MATERNAL QUESTION USE PREDICTS LATER LANGUAGE DEVELOPMENT IN SPECIFIC-LANGUAGE-DISORDERED CHILDREN

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The present study used a longitudinal correlational design to test whether variation in mothers' use of information-seeking and confirmation questions predicts variation in auxiliary and copula development in a sample of specific-language-disordered children. The study's confirmatory approach provides a sound empirical basis to conclude that the results of the present study did not occur by chance. Post hoc analyses were carried out to clarify the explanation of the predictive relationships. The main finding of the study was that mothers of specific-language-disordered children who used proportionally more information-seeking questions had children who showed greater mastery of auxiliary use 12 months later.

Researchers have studied the association between naturally occurring variation in maternal speech and later child language development for at least two reasons. First, naturalistic studies contribute to an understanding of why some children learn language more quickly than others (Hoff-Ginsberg & Shatz, 1982, for review). Second, some researchers have used such naturalistic studies to suggest therapeutic interaction styles (Cross, 1984).

Past studies have rarely used children with handicaps when examining the relation between maternal speech and child language development. Noteworthy exceptions are Sigel and McGillicuddy-Delisi's (1984) study of communication-handicapped children and Kenworthy's (1986) study of hearing-impaired children. The dearth of information on the relation between maternal speech and later language development in children with handicaps is surprising because handicapped children are frequently in need of therapeutic interaction.

Past results of naturalistic studies of maternal speech–child language development relations should be replicated with handicapped samples for two reasons. First, maternal speech that positively predicts child language development in normally developing children may not predict language development in handicapped samples. The handicap may create difficulties in attending to, understanding, or processing the linguistic data in the mother's speech. Second, most past studies were conducted in a way that produced many significant correlations by chance. The probability of finding significant correlations by chance increases as the number of correlations tested on one sample increases (Schwartz & Camarata, 1985). One statistical solution (i.e., Bonferroni's solution) to this problem is to divide the alpha level by the number of tests of significance (Howell, 1982). Using Bonferroni's solution with the typically small sample size of maternal speech-child language development studies would result in underidentifying many important relations, thus hindering further investigation. Testing the target relations with different samples is a more practical, yet reasonable, test of the generalizability of maternal speech-child language development relations.

Specific-language-disordered (i.e., SLD) children are a particularly promising clinical subgroup for examining maternal speech–child language development relations that have been found in previous exploratory studies on normally developing children. By definition, SLD chil-

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dren have chronologically average performance intelligence levels and intact hearing but have severely delayed productive language (Johnston, 1982). The cause of the productive language impairment in such children is usually not known (Leonard, 1987). Given their nonlanguage abilities, these children may be able to take advantage of many of the adult linguistic models to learn new linguistic structures.

The Potential Maternal Predictors and Child Outcomes Under Investigation in the Present Study

Mothers' questions represent one aspect of maternal speech that has most often been associated with later child language development (Barnes, Gutfreund, Satterly, & Wells, 1983; Furrow, Nelson, & Benedict, 1979; Gleitman, Newport, & Gleitman, 1984; Hoff-Ginsberg, 1986; Yoder & Kaiser, 1989). Hoff-Ginsberg (1986, 1987b) stated three overlapping reasons why questions may facilitate later language development. First, some questions present the to-be-learned linguistic data in a particularly salient, perhaps more analyzable, form more frequently than do other maternal utterances. For example, the rising intonation, obligation to respond, and subject-operator inversion of many questions may make the copula or auxiliary and other linguistic structures salient to the child. Second, some question types may "prod the child to analyze adult language." That is, some questions require formulating a response even when the child's language is slightly inadequate to fully address the question. When the child tries to formulate a response and cannot, he or she may be stimulated to analyze adult language to improve his or her ability to adequately respond. Finally, frequent question asking may index a maternal style that elicits child conversation that in turn is supportive of language development in many ways (McDonald & Pien, 1982).

Certain types of questions are more likely to be associated with language development than others. Information-seeking questions and confirmation questions are among the best candidates. Information-seeking questions have been called "real questions" by others (McDonald & Pien, 1982) and refer to requests for information that the speaker presumably does not know. Confirmation questions have been called "verbal reflective" questions by others (McDonald & Pien, 1982) and refer to requests for confirmation that the speaker correctly understood the listener's previous utterance.

