child scored below minus one standard deviation on the *Peabody Picture Vocabulary Test.* The two children creating the *low comprehension listener* condition scored substantially below age level expectations (greater than minus two standard deviations) on all of these measures.

In summary, language-impaired children were used to allow for the experimental control of a variable which could otherwise not have been achieved. Considerable efforts were made to make the children as similar as possible in all respects other than language comprehension level.

Procedures

Each condition involved an adult subject playing with a high comprehension listener or a low comprehension listener. The one-half hour interactions were conducted in a therapy room at a university clinic facility. Half the adult subjects, chosen at random, were assigned to the *high comprehension listener* condition first, while the other half were assigned to the *low comprehension listener* condition first. After the first condition was completed, the subjects immediately participated in the remaining condition.

The investigator was not present in the room during the experimental session. Each half-hour session was videorecorded. A camera with a zoom lens was mounted in each room and videotechnicians operated the cameras from behind one-way observational mirrors.

Prior to each experimental condition, each adult subject was told to play and interact naturally with the child for the duration of the half-hour session. In order to keep the adults as unconcerned as possible about their own language, they were told they were participating in a study of children's interactions with unfamiliar adults. Only after all data were collected were the adults told that their own language was the focus of the study. An effort was made to vary the toys somewhat from subject to subject in order to maintain the child's interest, while still providing similar types of toys. Each adult subject, however, used the same set of toys in the two conditions of each experiment.

Data

The data were derived from child-directed talk (CDT) provided by the adult subjects in each experimental condition. To obtain samples for analysis, transcription was started five minutes after the start of each videorecorded session and was continued until 100 utterances satisfying the rules for computing mean length of utterance (see Appendix B) were obtained. For these samples, both adult and child language and nonlinguistic situational context were transcribed according to conventions in Bloom and Lahey (1978, Appendix A.1), with the exception that adult utterances were separated from contextual information and placed in a middle column.

Analytic Scheme

The measures of adult child-directed talk (CDT) listed in Appendix A

were divided into two main categories reflecting two major aspects of CDT—the structural and the pragmatic.

For the structural aspect, measures were again divided into two subcategories including semantic-syntactic and lexical measures. The measures included in the semantic-syntactic category are believed to reflect both semantic and syntactic complexity. For measure 1(MLU), for example, an utterance is often increased by adding more semantic categories and/or increasing syntactic complexity. In *She is busy*, which contains three morphemes, there is one semantic category-state. In *She is very busy*, which contains four morphemes, there are two semantic categories-state and extent. The syntactic complexity of this second utterance has been increased as well by the addition of a modifier to the verb phrase. Generally, both semantic and syntactic complexity tend to increase in longer utterances. Although the remaining semantic-syntactic measures focused on the semantic aspect of CDT, they indirectly reflect syntactic complexity as well. Coordinating more semantic categories within an utterance will increase generally the syntactic complexity of the utterance as well. Thus, mean number of semantic categories per utterance (measure 2) reflects both semantic and syntactic complexity.

The frequency of each semantic category measure (measures 4 through 26) also reflects syntactic complexity in yet another way. Language is verb central. The verb categories in the scheme include action, locative, state, and notice. All other categories are generally embedded as constituents of verb relations. The occurrence of these other categories thus generally indicates longer and syntactically more complex utterances. This is most obviously true for the five semantic categories which can be used to form complex sentences (Bloom & Lahey, 1978, pp. 192-199). These are coordinate, causality, time, epistemic, and antithesis. An increased frequency of these categories would thus suggest increased syntactic complexity as well.

It is important to consider the structural complexity of CDT at the level of individual words. This contrasts with the previous semantic-syntactic measures which reflected the complexity of entire utterances. A lexical type-token ratio was used to analyze the lexical variety which occurred in the adults' CDT.

Pragmatics is concerned with the use of language as a social act, as distinct from the study of language structure (semantic-syntactic and lexical aspects). In this study, pragmatics was subdivided into the subcategories of context and function.

