

## DO PARENTAL QUESTIONS AND TOPIC CONTINUATIONS ELICIT REPLIES FROM DEVELOPMENTALLY DELAYED CHILDREN?: A SEQUENTIAL ANALYSIS

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This sequential analysis tested the relative extent to which several adult utterance types elicited conversational replies from developmentally delayed children. Eight developmentally delayed children in Brown's stages I and II and their primary parents were the subjects. Parent-child pairs were video and audio taped during their interactions with experimenter-provided toys in a lab setting. Transcripts of the interactions were coded for adult topic relatedness and obligation level and for child topic relatedness, length, and intelligibility. The results indicated that child replies of any length were elicited by adult topic continuations more than by any other adult utterance type. If a new topic was initiated, explicit prompts for child talk elicited child replies more than other adult utterance types. Multiword child replies were most likely to be elicited by explicit prompts that continued the child's topic. Child effects on the presence and effectiveness of adult conversational recruiting strategies were also tested.

**KEY WORDS:** spoken language use, parental speech, developmentally delayed children

Many developmentally delayed children do not talk as often as other children of the same linguistic level (Rosenberg, 1982). For three reasons, children who converse often with adults may develop language more quickly than children who converse less frequently. First, adults use several techniques that effectively model new language structures immediately after the child talks. For example, it is widely accepted that continuing the child's spoken topic while modeling slightly more advanced ways to communicate the child's message facilitates the acquisition of new language structures (e.g., expansions and recasts; Nelson, 1989; Snow, Perlmann, & Nathan, 1987). Second, immediate feedback on language use may help the child test hypotheses about underlying linguistic rules and concepts (Hoff-Ginsberg & Shatz, 1982). Third, frequent conversationalists may experience other aspects of facilitating dialogues more often than less frequent conversationalists (e.g., adult labeling of the child's focus of attention; Hoff-Ginsberg & Shatz, 1982; Shatz, 1987; Tomasello & Farrar, 1986).

Most research on adult language input to children examines correlations between total frequencies or proportions of adult behaviors with some measure of child language level (see Hoff-Ginsberg & Shatz, 1982, for review). These summary-level correlational analyses do not address which adult utterances immediately elicit child replies. Significant correlations between adult and child behaviors can occur without immediate elicitation occurring (Yoder & Kaiser, 1989). To identify adult utterances that immediately elicit child replies, a sequential level of analysis is required. In the context of the current research a "sequential level of analysis" means that the analyzed data are the numbers or proportions of child replies that immediately follow a target adult utterance. The "given behavior" is the proposed "elicitor" and the "target behavior" is the proposed "elicited behavior."

Research on mother-child interaction that uses a sequential level of analysis indicates that replies of normally developing children follow two types of adult utterances a high percentage of the time that the adult utterance types are used. These are prompting or requesting verbal information (e.g., questions, directives to give information; Olsen-Fulero & Conforti, 1983) and continuing the child's topic of conversation (i.e., topic continuations; Bloom, Rocissano, & Hood, 1976; Hoff-Ginsberg, 1987b).

Requests for verbal information may elicit child talk because they generally carry a relatively high social obligation for the child to respond (Olsen-Fulero & Conforti, 1983). Questions are frequently used to allocate speaker turn in conversations with young children (Blount, 1977; Ervin-Tripp & Miller, 1977). Utterances with a rising intonational curve appear to command the child's attention (Garnica, 1977). Moreover, normally developing children in the first two stages of language learning respond to questions more frequently than comments (Bloom et al., 1976; Howe, 1981; Olsen-Fulero & Conforti, 1983; Yoder, 1988).

Continuing the child's topic may elicit further child conversation for two reasons. First, presumably children are interested in topics that they talk about. Second, it may be easier for children to understand adult speech that continues the child's topic and attentional lead because the information processing load may be less for topic continuations than for topic initiations (Bloom et al., 1976; Hoff-Ginsberg, 1987a & 1987b; Landry & Chapieski, 1989).

Child replies have been found to follow adult topic continuations more than topic initiations in samples of young normally developing children (Chapman, Miller, MacKenzie, & Bedrosian, 1981; Yoder, 1988) and in hearing-impaired children (Kenworthy, 1986). In these

three studies, child replies followed topic continuations more than expected by chance. Counts of sequential occurrences must be compared with those expected by chance to conclude that the obtained frequency of target behavior-given behavior sequences was not simply a function of a frequently occurring target and/or given behavior (Bakeman & Gottman, 1986). For example, one can easily imagine obtaining by chance a relatively high proportion of adult topic continuations followed by child replies if the child is gregarious and if the adult inserts frequent comments about the topic. Fortunately, mathematical probability theory allows us to estimate the frequency with which one would expect child replies to follow adult topic continuations given the frequency with which these two behaviors occur. In sequential analysis, *chance* is defined as the product of the simple probability of the target behavior (e.g., number of child replies/total number of events in analysis) multiplied by the total number of instances of the given behavior (e.g., number of times the adult continues the topic; Bakeman & Gottman, 1986).

