

Effect of Verbal Routine Contexts and Expansions on Gains in the Mean Length of Utterance in Children With Developmental Delays

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Increasing the length of utterances is an important language goal for young children with developmental delays. At the early stages of language learning, longer utterances convey more semantic (Scollon, 1976) and grammatical (Brown, 1973) information than shorter utterances. Many children with developmental delays have particular difficulty in construct-

ing multiword utterances (Miller, Murray-Branch, Sedey, Miolo, & Rosin, 1991).

One theory of how children learn the semantic relations and grammatical rules that underlie many early multiword utterances argues that children derive information about new language structures from cognitive comparisons between structures present in the children's memory with relevant examples used by others (Nelson, 1989). Expansions are one type of adult input that may aid the development of the semantic and syntactic knowledge necessary for creative multiword use (Nelson, 1989). Expansions are adult utterances that follow the child's utterance, refer to the central events and relationships of the child's utterance, and increase the syntactic or semantic complexity of the message (Nelson, 1989). For example, a child might reach for a ball and say, "Ball." The adult expansion might be, "You want the ball." Expansions may help children induce underlying semantic relations and grammatical rules because the temporal proximity and semantic relatedness of the adult and child utterances may aid the children in making the necessary cognitive comparisons between the child's and the adult's utterances (Nelson, 1989). Expansions have been found to be effective in facilitating syntactic development in children who are developing typically (Nelson, Carskadden, & Bonvillian, 1973; Nelson, 1977) and who have severe developmental disorders (Scherer & Olswang, 1989).

However, using only expansions to facilitate multiword utterances may be inefficient for children in the single word stage, particularly if the children have developmental delays. Children with developmental delays typically converse less frequently than their linguistically matched peers (Rosenberg, 1982), thus providing few opportunities

ABSTRACT: This study tests the hypothesis that verbal routines and expansions increase generalized child mean length of utterance (MLU). Verbal routines were built through repeated interaction with the same picture book across several intervention sessions. The subjects were four young children with developmental delay. One of the subjects experienced two rounds of the intervention (i.e., two intervention phases with two different books) to provide the opportunity for more replication and extension of the effects. Generalization sessions were conducted with a different adult, different modality of material (i.e., objects), and different interaction style than were used during the intervention. The pattern of the results provides strong evidence that the intervention increased generalized MLU in children in the first stage of language development more than in children in a later language stage. The secondary analyses support the notion that verbal routines and expansions were responsible for the effects. Future research is needed to determine why the intervention was not effective for the developmentally older cases but was effective for the developmentally younger cases.

KEY WORDS: intervention, children with developmental delays, grammatical development, expansions, verbal routines

for expansions. In addition, some children with cognitive delays, especially those with Down's syndrome, tend to have less recall of auditory information than do mental age-matched children who are developing typically (Marcell & Armstrong, 1982; Marcell & Weeks, 1988). The apparent reduced short-term memory of children with developmental delays may make it difficult for them to remember their own utterances long enough to make the cognitive comparison with expansions. Finally, it may be particularly difficult for children with developmental delays in the first stage of language learning to do two difficult tasks simultaneously: converse and analyze new linguistic information in expansions.

It is posited here that routine contexts whose roles are filled by verbal turns (i.e., verbal routines) may improve the effectiveness of expansions in facilitating language development in children with developmental delays whose language is in the single word stage of development. Verbal routines are conversational contexts that (a) recur frequently, (b) have a predictable and recognizable sequence, (c) have at least one spoken turn for each speaker, and (d) have content that is limited to a small set of variations (Conti-Ramsden & Friel-Patti, 1987; Peters, 1983; Snow, Perlmann, & Nathan, 1987; Snyder-McLean, Solomonson, McLean, & Sack, 1984; Yoder & Davies, 1992).

The term "verbal routines" should be distinguished from the concept of unanalyzed phrases (Peters, 1983; Hickey, 1993). Verbal routines are contexts, whereas unanalyzed phrases are child utterances that are complete or reduced delayed imitations of phrases the child has previously heard (Peters, 1983). The turns in verbal routines may be, but are not necessarily, unanalyzed phrases. For example, assume the routine context is a repeated interaction about the same picture book. The nature of the interaction is repeated adult question and child answer sequences about the label of pictures on the page, with occasional spontaneous child comments about the pictures. One such spontaneous child comment might be "Cat chair," with the child pointing to the cat on the chair. An expansion of the child's utterance might be, "Yes, the cat is in the chair." Examples of such verbal routines are talking about familiar play schemas (e.g., phone play), taking turns at nursery rhymes, and conversing about familiar picture books.