These two question types have been found to be highly likely to elicit a child response (Olsen-Fulero & Conforti, 1983) and to be positively related to other maternal behaviors hypothesized to indicate a conversation-eliciting interaction style (McDonald & Pien, 1982). Information-seeking questions may facilitate some aspects of language development because they elicit more responses than other mother utterances and thereby may increase analysis of adult language. Additionally, infor-

mation-seeking questions may contain proportionally more instances of the target linguistic structure than other utterances. For example, maternal information-seeking questions have been found to contain more instances of auxiliaries than did the other maternal utterances (Hoff-Ginsberg, 1987b). The higher number of auxiliaries in information-seeking questions is important because Hoff-Ginsberg (1986) found that maternal information-seeking questions correlated with later child auxiliary use. Confirmation questions may be facilitative because their topic-continuing properties may be powerful reinforcers of the child's participation in the conversation (Hoff-Ginsberg, 1987b). Conversing more may elicit more frequent and contingent language models.

Information-seeking and confirmation questions have been found to be positively related to two aspects of later language development in normally developing children (Hoff-Ginsberg, 1986; Yoder & Kaiser, 1989). Hoff-Ginsberg's (1986) study of 22 normally developing 26-month-olds and their mothers found that the proportions of maternal utterances that were information-seeking and confirmation questions at Time 1 were related to child auxiliary development 4 months later. Yoder and Kaiser's (1989) study of 10 normally developing 22-month-olds and their mothers found that the proportions of maternal utterances that were information-seeking and confirmation questions at Time 1 were related to child copula development 5 months later. Both studies controlled for initial levels of child outcome measures to reduce the occurrence of spurious relations. However, these two studies tested many correlations thus increasing the probability of finding significant correlations by chance. The present study will test the predictive power of only two maternal utterance types: information-seeking and confirmation questions.

Auxiliary and copula development were the potentially predicted child language outcomes in the present study. In general, auxiliary development is significantly predicted by various aspects of maternal speech more frequently than any other aspect of child language (Hoff-Ginsberg & Shatz, 1982, for review). In addition to the aforementioned Hoff-Ginsberg (1986) results, auxiliary development has been predicted by maternal use of several question types (Barnes et al., 1983; Furrow et al., 1979; Gleitman et al., 1984). Copula development will also be investigated in the present study because copula use was predicted by information-seeking and confirmation questions in Yoder and Kaiser's (1989) study of normally developing children. In terms of clinical importance, copulas and auxiliaries carry tense in sentences using them (Quirk & Greenbaum, 1973) and offer two areas of particular difficulty for language-impaired children (Fletcher & Peters, 1984).

Investigating Alternative Explanations for the Mother Speech-Child Language Development Relations

Our past study with normally developing children

found that 7 of the 10 significant relations between various aspects of maternal speech at Time 1 and later child language development could be explained by a common relation with an uncontrolled aspect of child language in the initial session (Yoder & Kaiser, 1989). For example, the relation between early maternal information-seeking questions and later child copula use could be explained by a common relation with the percentage of child utterances that were multiword utterances at Time 1. Such indirect relations can be used to support equally the models of child effects on mothers and mother effects on children. For example, mothers may use more information-seeking questions when their children are using proportionally many multiword utterances because the mothers believe their children will be able to answer their questions. In contrast, mothers who use more information-seeking questions may elicit more multiword utterances. The relations between Time 1 and Time 2 child behavior may occur because the child's initial language level may affect how much he or she will learn in the future (Bloom & Lahey, 1978).

Given Yoder and Kaiser's (1989) findings, it is important to examine child language variables at Time 1 that may account for the relations between Time 1 maternal questions and Time 2 auxiliary and copula use. The two child language variables that accounted for the indirect relations between maternal speech and later child language development in the Yoder and Kaiser (1989) study were (a) the percentage of child utterances that were multiword utterances and (b) the percentage of maternal confirmation questions that the child addressed. For the present study, we added two more Time 1 child variables that logically measure the same construct as those represented by the child covariates in Yoder and Kaiser (1989), but that more closely measure the same constructs in the present sample. Mean length of utterance was added as a measure of language complexity because many of the children's utterances at Time 1 in the present sample were multiword utterances, thereby reducing the variance and thus the utility of the percentage of multiword utterances measure. Second, we measured the overall child responsivity to maternal questions that continued the child's topic as a more inclusive measure of the child's conversational responsiveness. Therefore, percentage of multiword utterances, mean length of utterance (MLU), child responsiveness to maternal confirmation questions, and child responsiveness to maternal questions that continue the child's topic were coded as potential Time 1 covarying child language variables.