Unpublished pilot work on 7 normally developing children and 1 retarded child indicated that the dimensions of topic relatedness (i.e., continuations vs. initiations) and obligation level (i.e., prompts to give verbal information vs. nonprompts) interact when predicting the probability that child replies will follow (Yoder, 1988). Specifically, adult prompts were more likely to elicit child replies than were adult nonprompts only if the adult prompt continued the child's topic. Adult prompts that initiated a new topic were no more effective elicitors of child replies than were adult nonprompts that continued the topic. Therefore, both obligation level and topic relatedness need to be considered when predicting the relative likelihood that adult utterances will elicit a child reply.

In summary, theoretical and empirical support suggests that topic continuations and prompts for information elicit replies from normally developing children in Brown's first two stages of language development. However, it is not known whether developmentally delayed children respond in a similar way. Additionally, there is no published sequential analysis of the interaction between topic relatedness and obligation level in eliciting child replies from any type of child. The current study is the first to investigate the relative summoning power on child replies (i.e., the probability of eliciting a child reply) of the four adult utterance types (i.e., continuing and initiating prompts and nonprompts) with developmentally delayed and retarded children.

The hypotheses regarding the summoning power of adult utterance types on developmentally delayed children's replies of any length were as follows: (a) Adult topic continuations elicit child replies more than expected by chance, (b) Adult topic continuations elicit child replies more than adult topic initiations, (c) Adult requests for verbal information (i.e., prompts) elicit child replies more than expected by chance, (d) Adult prompts elicit child replies more than adult nonprompts, (e) The relative order of the summoning power of child replies

will be adult continuing prompts > adult continuing nonprompts = adult initiating prompts > adult initiating nonprompts.

Although simply conversing with adults is important, using multiword replies to converse provides the adult with more information about the child's intended message (Snow, et al., 1987), thereby making a good match between the content of the adult's facilitating input (e.g., expansions) and the child's message more probable. One theory about facilitating language development suggests that helping a child contribute more information in the form of longer utterances may facilitate his or her later independent use of such utterances (Vygotsky, 1978). Although direct support for this application of Vygotsky's theory is not available, Yoder and Kaiser (1989) found that frequency of multiword utterances predicted later language development, even after controlling for initial levels of the child language development variables (i.e., copulas and responsiveness to adult test questions) in normally developing 22-month-olds.

Therefore, a second purpose of the study was to determine the relative summoning power of adult continuing prompts and nonprompts and initiating prompts and nonprompts on multiword child replies from developmentally delayed (DD) children. We conducted the study with DD children who were in the process of learning to use multiword utterances to continue the topic of conversation (i.e., those in Brown's stages I and II; Bloom et al., 1976). Because this is the first study to address this question, no specific predictions were made before conducting the study. Therefore, the results addressing this research question are considered exploratory and must be replicated before use for clinical decision-making.

The third major purpose of the study was to study the effect that the developmentally delayed children had on parents' use and effectiveness of the conversational recruiting strategies. We know from two decades of research on parent-child interaction that children and parents have a reciprocal effect on each other (Bell & Harper, 1981). Again, most of the previous research speculating about the immediate effect of aspects of children's speech and language on parents' speech to children uses correlations between summary level measures (e.g., total frequencies or proportions of individual behaviors). Such correlational designs make conclusions from past studies about immediate child effects on parents' speech quite tenuous. We used sequential analyses to determine whether intelligibility and topic relatedness of developmentally delayed children's speech immediately affects adult use of the most powerful conversational recruiting strategies. We thought that unintelligible and single-word child replies would elicit recruiting strategies because adults may need more information than is contained in these types of child utterances to understand the child's message.

Additionally, we explored whether presence of preceding child talk affected the effectiveness of the recruiting strategies. We used presence or absence of child talk as the condition to be tested because conversational use of recruiting strategies is thought to be easier for the child to

understand (Hoff-Ginsberg, 1987a). We selected immediately preceding child talk to be a reasonable operational definition of conversational use because we thought that most child talk would be followed by adult topic continuations. Additionally, child talk occurs more frequently than its subcategory, child replies, thereby affording a greater probability that one requirement of the analysis would be met (i.e., a sufficiently large expected probability of the sequential pattern under examination for each condition).

Identifying child behaviors that elicit the conversational recruiting strategies may reduce the probability that professionals will implicitly blame some parents of developmentally delayed children for not using the recruiting strategies as often as others. Additionally, knowing the conversational context of recruiting strategies in naturally occurring conversations may improve the naturalness and effectiveness of conscious use of the strategies. Because no literature is available on the last two research questions, no specific predictions were made and the results of the study regarding child effects must be considered exploratory.

In summary, the purpose of this study was two-fold. First, we tested the extent to which obligation level and topic relatedness of the adult utterances predicted summoning power on child replies and child multiword replies in developmentally delayed children. Second, we explored whether presence and type of preceding child utterances affected the presence and effectiveness of the most powerful adult conversational recruiting strategies. We used a sample of DD children because (a) they constitute a population in need of language intervention, and (b) because they typically speak relatively infrequently. We reasoned that their infrequent speech places them at risk for experiencing facilitating dialogue with adults less frequently than their linguistically matched normally developing peers. We used DD children in Brown's stages I and II because these children are in the process of learning to converse with multiword replies (a type of child reply that is relatively easy to expand). Many studies on DD children include a comparison group of normally developing children. However, given the many logical problems with comparison studies between DD children and normally developing children, it is reasonable to state and study research questions that do not require the comparison design (Baumeister, 1984). The present research questions do not require the normal-DD comparison design. It should be noted that the exclusion of normally developing children from the study limits the logical generalizability of the results only to DD children similar to those studied. Further restrictions on generalizability will be noted in the discussion section.