The contextual analyses were concerned with how each utterance related to the context in which it was uttered. Utterances do not exist or function in isolation. They are generally part of the context, both nonlinguistic and linguistic, in which they occur. The analysis of the relationship of child-directed talk (CDT) to the nonlinguistic context focused first of all on the extent to which the adult's utterances had perceptual support (measure 28). When perceptual support was present, the extent to which

the adult used gestures relating the nonlinguistic context with the content of their utterances was of interest (measures 29 and 30). These two measures determined one type of redundancy: that of gesture with respect to language.

The analysis of the relationship of CDT to the linguistic context provided an indication of how each adult utterance related to the immediately prior utterance, be it of the child or the adult. Measures 31 through 36 gave an indication of the degree of redundancy of the language used by the adult.

In addition to relating to the context in systematic ways, language is used for a purpose. It is a social behavior used to attain certain consequences. Neither semantics nor syntax deals with the use of language as a social tool. For example, the utterance *It's hot* semantically refers to a state, regardless of the purpose for which it is used. Pragmatically, however, its communicative function depends on the social context in which it is used. It may be intended as (a) a comment (for example, concerning the speaker's state), (b) a request (for example, that someone open a window), or perhaps (c) a warning (for example, to a child about to touch a stove). The analysis of communicative function considered what the speaker was trying to do by using language. The analysis of CDT used in this study tapped two broad functions language serves: requesting and commenting. Very generally, requests are speech acts which function to influence or regulate the behavior of the listener. Comments, on the other hand, offer information.

In the preliminary study, 21 of these 47 measures of CDT were found to be adjusted to the general developmental level of the child-listener (see Tables 1 and 2). These included measures reflecting each of the structural and pragmatic aspects of language (the definitions of these 21 measures of CDT are in Appendix B). Because the comprehension hypothesis predicted that changes in all aspects of CDT occur as a function of the child's comprehension level, these 21 CDT modifications also were expected to occur in the present investigation. Furthermore, if only more restricted aspects of CDT were influenced as a function of the comprehension level of the child-listener, the broad scope of measures would allow this more specific influence to be determined.

In the present study, the analysis was carried out on 2,000 utterances (ten adult subjects, two experimental conditions each, 100 utterance samples per condition). All measures, with the exception of three, were computed based on the frequency with which they occurred in each 100-utterance sample. Thus, for example, a value of 27.3 for no verb (measure 3 in Appendix A) would indicate that an average of 27.3 utterances in each 100 utterance sample did not contain a verb. The three exceptions to this computation method were mean length of utterance (measure 1), mean number of semantic categories per utterance (measure 2), and lexical diversity (measure 27). As the names of the measures indicate, mean length of utterance and mean number of semantic categories per utterance were

averages based on computations made for every utterance. Lexical diversity was based on 200 word samples.

Child Behavior Measures

After the data from the adult subjects were collected, some post hoc measures of child behaviors were made to determine if the measured differences in level of comprehension of the children determined by preexperimental testing resulted in significant differences in the comprehension feedback the children provided in the actual experimental sessions. In other words, this was done to validate the child-created experimental conditions. The following two measures of the children's comprehension feedback were obtained from the videotapes of the actual experimental sessions. The same transcribed samples used in the analysis of adult language provided samples for these child behavior measures.

1. Appropriate response. The percentage of appropriate responses to all adult utterances coded as requests for action, information, or permission which required responses was determined. An appropriate response could be motoric (for example, performing an action requested by the adult, pointing to the location of an object in response to *where* questions, and so forth), gestural (shaking head to indicate yes or no in response to yes/no questions), or verbal. Inappropriate responses included all verbal or motoric responses unrelated to the adult's utterance, or no response at all.

2. Appropriate response to confirmation requests. The percentage of appropriate responses to adult requests for confirmation were determined. This measure was believed to reflect the child's social skill as a conversational partner possibly more than his specific linguistic comprehension skill. It was thus analyzed separately from responses to other types of requests.