Finally, in the event of a significant relation between maternal question use and auxiliary or copula development, we determined whether the predictive question type contained more instances of the predicted aspect of the child's language than the other maternal utterances in the corpus. Such evidence is consistent with the explanation that the given question type is facilitative because it presents the to-be-learned language structure to the child in an analyzable manner proportionally more often than other utterances (Hoff-Ginsberg, 1987b).

In summary, the present study limited its analyses to testing the positive relation of information-seeking and confirmation questions with later child copula and auxiliary development. By making very specific hypotheses and limiting the tests of significance to the predicted relations, the probability of finding a significant correlation by chance has been reduced. By using specific-language-disordered children and their mothers as subjects, the clinical significance of the results has been increased.

METHOD

Subjects

The subjects for the present study were 5 preschool children with specific productive language disorders and their mothers. Subjects were originally recruited for participation in a longitudinal study of the changes in language-disordered children (Klee, Gavin, & Sahlie, 1987). They represent the total number of children who were screened in a large pediatric screening project, were referred to a speech and hearing clinic in Nashville, TN, and had (a) a clinically diagnosed developmental language impairment; (b) no other language beside English regularly spoken in the home; (c) no known neurological, cognitive, physical, or emotional problems; (d) normal hearing as demonstrated by a pure-tone hearing screening; (e) sufficiently intelligible speech for the transcription and analysis that would follow; and (f) mean length of utterances between 1.50 and 3.00 morphemes.

Four boys and 1 girl met these criteria and were selected for the study. At the initial session, the children's chronological ages averaged 3:8 (*SD* = 7 months, range = 2:10–4:4). The children were all White and came from families with two to three children. All five mothers had at least undergraduate college degrees with one having 1 year of postgraduate training.

The children's expressive delays were at least two standard deviations below that expected for their chronological ages at the initial session on at least two expressive language measures (see Table 1). The children's expressive language delay was verified through the expressive scales of the Sequenced Inventory of Communication Development (SICD) (Hedrick, Prather, & Tobin, 1984), mean length of utterance (MLU) (using Miller & Chapman, 1981), and Developmental Sentence Scoring (DSS) (Lee, 1974). The children's average receptive ages were 0–10 months below age level at the beginning of the study. All 5 children's receptive levels were higher than their production levels.

Procedure

Two 30-min mother-child free play sessions were selected from the longitudinal database: the initial session and one taken 12 months later. The long interval between

TABLE 1. Language characteristics of the children at initial session.

Child	CA	MLU	DSS	SICD—E	SICD—R	PPVT
A	3:10	1.81	3.53	2:4	3:4	4:1
B	2:10	1.72	2.37	2:4	2:4	NA
C	3:4	1.95	2.69	NA	2:8	2:3
D	4:4	2.72	5.82	3:8	3:8	3:11
E	4:0	2.30	4.46	3:8	3:8	4:3
M	3:8	2.10	3.77	3:0	3:2	3:8
SD	0:7	0.18	1.40	0:8	0:6	0:11

Note. CA = chronological age. MLU = mean length of utterance in morphemes. DSS = Developmental Sentence Score. SICD—E = Sequenced Inventory of Communicative Development, expressive age. SICD—R = Sequenced Inventory of Communication Development, receptive age. PPVT = Peabody Picture Vocabulary Test, revised edition. NA = not assessed.

sessions was selected to allow sufficient time for measurable increases in copula and auxiliary use in the language-disordered children. These sessions took place in a 4-m-by-6-m lab that was furnished like a playroom with many toys, a chalkboard, and a bookcase. The sessions were videotaped via a remote-controlled videocamera that was mounted in one of the upper corners of the room. The child wore a vest on which a light-weight, omni-directional microphone and FM transmitter were attached. A suspended omni-directional, pressure-zone microphone was suspended from the ceiling. The audio signals from the two microphones were mixed and recorded on one channel of the audio- and videotape recorders. No observers were present in this room during the recordings. The setting and available materials were consistent across observations and subjects. The mother and child were instructed to play as they would at home.

The language corpus from the free play session was orthographically transcribed at the morphemic level. To estimate the accuracy of the transcripts, an experienced transcriber reviewed five of the original transcripts while listening to the audiotaped interaction session and marked cases in which he disagreed with the original transcription. Using this verification process, there was 98% agreement on the utterances in half of the transcripts.