## METHODS

### *Subjects*

To recruit subjects, administrators of local educational intervention programs for developmentally delayed chil-

dren sent home consent letters to parents of the children who seemed to meet our selection criteria. We screened children of parents who signed and returned the consent letters. The selection criteria for the children were: (a) mean length of utterance between 1.01–2.49, (b) at least 50 intelligible utterances per 30-minute sample, (c) no noticeable sensory impairments, and (d) evidence of cognitive delay as indicated on school records.

Eight developmentally delayed children at Brown's stage I or II and the parent who reportedly spent the most time with the child participated in the study: Seven mothers and one father participated. The International Standard Classification of Occupations (1968) indicated that the occupational status of the mothers and fathers was just below the population mean (international mean = 43.3; mothers' mean = 38.87; fathers' mean = 40.6). The average number of years in school for the mothers who participated was 12 ( $SD = 5.1$ ; range = 11–18). The father who participated in the study went to school 13 years. On the average, the children were 53 months old ( $SD = 15.8$  months; range = 36–76 months). However, their average expressive level was at the 24-month level ( $SD = 3$  months; range = 20–28 months) and their average receptive level was at the 28-month level ( $SD = 4$  months; range = 24–36 months) as indicated by the Sequenced Inventory of Communication Development, Revised (Hedrick, Prather, & Tobin, 1984) and the Receptive-Expressive Emergent Language Scale (Bzoch & League, 1971). The average mean length of utterance in morphemes was 1.55 ( $SD = .40$ ; range = 1.2–2.47) thereby placing the children's language in Brown's stage I and II (Brown, 1973). Their average cognitive developmental quotient (from the Merrill-Palmer, Stutsman, 1948; and Bayley MDI, Bayley, 1969) was .64 ( $SD = .13$ ; range = .40–.86). Therefore, these children's cognitive delays ranged from dull-normal to moderately retarded (American Psychiatric Association, 1987). Table 1 summarizes this and other subject description data.

### *Procedure*

The parent and child engaged in a typical freeplay interaction session for 30 minutes with toys that we provided. We asked the parents to play with their children as they normally would at home without doing anything special or trying to meet any goal. The play area was a carpeted rectangle, 8'  $\times$  9½'. Age-appropriate toys (e.g., a small playhouse, toy phones, a toy car, truck, school bus, dress-up hats, a pop-up toy, a baby doll with blanket, bottle, etc., a toy cash register and groceries, and a toy medical kit) lined three sides of the play area. We videotaped the sessions through a one-way mirror and audiotaped them by means of a wireless microphone worn by the child and a microphone suspended from the ceiling.

*Transcription.* Trained transcribers recorded the content and sequence of spoken utterances and pauses that were 2 s long from the audio and videotaped sessions. Transcriptions followed the Systematic Analysis of Tran-

TABLE 1. Means, standard deviations, and ranges for subject descriptor variables.

<i>Subject descriptor</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Range</i>
<i>Parent</i>			
Participating mothers' years of education	12.1	5.1	11-18
Participating father's years of education	13	NA	NA
Mother's occupational status <sup>a</sup>	38.87	14.63	16-69
Father's occupational status <sup>a</sup>	40.6	10.25	22-52
<i>Child</i>			
Chronological age	53 mos	15.8 mos	36-76 mos
Productive age <sup>b</sup>	24 mos	3 mos	20-28 mos
Mean length of utterance	1.55	.40	1.2-2.47
Receptive age <sup>b</sup>	28.5 mos	4.38 mos	24-36 mos
Mental age <sup>c</sup>	26.9 mos	11.24 mos	23-42 mos
Productive developmental quotient <sup>b</sup>	.54	.17	.31-.74
Receptive developmental quotient <sup>b</sup>	.64	.20	.31-.78
Cognitive developmental quotient <sup>c</sup>	.64	.13	.40-.86

<sup>a</sup>Occupational status scores derived from the International Standard of Classification of Occupations (1968). Mean = 43.3; *SD* = 16.9; range = -2-90. Data reported for parent(s) with whom the child lived.

<sup>b</sup>Productive and receptive age equivalency scores from the Sequenced Inventory of Communication Development, Revised and the Receptive-Expressive Emergent Language Scale (Bzoch & League, 1971). Developmental quotients are calculated by dividing age equivalency by chronological age at time of test. They index degree of delay with respect to chronological age.

<sup>c</sup>Mental ages from the Bayley MDI (Bayley, 1969) and the Merrill-Palmer (Stutsman, 1948).

scripts (SALT; Miller & Chapman, 1983) format with one major exception. Pauses were indicated in the first column of the transcript instead of the specified method in SALT manual (a colon) so that 2-s pauses would be treated as events to be analyzed in the sequential analysis. The inclusion of pauses as relevant events more accurately represented the way parents and children used the conversational time than just including utterances. All transcripts were verified by viewing the videotaped session while checking the veracity of the transcript before coding.