Two further measures were obtained from data collected during the experimental sessions. These are measures 3 and 4 defined below, which were designed to determine if there was consistency in the treatment conditions created by the children for all the adult subjects.

3. Percent intelligibility (adapted from comprehensibility measure by Cross, 1977). Percent intelligibility was computed by determining the percentage of each child's utterances which was intelligible. Adult responses to the child's utterances were often used in making this judgment. For example, the child's utterance was considered unintelligible if the adult response was *What?* or *What did you say?*

4. Total number of intelligible words occurring in sample. This category excluded *yes* and *no* verbal responses because they were also frequently conveyed by head nods which were equally communicative and responded to similarly by the adults.

Reliability

Reliability was established for transcription and for scoring procedures.

The reliability for transcription was obtained by having three independent judges transcribe two 100-utterance samples on each of two randomly selected subjects (400 utterances total). This same procedure was used in obtaining reliability for the scoring system. For transcription, percent agreement for segmentation of the corpus into utterances, morpheme agreement, description of the nonlinguistic context, and for categorization of utterances as a question (based on subject-verb inversion, containing a tag, and/or having raising terminal contour) ranged from 89 to 99 percent. For scoring procedures, interjudge agreement ranged from 98 to 99 percent for mean length of utterance; 98 to 100 percent for lexical diversity; 82 to 88 percent for coding semantic categories; and 79 to 89 percent for the pragmatic categorization scheme. For child behavior measures, reliability was based on interjudge agreement on four randomly chosen samples. Percent agreement ranged from 74 to 92% on the four measures.

RESULTS

Because the results of the preliminary investigation provided predictions for the outcome on the 21 measures of CDT in the present study, a one-tailed t test for paired samples was used to assess the significance of the CDT used in the *high comprehension listener* versus the *low comprehension listener* conditions. Significant differences in the adults' CDT ($p < 0.05$) were obtained on four of the 21 measures. These included two measures of the structural aspect of CDT shown in Table 1 and two pragmatic measures shown in Table 2. Of the remaining 17 measures predicted by the results of the preliminary study to show significant differences in the main study, 14 had means in the expected direction and the remaining three had means that were tied. These results only partially support the comprehension hypothesis which predicts that adults will modify all aspects by their talk (CDT) to a child as a function of that child's comprehension level.

No measures of semantic-syntactic complexity, except the frequency of the semantic category state, were significant in this study and could thus be considered to be adjusted primarily to the comprehension level of the child-listener. Pragmatic measures of the linguistic context likewise did not reveal significant differences between CDT used in the *high comprehension listener* versus the *low comprehension listener* condition. No pragmatic measures of communicative function were significant. However, the comprehension level of the child-listener did influence significantly the pragmatic aspect of CDT which considers how utterances relate to the nonlinguistic context. The adult subjects made more reference to nonpresent objects, persons, and events and provided less nonverbal cueing in the *high comprehension listener* condition. Lexical diversity also revealed significant differences between CDT used in the two conditions, being higher in the *high comprehension listener* condition than in the *low comprehension listener* condition.

Child Behavior Measures

The measure of appropriateness of child responses to requests for action, information, or permission was significant ($p < 0.05$, $df = 7$) with children in the *high comprehension listener* condition (*mean* = 53.7) giving more appropriate responses than children in the *low comprehension listener* condition (*mean* = 38.6). The measures of appropriateness of child responses to requests for confirmation were not significantly different. Because it is possible that responses to requests for confirmation may reflect social skills rather than language comprehension per se, these overall results indicate that the children in the *high comprehension listener* condition gave significantly more comprehension cues than did children in the *low comprehension listener* condition.

The two child language measures, intelligibility and total number of words, were not significantly different between the two conditions. These results indicate that the quality and quantity of verbal cues given by the children in the two conditions were not significantly different.