A subset of the child's utterances (100 consecutive, intelligible multiword utterances) was the basis for the measures of child grammatical development. Because of the low frequency of some of the pragmatic variables, the maternal variables and the child responsiveness variables were coded on the entire session.

Maternal variables. An experienced observer of mother-child interaction coded the initial sessions for the occurrence of maternal behaviors fitting three classes. The first two of the following are mutually exclusive and were used as maternal predictors; the third one is a composite category that was used as the denominator of one of the child Time 1 covariates:

1. Information-seeking questions are maternal utterances that request the child to provide information that the mother presumably does not know, but that the child presumably does know (Hoff-Ginsberg, 1986; McDonald & Pien, 1982). These were yes/no or wh-questions (e.g., Do you want to play with this? What do you want to do?) and included questions that were on or off the child's topic of conversation.

2. Confirmation questions are maternal utterances that continue the child's topic of conversation and act to acknowledge or clarify the child's previous utterance (Hoff-Ginsberg, 1986; McDonald & Pien, 1982; Yoder & Kaiser, 1989). These usually repeated part of the child's previous utterance (e.g., C: He sweep with that. M: Does Grover sweep streets with that?).

3. All on-topic questions is a composite category including all of the question types that Olsen-Fulero and Conforti (1983) found to elicit a high proportion of child responses (i.e., information-seeking questions, confirmation questions, test questions, requests for clarification, permission questions, and comments in tag question form) that also continue the child's topic of conversation. The topic was usually defined by the object that the child was playing with. However, in the case of utterances not involving an object, the topic was defined by the child's or the mother's action verb (e.g., C: I don't want to sing. M: Won't you sing for me?). The percentage of maternal utterances that were information-seeking questions or confirmation questions were the two potential maternal predictors. To compute the covarying child language variable of percentage of child responsiveness to maternal confirmation questions at Time 1, the frequency of maternal confirmation questions was the denominator. To compute the covarying child language variable of percentage of child responsiveness to maternal on-topic questions at Time 1, the frequency of on-topic questions was the denominator. The intraclass correlation estimate for interobserver reliability of the maternal variables averaged .81 (range: .51–.99). Intraclass correlation estimates are useful in estimating interobserver reliability for low frequency variables and for controlling for overestimation of reliability in variables with little variance (Mitchell, 1979).

Potential child outcome variables. One measure of copula use and two measures of auxiliary use were taken at each session for all children. Brown's (1973) percentage of obligatory contexts with copulas was used as the measure for the child's mastery of the copula system. There is disagreement on the most accurate method of estimating mastery of auxiliaries from conversational samples. Therefore, two methods were used. The first method was Brown's (1973) percentage of obligatory contexts with primary auxiliaries. However, unambiguous obligatory contexts can only be determined for primary auxiliaries (i.e., forms of *have*, *be*, and *do*). Modal auxiliaries (e.g., *can*, *would*, *should*, etc.) can occur in sentences that children typically say without the auxiliary (e.g., *He run.* vs. *He can run.*). Therefore, the second measure, the number of auxiliaries per verb phrase, was also used so that a gross estimate of the opportunities to use all auxiliaries could be used to quantify auxiliary verb developmental level (Hoff-Ginsberg, 1986). The second measure is an imperfect measure of auxiliary level be-

cause not all verb phrases require auxiliary verbs (e.g., *He runs.*). Intra- and interobserver percentage of agreement on all 5 subjects' data was above 90% for these child outcome measures.

Potential Time 1 child covariates. Four child language measures were coded at the initial session: (a) Mean length of utterance in morphemes was computed according to Brown's (1973) conventions; (b) the percentage of child utterances that had more than one word (i.e., had grammatical structure) was computed using the conventions of Fletcher, Garman, Johnson, and Schelleter (1986); Yoder and Kaiser's (1989) conventions were used to compute (c) the percentage of child responsiveness to maternal confirmation questions and (d) the percentage of child responsiveness to all on-topic maternal questions. Child responses were semantically related, intelligible utterances that followed target maternal questions. Intraclass correlation estimates of these measures averaged .88 (range: .70–.99).