*Reliability of transcription and uncoded variables.* An independent observer transcribed the middle 15 minutes of three randomly selected transcripts to estimate the reliability of aspects of the transcript that would affect the analyses and veracity of coding. Selected aspects were: (a) presence of event, (b) identification of major event type (i.e., pause, child utterance, or parental utterance), (c) segmentation of utterances, (d) transcription of adult utterances, (e) transcription of at least partially intelligible child utterances, (f) judgment that a present child utterance was completely unintelligible. We used point-by-point percentage agreement to estimate interobserver agreement. When the denominator of this percentage (sum of agreement and disagreements) exceeded 5, we report the mean and range of percentage agreement. The denominator for percentage agreement of child unintelligible utterances was only 3 for one subject; therefore, we report percentage agreement for unintelligible utterances across all 3 subjects for this variable. The estimates are as follows: presence of event ( $\bar{x}$  = .93, range = .91-.96), major event type ( $\bar{x}$  = .997, range = .00-1.00), segmentation of utterances ( $\bar{x}$  = .98, range = .975-.996), transcription of adult utterances ( $\bar{x}$  = .989, range = .975-.996), transcription of at least partially intelligible child

utterances ( $\bar{x}$  = .95, range = .92-.98), and unintelligible child utterances (.78). The relatively low agreement on unintelligible child utterances was probably caused by differences in direct experience with the child and parent. The consequences of relatively low reliability are attenuated differences or relations (Pedhazur, 1982). Therefore, differences between sequential relations involving unintelligible child utterances were found despite the problem of relatively low agreement concerning this variable.

*Coding.* Subsequently, a research assistant coded adult and child utterances from the transcripts and the videotapes. The first author trained the observers in using the coding system for at least 200 hours and the observers met a high agreement criteria ( $\kappa > .70$ ; Bakeman & Gottman, 1986) for all categories before coding the dyads reported in this report.

We coded adult utterances for obligation level (prompts vs. nonprompts vs. other) and topic relatedness (continuation vs. initiation vs. other). Prompts were defined as adult utterances that carry a high demand for the child to give a verbal response regardless of the syntactic form of the adult utterance. Prompts included the adult utterance types that Olsen-Fulero and Conforti (1983) found to have a high summoning power and that occurred most frequently (real questions, test questions, confirmation questions, and requests for repetition). The prompts may request yes/no responses or other responses. They may follow the child's topic or begin a new topic. Topic was defined by the referent object and ongoing actions or events. In the rare occurrence that the subject matter of the conversation was an abstract (e.g., a song) or absent entity (e.g., a friend), the sentence subject or object was the topic of the conversation (Chapman et al., 1981; Kenworthy, 1984). In the case of unintelligible utter-

ances, we coded topic from nonverbal behaviors showing attention to an entity, activity, or event (Kenworthy, 1984). Once a topic was continued by the noninitiating partner, either partner could unilaterally continue the topic within that exchange. In this way, each code could follow itself, thus preventing a necessary dependency between categories (Kenworthy, 1984).

We coded the child utterances for topic relatedness, length, and intelligibility. When coding child replies and initiations, we applied the above definition of topic. We also distinguished single-word versus multiword replies. An unintelligible utterance was one in which the transcriber understood no words. We used parents' verbal interpretations following the target child utterance to transcribe an utterance if at least one phoneme matched the adult's gloss and the adult's gloss logically encoded some aspect of the child's focus of attention. The entire coding system is available from the first author.

*Reliability of coding.* Cohen's kappa (Bakeman & Gottman, 1986) was used as the estimate of interobserver agreement on the coding of 75% of the data (six of the eight dyads). Average kappa for the entire coding system was .96. Average kappas for individual categories were as follows: (a) adult continuing prompts = .96; (b) adult continuing nonprompts = .97; (c) adult initiating prompt = .90; (d) adult initiating nonprompts = .87; (e) adult other utterances = .76; (f) child multiword replies = .95; (g) child single word replies = .97; (h) child topic initiation = .80; and (i) child other utterances = .83.

*Data transformation.* Custom designed computer software (Yoder & Tapp, 1990) transformed the coded transcripts into a single line of 3-digit codes. This file was input to sequential analysis software.

### *Analyses and Interpretation of Sequential Analysis Results*

We examined the research questions using lag 1 sequential analysis. When individual sessions had a sufficiently large number of adult and child utterances and the expected transitional probability for the sequential pattern being tested was sufficiently large, we tested the hypotheses on each appropriate individual dyad and on the pooled sample of all eight dyads. We used Bakeman and Gottman's (1986, p. 138) application of Siegel's (1956) formula to determine the minimum number of events (i.e., utterances and pauses) and expected transitional probabilities to justify the analyses. When the individual dyads did not meet the above criteria, we tested the hypotheses on the pooled sample across the eight dyads. Pooled samples exceeded the minimum number of events and expected probabilities for all of the following results.