DISCUSSION

The purpose of the present study was to investigate the comprehension model of child-directed talk (CDT). Two premises of this model are 1) that modifications characteristic of adult CDT are produced in an effort to enhance the child's comprehension, and 2) these adjustments are shaped by comprehension feedback from the child. The important implication is that a child's comprehension level is the *crucial* factor determining the adjustments found in CDT.

The results of the present study only partially supported this hypothesis. The two types of children (those with high and those with low comprehension levels) did provide different amounts of comprehension feedback. The adult subjects revealed some sensitivity to this difference by adjusting on four of the 21 measures of CDT. These adjustments were nevertheless fewer than the comprehension model predicted.

Of the means which were not significantly different, all were either in the predicted direction or tied. This trend suggests that the children's comprehension level may have had some systematic influence on many other CDT modifications. However, these means were not significantly different. Thus, it cannot be concluded that the child's language comprehension level was the single major variable shaping the aspects of adults' CDT tapped by the 17 non-significant measures.

The following section explores possible reasons both for these particular findings and for the lack of influence of comprehension level on the semantic-syntactic complexity of CDT. Then, the conversational model is evaluated as a possible alternative explanation.

Lack of attention to developmental change in the strategies children use to derive meaning from language underlies the failure of the comprehen-

sion model to explain the semantic-syntactic complexity of CDT. In comprehension development, "progress seems to be from an understanding of objects and some nonlinguistic symbols [gestures] one at a time, to a coordination of such signals, and to an understanding of objects' linguistic names, and thence to an understanding of syntax" (Macnamara, 1977, p. 32). Children begin with a reliance on the nonlinguistic context coupled with nonverbal cueing. Next they add an understanding of key lexical elements, and finally use semantic-syntactic structure to derive meaning from utterances. Therefore, the sources of meaning to which feedback is a response change as children progressively develop new comprehension strategies.

If children rely on developmentally appropriate strategies, then adults can facilitate a child's comprehension by adjusting to the strategies characteristic of the child's level of development. For example, if a child relies primarily on the nonlinguistic context in conjunction with nonverbal cueing, the adult should use the here and now along with such nonverbal cueing. This argument contrasts with the comprehension model which sees adults adjusting to the child's knowledge of language structure rather than to the child's developmentally determined comprehension strategies. The findings of the present study indicate that developmental characteristics of children's comprehension strategies are determinate.

Let us now consider how, depending on their developmental level, children's responses to linguistic messages can be influenced by the nature and availability of four other sources of meaning: 1) reference to the present nonlinguistic context, 2) nonverbal cueing, 3) lexical items within utterances, and 4) semantic-syntactic structure. For each we will consider the relationship between comprehension strategies and adjustments in CDT noted in this and other studies.

Nonlinguistic context. One obvious cue used by children is the nonlinguistic context in which an adult utterance occurs. When adults emphasize objects, events, and relations present in the here and now, they facilitate the child's derivation of meaning from the utterance. "When a sentence is redundant with respect to the context in which it occurs, the amount of information which he needs to get from the linguistic message is probably minimal. On the other hand, knowledge of semantic constraints and knowledge of syntax are necessary for understanding messages that do not refer to the contexts in which they occur. In such utterances, the 'meaning' is in the linguistic message" (Bloom and Lahey, 1978, p. 243). Apparently there has been no previous investigation of chidren's comprehension as a function of the presence or absence of contextual support. In the present study, adults' talk directed to children with low comprehension levels contained significantly fewer utterances with reference to nonpresent objects, persons, and events. If the assumption of the comprehension model that feedback from the child shapes CDT is valid, these children must have indicated in some way that they could best derive meaning from utterances referring to the here and now. This

finding is consistent with the positive significant correlation found by Cross (1977) between children's receptive language level and the amount of reference to the nonpresent in their mothers' CDT. Moerk (1975) suggests that one of the major functions of maternal verbal interactions with their children is to translate the nonlinguistic context (objective, environmental, and pictorial) into the verbal medium.