RESULTS

Analysis Procedure

The data were analyzed using a three-step analysis procedure: (a) Preliminary analyses were run to determine whether it would be necessary to partial out the Time 1 scores from the language outcome measures; (b) correlation matrices were computed for child language development variables with potential maternal Time 1 predictors; and (c) finally, post hoc analyses were carried out to explore alternative explanations for significant predictive relations between maternal Time 1 and child language development variables.

Selection of Language Development Scores

To be used as scores indexing copula and auxiliary development, the language development scores had to be statistically independent of their Time 1 scores. This criterion was necessary because variation in language level at Time 1 may elicit concurrent variation in maternal interaction style and predict later language development (Barnes et al., 1983). Outcome scores were rendered independent of their Time 1 scores by one of the following two procedures.

When Time 1 scores of the copula or auxiliary measure were related in a linear fashion to the Time 2 scores of the same variable, residualized gain scores were used as the language outcome scores. Residualized gain scores are the Time 2 scores with the Time 1 scores partialed out (O'Connor, 1972). The simple regressions indicated that the Time 1 percentage of obligatory contexts with primary auxiliaries predicted its Time 2 scores ($R^2 = .75, p < .05$, one-tailed). Review of the residuals indicated that this relationship was linear and that the residuals were approximately normally distributed. Therefore, when an analysis involved the percentage of obligatory contexts with primary auxiliaries, residualized gain scores of this variable were used.

When the simple regression analysis indicated no relationship between the Time 1 and Time 2 scores of the copula or auxiliary measures, the Time 2 scores were used as the language outcome scores. Regressions indicated that variation on the remaining two language outcome variables (i.e., percentage of auxiliaries per verb phrase and percentage of obligatory contexts with copulas) at Time 1 was not related to variation on these variables at Time 2 ($R^2 = .25, p = .19$, one-tailed; $R^2 = .44, p = .10$, one-tailed, respectively). Therefore, the Time 2 scores of these two variables were used as language outcome scores.

Raw Data and Descriptive Statistics on Potential Predictors and Outcomes

The small sample size makes it practical to print the individual subjects' data. The reader should note whether

TABLE 2. Frequencies, percentages, means, and standard deviations for target maternal questions and total maternal utterances at Time 1.

	Maternal utterances at Time 1				
Mother	# of info. seeking questions	% of info. seeking questions	# of confirm. questions	% of confirm. questions	# of total maternal utterances
A	31	28	21	5.8	363
B	15	5	14	5	281
C	38	6	12	2	596
D	26	4	22	3.8	586
E	48	9	29	5.7	510
M	31.6	10.4	19.6	4.5	467.2
SD	11.1	9.0	6.1	1.4	139.7

Note. Info. = information; confirm. = confirmation.

residualized gain scores were used for the outcome scores. The data appear in Tables 2 and 3.

Predictive Relations Between Maternal Question Types at Time 1 and Child Development of Copula and Auxiliary Verb Systems

Simple correlations of maternal information-seeking questions and confirmation questions at Time 1 with the three measures of copula and auxiliary development were computed. Pearson correlations (i.e., r) were used when both variables were approximately normally distributed. Spearman rank-order correlations (i.e., rs) were used when one or both variables were grossly skewed. Because the predictions were directional and the small sample size warranted maximum statistical power, all a priori hypotheses were tested with one-tailed tests.

Information-seeking questions at Time 1 predicted auxiliary development as measured by residualized gains in the percentage of obligatory contexts with primary auxiliaries ($rs = 1.00$, $p < .01$, one-tailed) and the number of auxiliaries per verb phrase at Time 2 ($rs = .90$, $p < .025$, one-tailed).[1] No other hypotheses were supported. The small sample size requires that one refrain from interpreting nonsignificant correlations. However, because tests of

significance take into consideration the sample size and because only a priori predictions were tested, significant correlations are probably reliable. The correlations appear in Table 4.

To test the validity of the predicted outcome measures, it is useful to determine the correlation between the two significantly predicted language development outcomes. Residualized gains in the percentage of obligatory contexts with primary auxiliaries and the number of auxiliaries per verb phrase at Time 2 were positively correlated ($r = .86$, $p < .025$, one-tailed).

Alternative Explanations for the Relations

Correlational methodology cannot determine causation, but the systematic examination of alternative explanations of the results can be useful in interpreting correlational results (Yoder & Kaiser, 1989). There are several alternative explanations for the positive relations between variation in maternal use of information-seeking questions and auxiliary development. Two of these will be explored here.