In the presentation and discussion of the results, we use the term *elicit* (e.g., adult topic continuations elicit child replies) to mean that the obtained sequential frequency (i.e., the number of times the target behavior followed the given behavior) was significantly larger than the expected sequential frequency. In the context of the present study,

"significance" of the difference between obtained and expected sequential frequencies means that the difference was large enough that one can reasonably expect the obtained sequential frequency to exceed the expected value in other similar interactions with the subjects we studied. Because our observations are pairs of behaviors, not people, we cannot interpret statistical significance in the present context as sufficient reason to expect the results to replicate. Therefore, replication of the results across several individuals is necessary to justify generalization to other similar parent-child dyads. This is especially true in cases in which no specific predictions were made before collecting data (e.g., our hypotheses regarding multiword replies and child effects).

We tested the significance of the difference between obtained and expected sequential frequencies using the  $z$  statistic described in Allison and Liker (1982) that was later corrected for autocorrelation of the target and given behaviors (i.e., corrected  $z$ ). In general, if the autocorrelation of target or given behaviors exceeds  $+0.25$  or  $-0.25$ , then uncorrected  $z$  scores do not accurately test the significance of the difference between obtained and expected sequential frequencies (Gardner, Hartmann, & Mitchell, 1982). Therefore, before testing the significance of obtained sequential patterns, autocorrelation of the given and target events was statistically controlled using Faraone and Dorfman's (1987) correction factor, thus resulting in their Markov  $Z$  score. Computer simulations have demonstrated that this corrected  $z$  score produces accurate results under conditions of varying amounts of lag 1 autocorrelation (Faraone & Dorfman, 1987). We determined the relative sequential dependency by pairwise comparison of the corrected  $z$  scores ( $z_1 - z_2/\text{square root of } 2$ ; Serlin, 1981).

We examined child effects on the effectiveness of the most powerful adult recruiting strategies by comparing adjusted cell residuals from the null model table of a logit analysis. These comparisons were conducted for the most powerful conversational recruiting strategies under conditions when child talk preceded the recruiting strategy versus when child talk did not precede the recruiting strategy. An adjusted residual tests the difference between obtained and expected sequential frequencies for a particular cell of a contingency table (Haberman, 1973) and is equivalent to the uncorrected  $z$  score (Bakeman, Adamson, & Strisik, 1989). The comparison of adjusted residuals was tested as a  $z$  score of the difference of the adjusted residuals. We tested child effects on the effectiveness of only the most powerful recruiting strategies because sufficient expected probabilities for one or both of the conditions were not present for the other adult utterance types.

## RESULTS

### *Descriptive Statistics*

Before the tests of the hypotheses are reported, descriptive statistics of the adult and child utterances will be

summarized to place the sequential patterns in context. Table 2 contains a summary of the frequency and proportion of speaker's utterances that were the specified utterance type in the form of means and standard deviations for the individual dyads. For the concatenated files (pooled across dyads), total frequency and proportion for the specified utterance type is given across all subjects. These latter data are relevant background information for the pooled sample analyses.

### *The Summoning Power of Adult Utterances on Child Replies and Child Multiword Replies*

The results pertaining to the research questions regarding the relative summoning power of the topic relatedness and obligation level of the adult utterances on child replies, in general, and on multiword replies, specifically, are summarized in Table 3.

We tested Hypotheses 1 and 2 in the pooled sample and in five of the eight dyads. In the pooled and in all five individual analyses, child replies followed adult topic continuations more than expected by chance (pooled corrected  $z = 28.98$ ; mean individual corrected  $z = 8.93$ ; critical  $z = 1.96$ ). In the pooled and in all five individual analyses, adult topic continuations elicited child replies more than did adult topic initiations (difference in cor-

TABLE 2. Frequencies and percentages for parental and child utterance types.

	Individual dyads		Pooled across dyads
	Mean frequency (SD)	Mean percentage of speaker's utterances <sup>a</sup> (SD)	Frequency (Percentage of speaker's utterances <sup>a</sup> )
<b>Adult</b>			
Topic continuing prompts	89 (51)	.19 (.43)	712 (.21)
Topic continuing nonprompt	294 (95)	.65 (.82)	2355 (.68)
Topic initiating prompts	10 (8)	.02 (.01)	81 (.02)
Topic initiating nonprompts	33 (16)	.10 (.09)	260 (.07)
<b>Child</b>			
<i>Topic Relatedness</i>			
Multiword replies	72 (50)	.23 (.15)	573 (.23)
Single word replies	162 (76)	.50 (.16)	1293 (.52)
Initiations	24 (11)	.08 (.04)	271 (.11)
<i>Unintelligibility</i>			
Unintelligible	43 (39)	.15 (.11)	371 (.14)
Partly/completely intelligible	279 (104)	.85 (.11)	2228 (.86)

<sup>a</sup>Percentages do not sum to 1.00 within actors because uncodable utterances have been excluded from the table.

TABLE 3. Transitional probabilities and corrected  $z$  scores for child replies and multiword replies given adult conversational recruiting strategies.