Nonverbal cueing. Nonverbal cueing (explicit gesture and pointing which accompany utterances) is another important source of meaning. Shatz (1978) found that the extent of nonverbal cueing in mothers' CDT varied considerably. The mother of the youngest child cued 75% of all her directives while the mother of the oldest cued less than 20% of her directives. Shatz concluded that "cueing may be an attempt to focus the immature child's attention on the referents of speech" (p. 44). She did not, however, find that mothers' cueing had an effect on their children's appropriate response rate. Macnamara (1977), on the other hand, demonstrated that gesture can carry great meaning independent of language. When a gesture was introduced which conflicted with the linguistic message, the children most often responded to the gesture.

In the present study, nonverbal cueing was one of the very few aspects of CDT significantly influenced by a child's comprehension level. This suggests that the children with low comprehension abilities responded differentially to the presence versus the absence of nonverbal cueing in the adults' behavior. There were significantly more instances in the low comprehension condition than in the high comprehension condition for which the adult simultaneously cued (pointed to, placed, held and examined, reached for, offered, picked up, tapped on, or showed) objects or locations referred to in her utterances. This cueing likely assisted the children in figuring out the noun referents without their necessarily understanding the language itself.

Most studies have focused only on the verbal aspects of CDT, nonverbal cueing was addressed in two studies. Wedell-Monnig and Westerman (1977) found that mothers of deaf children continued to accompany their CDT with nonverbal cues, whereas mothers of normal-hearing children gradually eliminated nonverbal cues. Garnica (1977) found that the amount of nonverbal cueing by adults was inversely related to the child's age and responsiveness. In both these studies, the child's comprehension cues were believed to have shaped the adults' nonverbal cueing. The findings of the present study are consistent with this conclusion.

The original measures of nonverbal cueing looked only at adult gestures and actions. It seems very likely that adults also would use the child's gesture and activity to facilitate the child's comprehension. That is, the child's activities and focus of attention as evidenced by his pointing, and so forth, might also be referred to more frequently in the adults' talk directed to children with greater comprehension deficits. To look at this possibility, a post hoc measure was devised that examined how frequently the adults' utterances contained reference to an object (or location) that

the child was pointing to, showing, placing, holding and examining, reaching for, offering, picking up, tapping on, and so forth. This measure revealed significant differences. More adult utterances contained reference to child-cued objects and locations in the low comprehension condition than in the high comprehension condition.

Lexical adjustments. Several studies demonstrate that during the early development of grammar, children respond to lexical rather than structural aspects of language (Chapman & Miller, 1975; Macnamara, 1977; Wetstone & Friedlander, 1973). In the present study, there was less lexical diversity in talk directed to children with low comprehension levels. Additional studies have noted that the lexical diversity of CDT increases as the age of the child being addressed (and presumably their comprehension level) increases (Broen, 1972; Fraser & Roberts, 1975; Phillips, 1971, 1973).

Semantic-syntactic structure. Both direct and indirect evidence from experimental studies indicates that children younger than 3½ to 5 do not make consistent use of word-order (a key aspect of semantic-syntactic structure) as a basis for language comprehension (Carrow, 1968; Chapman & Miller, 1975; deVilliers & deVilliers, 1973; Fraser, Bellugi, & Brown, 1963; Macnamara, 1977; Strohner & Nelson, 1974; Wetstone & Friedlander, 1973). The low comprehending children in this study were functioning below the age level equivalency at which they would be expected to rely primarily on semantic-syntactic structure to derive meaning. Because these children were probably not using semantic-syntactic structure to comprehend, it is unlikely that they gave more comprehension feedback to structurally simpler utterances. If this is the case, the adults would have had no feedback to which to adjust the semantic-syntactic structure of their CDT. It seems logical, then, that the semantic-syntactic structure of the talk adults directed to low comprehension level children was not significantly simplified. Instead, comprehension was facilitated by making other sources of meaning more salient.

The high comprehension-level children, on the other hand, would be expected to use primarily semantic-syntactic structure in deriving meaning from utterances. With these children, adults would not be expected to emphasize other sources of meaning as much as they would with low comprehension level children. This corresponds exactly with the findings of the present study.