Maternal question use as a cause of variation in later child auxiliary development. One of the reasons information-seeking questions may facilitate auxiliary development is that they may provide a model of how auxiliaries are used in a salient and processable form to the child more frequently than do other types of maternal utterances (Hoff-Ginsberg, 1987b). Significantly more [$t(4) = 3.28$, $p < .01$, two-tailed] auxiliaries per utterance were in information-seeking questions ($M = 0.42$, $SD = 0.18$) than in the rest of the mothers' utterances ($M = 0.24$, $SD = 0.05$).

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[1]Many readers will be concerned about the veracity of a perfect association. Note however, that Spearman's rho is derived from rank scores, which can be reliably measured more easily and will more likely be stable over time than actual percentages. For the reader's information, the Pearson's r for the correlation between child primary auxiliaries/obligatory contexts and maternal information-seeking questions = .96; $p < .01$.

TABLE 3. Raw data, means, and standard deviations for child copula and auxiliary measures at Time 1 and Time 2.

Child		% of VP w/aux.	% of oblig.[a] contexts w/primary aux.	# of aux.	% of oblig. contexts w/copulas	# of cop.
			Child copula and auxiliary measures			
A	Time 1	15	33	7	18	3
	Time 2	45	92	27	92	21
B	Time 1	18	70	10	68	21
	Time 2	33	94	28	100	19
C	Time 1	20	40	3	0	0
	Time 2	30	76	22	89	8
D	Time 1	4	0	1	0	0
	Time 2	16	35	10	45	5
E	Time 1	9	17	2	0	0
	Time 2	37	63	21	57	8
Time 1						
	M	13.2	32	4.6	17.2	4.8
	SD	5.9	23.5	3.4	26.3	8.2
Time 2						
	M	32.2	72	21.6	76.6	12.2
	SD	9.5	21.7	6.4	21.5	6.5

Note. oblig. = obligatory; VP = verb phrases; aux. = auxiliaries; cop. = copula.
[a]Residualized gain scores used as outcome scores for this variable.

Child language at Time 1 as a common cause of variation in maternal questions and auxiliary use. Alternatively, maternal information-seeking question use may be positively related to auxiliary development because variation in both variables is "caused by" some other Time 1 variable. The "common cause" variable may be a child variable, a maternal variable, or some variable outside the mother-child pair. This study investigated possible common cause variables within the child.

To search for potential "common cause" variables, I tested the association between candidates for such common causes with information-seeking questions. If there were significant correlations, then I tested the association of the potential common cause variable(s) with the two auxiliary outcomes. Cases in which the Time 1 child variable was correlated with information-seeking questions and an auxiliary outcome measure constituted evidence of a possible common cause variable. The four Time 1 child variables that were examined as potential "common cause" variables were (a) mean length of utterance in morphemes, (b) percentage of child utterances that had more than one word, (c) percentage of maternal confirmation questions that the child addressed, and (d) percentage of all maternal on-topic questions that the child addressed. None of the four variables were related to both information-seeking questions and the auxiliary outcomes.

DISCUSSION

The present study used a longitudinal correlational design with SLD children to confirm the findings of past studies with normally developing children (Hoff-Ginsberg, 1986; Yoder & Kaiser, 1989). I tested whether variation in the proportion of mothers' information-seeking and confirmation questions predicts variation in auxiliary and copula development. Very specific, directional hypotheses were posited before coding and analyzing the data. This confirmatory approach provides a sound empirical basis to conclude that the results were not found by chance. Post hoc analyses were carried out to clarify the explanation for the predictive relationships. The main finding of the study was that mothers of the specific-language-disordered children who used proportionally more information-seeking questions at Time 1 had children who showed greater mastery of auxiliary use 1 year later.

Information-Seeking Questions and Auxiliaries

The present finding is consistent with the findings of other investigators who have found that maternal information-seeking questions predict later child language development. Hoff-Ginsberg (1986) found a relationship between information-seeking questions and auxiliary development. Yoder and Kaiser (1989) found that information-seeking questions predicted copula development. The discrepancy in the affected outcome may be because

the children in Yoder and Kaiser's sample were developmentally younger than those in the present and Hoff-Ginsberg's (1986) samples. Others have suggested that particular properties of children's language growth that are predicted by various aspects of mothers' speech will vary according to how sensitive the different aspects of syntax growth are at different stages of language development (Bohannon & Hirsch-Pasek, 1984; Hoff-Ginsberg, 1986; Hoff-Ginsberg, 1987a).