Sequential patterns	Transitional probability	Corrected $z$ score
<i>Child replies</i>		
Adult continuations		
Mean for dyadic	.46	8.93
Pooled	.47	28.98
Adult initiations		
Mean for dyadic	.37	.33
Pooled	.32	1.69
Adult prompts		
Mean for dyadic	.59	6.61
Pooled	.57	19.01
Adult nonprompts		
Mean for dyadic	.41	7.63
Pooled	.42	19.44
Adult continuing prompts		
Pooled only	.58	18.22
Adult continuing nonprompts		
Pooled only	.44	19.50
Adult initiating prompts		
Pooled only	.48	3.98
Adult initiating nonprompts		
Pooled only	.28	-.02
<i>Child multiword replies (pooled only)</i>		
Adult continuing prompts	.15	7.59
Adult continuing nonprompts	.09	3.85
Adult initiating prompts	.11	1.24
Adult initiating nonprompts	.03	-2.66

Note. The critical difference  $z$  score is 2.77 at .05 level for 2-tailed test.

rected  $z$  for pooled analysis = 27.29; mean difference in corrected  $z$  for individual analyses = 7.56; critical difference between corrected  $z$  scores = 2.77; alpha = .05 level for two-tailed test).

Hypotheses 3 and 4 were tested in the pooled sample and in seven of the eight individual dyads. In pooled and in all seven individual analyses, child replies followed adult prompts that requested verbal information more than expected by chance (pooled corrected  $z = 19.01$ ; mean individual corrected  $z = 6.61$ ). However, there was no support for the hypothesis that adult prompts elicit child replies more than nonprompts (difference in corrected  $z$  for pooled analysis = .43; mean difference  $z$  for individual analysis = .67).

We tested Hypothesis 5 in the pooled sample only because the expected transitional probabilities and total number of events were too small in the individual dyads to test the significance of the sequential patterns of interest. Adult continuing utterances, whether they requested information (corrected  $z = 18.22$ ) or not (corrected  $z = 19.50$ ), elicited child replies about equally and did so more than adult utterances that initiated a new topic (corrected  $z = .33$ ). However, of the adult utterances that initiated a new topic, prompts requesting verbal information (corrected  $z = 3.98$ ) elicited child replies more than nonprompts (corrected  $z = -.02$ ). Adult initiating nonprompts did not elicit child replies (i.e., the obtained sequential frequency was not significantly greater than the expected value).

We could test the relative summoning power of adult utterances on child multiword replies in the pooled sample only because the expected transitional probability and number of total events were insufficient in the individual sessions. Adult continuations elicited child multiword replies (corrected  $z > 1.96$ ); the other recruiting strategies did not. The results with respect to the relative summoning power on child multiword replies were as follows: adult continuing prompts (corrected  $z = 7.59$ ) > adult continuing nonprompts (corrected  $z = 3.85$ ) = adult initiating prompts (corrected  $z = 1.24$ ) > adult initiating nonprompts (corrected  $z = -2.66$ ) (critical difference  $z = 2.77$ ). It should be noted that adult initiating nonprompts suppressed multiword replies; that is, obtained sequential frequency was significantly less than the expected value.

In summary, adult utterances that continued the topic elicited the developmentally delayed children's replies more than adult initiations, regardless of the obligation level of the adult utterance. If a new topic was initiated, adult utterances that prompted the child to give information elicited more replies than those that did not. With regards to multiword child replies, prompts had significant summoning power only if they continued the topic. In fact, continuing prompts had the most summoning power for multiword child replies in this developmentally delayed sample.

#### *Child Effects on the Summoning Power of Adult Continuations and Continuing Prompts*

Table 4 summarizes the results regarding the effect of preceding child talk on the summoning power of the two most powerful recruiting strategies. Only the most powerful recruiting strategies could be used in this analysis because the expected transitional probability for the other recruiting strategies was insufficient. Additionally, the number of events in individual sessions was insufficient to conduct logit analyses of 3-event sequences.

TABLE 4. Transitional probabilities and adjusted residuals for the most powerful recruiting strategies under two different discourse conditions.

<i>Sequential patterns and conditions</i>	<i>Transitional probability</i>	<i>Adjusted residual</i>
Child Replies/ Adult Continuations		
Preceding Child Talk <sup>a</sup>	48.23	25.50
No Preceding Child Talk <sup>b</sup>	31.96	7.57
Child Multiword Replies/ Adult Continuing Prompts		
Preceding Child Talk	20.00	9.19
No Preceding Child Talk	8.99	1.11

*Note.* Critical difference between residuals = 2.77; alpha = .05; two-tailed test.

<sup>a</sup>The total number of pairs of events occurring after child talk was 2,180.

<sup>b</sup>The total number of pairs of events occurring after no child talk was 5,597.

Therefore, these analyses were conducted only on the pooled sample. Although significant under both conditions, the summoning power of adult continuations on child replies was stronger when the child talked prior to the adult utterance (adjusted residual = 25.50) than when the child did not do so (adjusted residual = 7.57; difference  $z = 17.93$ ; critical difference between residuals = 2.77). Adult continuing prompts elicited child multiword replies greater than expected by chance only when the adult utterance was preceded by child talk (adjusted residual = 9.19). Additionally, the summoning power of adult continuing prompts on child multiword replies after child talk was significantly greater than that when child talk had not preceded the adult utterance (adjusted residual = 1.11; difference between residuals = 8.08). Under conditions of equal sequential dependency, adjusted residuals tend to increase in absolute value as the total number of events increases (Yoder & Tapp, 1990). Therefore, one may reasonably wonder if the difference in the adjusted residuals could be due to the fact that the two conditions occurred at different rates. The note in Table 4 indicates that the condition with the largest adjusted residual occurred the least number of times. Therefore, this trivial alternative explanation can be ruled out.