In summary, then, the comprehension model has received only partial support from the results of this study. However, the implications of the comprehension model for the role of CDT in the language acquisition process may still hold. The specific sources of meaning on which a child focuses in decoding linguistic messages change as the child develops. By emphasizing exactly those cues on which a child tends to focus, CDT may facilitate the child's development of language. As the data presented here suggest, the adult tailors talk to the child's *strategies for learning language* rather than to the child's *actual knowledge of language structure.*

Consequently, the potential role of CDT in the language development process has not been discredited by the results obtained. Instead, CDT may just function in a manner different from that which has been previously suggested. Future research may confirm that adults' adjustment to children's strategies is indeed important to the development of language.

Conversational Model Revisited

If the comprehension model does not explain the results of the present study regarding the semantic-syntactic complexity of child-directed talk (CDT), it seems reasonable to ask whether the conversational model does. The conversational model posits that the child's nonverbal cognitive ability shapes the semantic-syntactic complexity of CDT.

Using data from the preliminary and main experiments, an attempt was made to determine if a child's nonverbal cognitive level of development does influence the semantic-syntactic aspect of CDT. This was done by comparing talk addressed to the two developmentally-delayed children in the preliminary experiment with that addressed to the two low comprehension level children in the main experiment. These children were similar in receptive and expressive language level; they differed substantially only in the nonverbal cognitive level of their development. The low comprehension level children had normal nonverbal cognitive development; the developmentally delayed children had low (substantially below age level expectations) nonverbal cognitive skills.

Table 4 presents the means and standard deviations obtained on three semantic-syntactic measures in these two conditions. None of these measures revealed significant differences between the two conditions in a t test for paired samples ($p < 0.05$). Hence no support was found for the assumption of the conversational model that a child's nonverbal cognitive level is the major determinant of the semantic-syntactic aspect of CDT.

TABLE 4. The effects of nonverbal cognitive level on the semantic-syntactic aspect of CDT.

	Listener with High Nonverbal Cognition		*Listener with Low Nonverbal Cognition*	
CDT Measure	*Mean*	*(SD)*	*Mean*	*(SD)*
1. Mean length of utterance	4.6	(1.0)	4.3	(1.0)
2. Mean number of semantic categories per utterance	1.6	(.31)	1.4	(.51)
3. No verb	31.8	(8.8)	36.0	(11.5)

Note: Values are for the 10 adults who participated in both Experiments.

CONCLUSION

Despite numerous studies, the evidence does not yet indicate what specific child variables shape child-directed talk (CDT). Results have been conflicting and designs have been largely correlational. In an attempt to reconcile these results, an experiment was designed to examine differences in the talk addressed to children with two differing levels of language comprehension. The results demonstrate that the comprehension model does not provide an adequate account of all aspects of CDT. Furthermore, the conversational model fails to explain the semantic-syntactic complexity of CDT.

Perhaps our focus should be shifted from language knowledge to strategy (Lieven, in press a, b; Nelson, 1973). Examination of how a child's strategies for learning language influence adult CDT may better reveal how adults influence the language acquisition process.

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APPENDIX A

Categorization of the 47 measures used to analyze adult CDT in the preliminary experiment. Measures which were sensitive to CDT adjustments are identified with an asterisk.

I. Structural measures

A. Semantic-syntactic
- *1. Mean length of utterance
- *2. Mean number of semantic categories per utterance
- *3. No verb
- 4. Existence
- 5. Nonexistence-Disappearance
- 6. Recurrence
- 7. Rejection
- *8. Denial
- *9. Attribution
- *10. Possession
- 11. Action
- 12. Locative
- *13. State
- 14. Quantity
- 15. Notice
- *16. Time
- *17. Coordinate
- *18. Causality
- 19. Dative
- 20. Specifier
- *21. Epistemic
- 22. Mood
- 23. Antithesis
- *24. Extent
- 25. Manner
- 26. Nonsemantic