Hoff-Ginsberg (1987b) suggests that information-seeking questions may facilitate child auxiliary development partly because such questions frequently present auxiliaries in a salient and processable form to the child. The present data and Hoff-Ginsberg's (1987b) study found that information-seeking questions had significantly more auxiliaries per utterance than did the rest of the maternal utterances. Information-seeking questions may be particularly salient utterances because they often have a distinctive intonation contour and a particularly strong obligation to respond (Olsen-Fulero & Conforti, 1983). After concluding that many language-disordered children have attention deficits, Johnston (1982) recommended using language learning contexts that draw the child's attention to the targeted linguistic structure. Information-seeking questions may serve such a function. A more direct test of this hypothesis would be possible with larger samples of the dyads' interactions. Such large samples would more readily allow reliable measures of the low-frequency category of information-seeking questions that have auxiliaries versus those that do not, and the investigator could test the relation between this special type of information-seeking question and later auxiliary development. If information-seeking questions do facilitate auxiliary development because they frequently present auxiliaries in an easily processable form, then future research would do well to investigate the facilitative effects of other salient maternal utterances that frequently model auxiliary use.

Potentially, other explanations exist for the relationship between information-seeking questions and auxiliary development besides that of the mother influence model previously given. For example, differences in children's language or cognitive skill at Time 1 may elicit variation in maternal interaction style. In turn, these individual

TABLE 4. Correlations between maternal questions and later child development of auxiliaries and copulas.

| | Child language outcome | | |
Maternal questions	Auxiliaries/ verb phrase	Primary auxiliaries/ obligatory context	Copulas/ obligatory context
Information seeking[a]	.90*	1.00**	.30
Confirmation[b]	.58	.50	.00

[a]Tested with Spearman correlations; information-seeking questions skewed. [b]Tested with Pearson correlations; both variables normal.
*$p<.025$. **$p < .01$.

child differences may be manifested in variation in later auxiliary development. Although there was no evidence of a linguistic common cause in the set of Time 1 child variables selected for this study, such an explanation remains possible.

The present data provide consistent, but not sufficient, evidence that variation in the use of maternal information-seeking questions is one cause of variation in later child auxiliary development. The correlational data support the existence of the association between naturally occurring proportions of maternal information-seeking questions and later child auxiliary development. The replicated and confirmatory nature of these data provide strong support that this relation is not due to chance. Additionally, the replicated finding that information-seeking questions are relatively rich in linguistic information on auxiliary use bolsters the maternal influence explanation. However, experimental manipulation of the use of information-seeking questions is necessary to complete the evidence needed to accept such a causal relationship.

Implications for the Study and Treatment of Children with Specific Language Disorders

The transactional model of development (Sameroff & Chandler, 1975) reminds us that most handicapping conditions are the result of both environmental and biological factors. Given the many sources of language input, the magnitude of the subjects' productive delays, and the self-righting tendencies of human beings (Leonard, 1987; Sameroff, 1983), it is improbable that variation in maternal style was the primary original cause of the children's language deficits. However, if future studies manipulating the use of information-seeking questions show that using such questions can facilitate language development in young children with specific language disorders, then naturally occurring variation in the use of these questions is probably one reason why some specific-language-impaired children learn auxiliaries faster than others.

Caution should be used when employing the present data and other correlational data as the basis for immediate remedial training with mothers of handicapped children. Most investigators believe that much variation in maternal interaction styles is in response to their children's developmental levels and handicapping conditions (Brazelton, Koslowski, & Main, 1974; Brooks-Gunn & Lewis, 1984; Mahoney & Robenalt, 1986; Richard, 1986; Yoder & Kaiser, 1989). If this is true, then asking mothers to assume a prescribed style may introduce tension into the mother-child relationship. The result may be a reduction in mother-child interaction or little or no maintenance of the trained interaction style. These negative side effects may be particularly probable if the prescribed style is very different from that which is naturally elicited by their children.

The conservative position is to wait for an experimental test of whether the prescribed style is in fact facilitative and whether such manipulation of style has negative

emotional consequences on the quality of the mother-child relationship or interaction. At the very least, interventionists should be consciously aware of the possibility of negative side effects from manipulating maternal interaction style. If the mother reports sustained tension in the interaction or if there is a sustained increase in inappropriate behavior in the child, then a more gradual change in the style may be warranted.

ACKNOWLEDGMENTS

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