#### *Child Effects on Adult Use of Continuations and Continuing Prompts*

Table 5 summarizes the relative summoning power of the two levels of child intelligibility (partly or fully intelligible vs. unintelligible), and of the three levels of child topic relatedness (single word replies vs. multiword replies vs. initiations) on the two most powerful recruiting strategies (adult continuations and adult continuing

TABLE 5. Transitional probabilities and corrected  $z$  scores for the two most powerful recruiting strategies given various types of child utterances.

<i>Sequential patterns</i>	<i>Transitional probability</i>	<i>Corrected <math>z</math> score</i>
<i>Adult continuations/ Child topic relatedness</i>		
1. Multiword replies	.62	10.95
2. Single word replies	.75	27.58
3. Initiation	.43	.93
<i>Child intelligibility</i>		
1. Partially/completely intelligible	.67	30.24
2. Unintelligible	.48	3.52
<i>Adult continuing prompts/ Child topic relatedness</i>		
1. Multiword replies	.18	7.59
2. Single word replies	.16	9.25
3. Initiation	.16	3.79
<i>Child intelligibility</i>		
1. Partially/completely intelligible	.17	14.42
2. Unintelligible	.16	5.11

*Note.* These scores are based on a pooled sampled analysis across all 8 subjects. Critical difference  $z$  at .05 level for 2-tailed test = 2.77.

prompts). These comparisons could only be conducted on the pooled sample due to insufficient number of events in individual sessions.

Although all child talk elicited adult continuations and continuing prompts, child replies and intelligible child talk were most likely to elicit the recruiting strategies.

## DISCUSSION

Because this study is the first to examine recruiting strategies with developmentally delayed children, it is important to state the extent to which the same sequential patterns are likely to replicate in a similar sample of developmentally delayed children. The generalizability of the present study's results varies depending on (a) the extent to which the effect was replicated across several individuals and (b) whether the obtained effect was predicted before testing (Kerlinger, 1979). In the present study, the relative summoning power of adult utterances on child replies was predicted before testing, but only partly confirmed by the results. Therefore, we have moderately strong confidence that: (a) topic-continuing prompts elicit child replies more than topic initiations, and (b) topic-initiating prompts elicit child replies more than topic-initiating nonprompts in similar parent-child dyads. The population represented in this study is developmentally delayed children in Brown's stages I and II who have no sensory impairments. We were not able to fulfill the conditions that allow confident generalization for the relative summoning power of adult utterances on multiword child replies or for the child effects on the presence and effectiveness of adult recruiting strategies. Therefore, replication of the latter results would improve our confidence in their generalizability to similar parent-child dyads.

The results indicate that adult utterances that continued the topic elicited the developmentally delayed children's replies of any length more than initiations, regardless of whether the adult utterance was a request for information. These results corroborate those found with normally developing children in the same developmental period (Bloom et al., 1976). Bloom et al. (1976) suggested that it is more difficult for early language learners to respond contingently to an adult utterance if the utterance initiates a new topic. When faced with an adult utterance that changes the topic, the child must locate the new nonlinguistic referent in the environment or interpret the referent exclusively from linguistic information before comprehending the adult utterance.

Unlike continuing prompts, initiating prompts elicited only single-word child replies. If topic continuations are easier to respond to, then it is understandable why the child would respond with a linguistically simple response to a topic initiation. Topic initiations may place a greater information processing load on the child (Bloom et al., 1976). Applying this information to language assessment, one can characterize the majority of questions in a test or probe situation as topic initiations. The greater information processing load of initiating questions may

partially explain our observation that the developmentally delayed children in our other studies tend to generalize newly learned language skills to probe questions well after the newly learned language has been observed in conversational contexts.

The distinction between prompts and nonprompts became important (a) when the elicited behavior was multiword replies, and (b) when the adult utterance initiated a new topic. Following a child utterance with a request for more information about the child's topic was most likely to elicit the DD children's multiword replies. If the adult changed the topic, requests for information were more likely to elicit child replies than were nonprompts. Prompts for information may be more powerful elicitors of child replies than are nonprompts because they signal to the child that it is her or her turn to speak (Olsen-Fulero & Conforti, 1983). Looking at the main effects of questions on child replies (i.e., ignoring topic relatedness), several investigators have found prompts to be more powerful elicitors of child replies than nonprompts in normally developing children (Bloom et al., 1976; Olsen-Fulero & Conforti, 1983).