B. Lexical
- *27. Lexical diversity

II. Pragmatic measures

A. Context: *Nonlinguistic*
- *28. Nonpresent reference
- *29. Nonverbal cueing—object
- 30. Nonverbal cueing—action

Linguistic
- *31. Exact self-repetition
- *32. Expansion self
- *33. Reduction self
- 34. Complete or answer self
- 35. Expansion child
- *36. Imitation child
- 37. Related topic
- 38. New topic

B. Communicative function: *Request*
- 39. Request attention
- 40. Request action, information, or permission
- 41. Proposal joint action
- *42. Request confirmation

Comment
- 43. Child activity or state
- 44. Adult activity or state
- 45. Reinforcing comment
- *46. General information

Residual
- 47. Residual

APPENDIX B

Definitions of the 21 child-directed talk (CDT) measures predicted to reveal significant differences as a function of the language comprehension level of the child-listener. Measure numbers correspond to the numbers in Appendix A.

I. STRUCTURAL MEASURES

A. Semantic-Syntactic Measures

1. Mean length of utterance. Mean length of utterance was based on a morpheme count computed according to criteria set forth by Brown, 1973 (p. 54), and adapted for application to adult language. Brown's criteria which related to a child's limited knowledge of morphology were eliminated. Thus, irregular past tenses and catenatives (for example, *wanna*) were counted as two rather than one morpheme (Rondal, 1976).

2. Mean number of semantic categories per utterance. Twenty-two semantic content categories were used to analyze the mean number of semantic categories per utterance. Twenty were from Bloom and Lahey (1978, Appendix B, pp. 610-612). Their categories were

in some cases combined, added to, restricted, or in other ways adapted for use with adult language. Two more categories (extent and manner) were added to their scheme (for definitions of additional measures beyond those found in this appendix, see Van Kleeck, 1978). A residual category included all stereotypic utterances which are part of a social interaction only, and which lack reference to ideas about the world. This category was called nonsemantic. A zero was averaged in the calculation of the mean number of semantic categories per utterance for each utterance falling completely in the nonsemantic category. Thus, if an adult used more empty social speech in any particular experimental condition, this measure reflected it.

3. No verb. Utterances which did not contain a verb were categorized under no verb.

8. Denial. Utterances were categorized as denial if they negated the identity, state, or event expressed in the previous utterance (whether the previous utterance was the child's or the adult's). In the following two consecutive utterances, the second is an example of denial. *That's a sheep. Oh no, he's not.* (from Bloom and Lahey, 1978, p. 610).

9. Attribution. Utterances which made reference to properties of objects with respect to (a) an inherent state of the object (for example, *broke* or *sharp*) or (b) specification of an object that distinguishes it from others in its class (for example, *red, big,* or *bread,* as in *bread book* were categorized as attribution). Another form of coding attribution was to refer to an attribute as a condition of the object with a copula sentence as in *the car is big.* This form of coding attribution was placed under state (measure 13) (from Bloom and Lahey, 1978, p. 610). The specification of a class within a class of objects by use of phrases such as *a kind of pencil, a sort of pencil,* or *a type of pencil* was also coded as attribution.

10. Possession. Utterances placed in this category made reference to objects within the domains of different persons, as in *that's the baby's bottle* or *his feet are big.* As with attribution, there is an alternative form for coding possession. One can specify the possessive state of the object with the copula sentence, as in *the car is mine.* This form of coding possession was placed under state (from Bloom and Lahey, 1978, p. 610).