One language intervention approach, the hybrid approach (Fey, 1986), ideally uses questions in a conversational context to elicit child production of language goals. Two examples of the hybrid approach that explicitly use questions as part of the intervention are incidental teaching (Hart & Risley, 1975) and the mand-model procedure (Warren, McQuarter, & Rogers-Warren, 1984). The present study's findings suggest that the effectiveness of question use in eliciting child multiword replies is dependent on the preceding child behavior. Questions that continued the child's topic and that were used immediately after the child had just spoken were the most powerful elicitors of multiword replies. These findings support the importance of a truly conversational use of questions. Therefore, multiword replies may best be elicited from young DD children by stimulating child talk through topic continuations, arranging the environment to stimulate the child's need to request or comment (Ostrosky & Kaiser, in press), or waiting for the child to talk and then following with a request for more information about the child's topic. Such strategies have been used to facilitate vocabulary and semantic relations use in DD children (Warren & Kaiser, 1988) and syntactic development in normally developing children (Schwartz, Chapman, Prelock, Terrell, & Rowan, 1985).

Not all theories of language intervention consider question-asking a positive influence on child language development. The conversational model of language intervention (Fey, 1986) discourages adult question use because proponents of the approach posit that questions encourage the young child to become dependent upon adults to elicit his or her participation in the conversation. Many researchers have coded requests for information along with directives for nonverbal behaviors as instances of directive behavior (Mahoney & Powell, 1988). Some, but not all, studies on maternal directiveness suggest that it is negatively related to child development (see Tannock, 1988, for a review). We believe that a more accurate view

of directives in general, and questions specifically, is that moderate use of directives that maintain the child's focus of attention are likely to be a positive influence on child behavior and development (Landry & Chapieski, 1989; Tannock, 1988).

With this controversy in mind, it is reasonable to use questions judiciously. One may use the present results to suggest a prompting hierarchy. As with all prompts of child behavior, the wise clinician will use the least intrusive or least powerful prompt necessary to aid the child in participating in the conversation.

Sequential analyses, such as those used in this study, allow very specific hypotheses to be tested thereby reducing the number of alternative explanations to obtained sequential relations. However, the results should not be interpreted as strong support for the causal influence of topic continuations or continuing prompts. We must await an experimental manipulation of these maternal variables before making a strong causal inference.

### *Designing an Intervention Study From the Present Results*

Nelson (1989) advised interventionists to use potentially facilitating utterance types only as frequently as a natural conversational style allows. In the present study, the average proportion of adult utterances that were topic continuations was approximately 84% (.19 + .65 in Table 2). Only 19% of adult utterances were continuing prompts. If more than a fifth of the adult utterances were continuing prompts in an intervention study conducted with handicapped children who are similar to those in the present study, then the conversational nature of the interaction session might be sacrificed. The resulting effect on the interaction is unknown, but one can reasonably predict a stifling effect on both parent and child.

If future intervention studies use parents as interventionists, then remaining mindful that the children are likely to affect the parents' use of the recruiting strategies is particularly important. In the present study, all child talk elicited adult continuations and continuing prompts, but unintelligible child talk and child initiations did so less reliably. Therefore, children who are quite unintelligible or frequently initiate are likely to have parents who use the recruiting strategies relatively little. Parents may not continue the topic after unintelligible child utterances as often because they may find it difficult to identify the child's topic (e.g., when the child is playing with a different object than he or she is looking at while vocalizing). Parents may not continue the topic as often immediately after child initiating utterances because it may often take a few utterances to understand what the child is talking about. In either case, asking the parents to attempt to overcome the natural tendency to use fewer topic continuations when confronted with unintelligible initiations may cause tension during the interaction and result in eventual reduction in the frequency and quality of interaction (Yoder, 1989). Mahoney and Powell (1988)

reported significantly less parental expressiveness and warmth toward their children after teaching the parents to assume a prescribed interaction style. Although not conclusive, Mahoney and Powell's (1988) data suggest the possibility that teaching parents to assume a prescribed interaction style different from that elicited by the child may have negative side effects. In the future, carefully conducted experimental studies on the presence and conditions under which negative side effects occur are necessary.

### *The Effect of the Recruiting Strategies on Language Development*

The present study investigated the immediate effect of various adult utterances on DD children's language use, not their language development. However, many have posited that conversational styles that recruit child conversations indirectly facilitate language development (Kaye & Charney, 1980; McDonald & Pien, 1982; Olsen-Fulero & Conforti, 1983). Recruiting children's conversation may eventually facilitate their language development because conversation may elicit adult behaviors that past research has demonstrated to facilitate language development (e.g., expansions; Snow et al. 1987). Shatz (1987) referred to child behaviors that elicit conditions that may facilitate child language development as elicitation bootstrapping operations. We have yet to see whether using conversational recruiting strategies, such as were investigated in the present study, will facilitate generalized child conversation with adults in other situations. However, even if recruiting strategies do not result in generalized conversation with other adults, recruiting strategies may "scaffold" the interaction so that it is easier for the child to continue talking about the same conversational topic. Doing so may help the child attend to and comprehend the adult language models (Bloom et al., 1976).

Empirical support for the claims that using conversational recruiting strategies such as questions and topic continuations facilitates language development is restricted to significant longitudinal correlations in normally developing (Barnes, Gutfreund, Satterly, & Wells, 1983; Hoff-Ginsberg, 1986; Yoder & Kaiser, 1989) and language-impaired children (Yoder, 1989). We have yet to see whether the relation between conversational recruiting strategies and later language development is a causal one, particularly in developmentally delayed children.

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