13. State. Utterances in this category made reference to states of affairs involving persons or other animate beings including (a) internal states, as in *I like the dolly's dress,* (b) external states, as in *it's dark outside,* (c) states of ownership or possession, as in *the car is mine,* or (d) attributive states, as in *he's funny* (from Bloom and Lahey, 1978, p. 611). Also coded as state were the state of affairs involving objects often given semi-animate status (for example, vehicles), as in *the car needs gas.*

16. Time. Utterances containing noninflectional reference to time were coded as time. These included adverbs *(just, now, then,* or *before)* and nouns or noun phrases *(at night, yesterday,* or *next year).*

17. Coordinate. This category included utterances which referred to two events or states (or both) that were independent of each other (in other words, the joining of the two did not create a new meaning), but were somehow bound together in space or time (or both). The two clauses could include the same or different verbs and could relate to sequential, simultaneous, or static events and/or states. This category was also used to refer to two objects conjoined intraclausally that were independent of each other, but were bound together in space or time (or both). Examples of utterances coded as coordinate include, *Bert and Ernie want to go for a ride* (intraclausal), *Cookie Monster's gonna eat some cookies and Bert's gonna eat some, too* (interclausal, same verb), and *he keeps running and jumping* (interclausal, different verb (from Bloom and Lahey, 1978, p. 611).

18. Causality. Utterances included in this category were those which had an implicit or explicit cause and effect relationship between two verb relations. That is, one expressed event or state was somehow dependent upon the other for its occurrence, as in *move your juice away from the edge so it doesn't spill* (from Bloom and Lahey, 1978, p. 612).

21. Epistemic. When the relationship between two states or an event and a state referred to certainty or uncertainty about an event or state, the relationship was classified as epistemic, as in *I think maybe it's broken* (from Bloom and Lahey, 1978, p. 612).

24. Extent. Utterances which contained reference to degree, intensity, or duration were coded as extent. This included *pretty,* as in *that's pretty big; little,* as in *it's a little hard to open; very,* as in *the baby is very tired;* and so forth.

B. Lexical Measure

27. Lexical diversity. Lexical diversity was computed by a lexical type-token ratio. The number of different words (types) was divided by the total number of words in the sample

(tokens). It was computed on the first 200 words of the written transcription. Free morphemes which carried bound morphemes were counted separately. Thus, *boy* and *boys* were considered as different types.

II. PRAGMATIC MEASURES

A. Context: Nonlinguistic

28. Nonpresent reference. Utterances making complete or partial reference to spatially and/or temporally removed objects, persons, and events were categorized as nonpresent reference.

29. Nonverbal cueing—object. Utterances containing reference to an object or location the adult was simultaneously pointing to, placing, holding and examining, getting, offering, picking up, tapping on, or showing were categorized under nonverbal cueing—object. This measure was believed to reflect the amount of assistance the adult gave the child enabling him to comprehend the noun referents contained in the linguistic message without the child necessarily having to understand the language itself.

A. Context: Linguistic

31. Exact self-repetition. When the adult's utterance was a total or partial exact repetition of her own previous utterance, and no child utterance intervened, it was categorized as an exact self-repetition.

32. Expansion self. Coded as expansion self were adult utterances which were expansions of the adult's previous utterance, when no child utterances intervened. These utterances added some new information while retaining the grammatical form of the previous utterance or merely expanded the grammatical form. Pronoun substitutions were allowed. In the following two consecutive utterances, the second was coded as expansion self. *Put it on the table. Put it on the table in the kitchen.* The second utterance added more information.

33. Reduction self. Utterances which reduced the information and/or form of the adult's previous utterance, when no child utterance intervened, were coded as reduction self. In the following two consecutive adult utterances, the second was coded as reduction self. *What do daddys say when you're going to sleep? What do they say?*

36. Imitation child. Total or partial imitations of a child's utterance, or imitations of a child's utterance where pronouns have been reversed were included in this category. In a sequence where the child said *I can build it real tall,* and the adult responded *you can build it real tall,* the adult utterance was coded as imitation child.

B. Communicative Function: Request

42. Request confirmation. Utterances which were primitive tags, regular tags, and question of the type *isn't that a nice truck?* Were coded as request confirmation.

B. Communicative Function: Comment

46. General information. Comments which gave information but did not directly describe ongoing activities or states were placed in this category. For example, *my little boy is three years old* was placed in this category.