Repeated interaction around the same picture book has been used to develop verbal routines in several studies (Ninio, 1983; Ninio & Bruner, 1978; Snow & Goldfield, 1983; Watkins & Davis, 1992). Book reading occurs naturally in many homes and schools. It also allows a relatively easy manipulation of familiarity while maintaining much control over the content of the interaction.

Verbal routines may augment the effectiveness of expansions in two main ways. First, verbal routines may increase the probability that young children with developmental delays will participate verbally in the conversation. Doing so would provide interventionists with more opportunities to expand the child's utterance. It might be easier for children to participate in verbal routines than in nonroutine conversations because the predictability of routines makes the information processing load relatively light (Shatz, 1983).

Empirically, children who are developing typically in Brown's (1973) Stages II, III, and IV have been found to exhibit more utterances in routinized interactions than in nonroutinized ones (Snow et al., 1987; Conti-Ramsden & Friel-Patti, 1987). Yoder and Davies (1992) found that children with developmental delays in the first stage of language learning talked more in routines than in nonroutines.

Second, children with developmental delays may be better able to converse while simultaneously analyzing the input from expansions in routines than in nonroutines. If children use their "cutting edge" language skills in routines more than in nonroutines, it would support the notion that routines do indeed reduce the information processing load on the child. Additionally, if children are more likely to use other possible language learning strategies in routines than in nonroutines, then perhaps they also are more likely to learn from expansions in the routines than in nonroutines. Empirically, 2-year-olds (2;3 to 2;9 [years:months]) who are typically developing (Conti-Ramsden & Friel-Patti, 1987) have been found to use more complex language in routines than in nonroutines. In addition, as the familiarity of the interaction increased, preschoolers with language impairment used more delayed imitation (Watkins & Davis, 1992).

Kim and Lombardino (1991) conducted the only published experimental study on the effect of routines on language acquisition in children with mental retardation. They used a modified alternating treatments design to test whether intervention in the context of scripts, an elaborate type of routine, resulted in more efficient comprehension of semantic relations in four children with mental retardation. They found that three of the four preschool children learned to comprehend target semantic relations faster under script intervention conditions than under nonscript intervention conditions. No studies have investigated the effect of combining the use of expansions in the context of routine contexts on productive language development.

When one is evaluating the effect of expansions within verbal routines on child length of utterance, it is important to measure child length of utterance in generalization sessions that differ in several important ways from the intervention sessions (Kaiser, Yoder, & Keetz, 1992). The present study measures mean length of utterance (MLU) from generalization sessions that vary from the intervention session in (a) adult conducting the session, (b) modality of the materials (i.e., objects, not pictures were used), and (c) interaction style. Such a measure is more likely to indicate the acquisition of new competence, as opposed to greater use of existing skills, than are measures taken from sessions that are very similar to the intervention sessions (Kaiser et al., 1992). Although MLU does not specify which grammatical elements the child uses, it does correlate with more detailed measures of grammatical development in children with language disorders, particularly in children with MLUs equal to or under 3.0 (Scarborough, Rescorla, Tager-Flusberg, Fowler, & Sudhalter, 1991). Therefore, MLU has been widely used as an easily calculated distal measure of early grammatical level (Scarborough et al., 1991).

In the present study's intervention sessions, we asked children questions about the pictures in a book and expanded the children's utterances. For each child, the same picture book was used in all of that child's intervention sessions to facilitate the construction of a verbal routine. It was predicted that as the interactions became more familiar, the children would talk more often about the books in the intervention sessions. Increased talk was measured as an indirect indication that a routine was being constructed because routine construction cannot be measured directly. It also was predicted that this increase in the number of opportunities for expansions would be reflected in the adults using progressively more expansions in the intervention sessions. The use of expansions and the presence of verbal routines in the intervention sessions were predicted to facilitate the use of longer utterances by the child in the generalization sessions.

METHODS

Subjects

Four subjects, three males and one female aged 24 to 54 months, were selected for inclusion in the study. Table 1 indicates that the subjects varied widely in their chronological age, mental age, mental development index, receptive language age, and productive language age. The mental development indices indicate that the children scored in the borderline or mild mental retardation range.

The MLUs in the baselines indicate that the subjects can be grouped into two subgroups. Three cases were in Brown's (1973) Stage I (the single word stage). These were subject A, subject B at the beginning of his first book (i.e., B-1), and subject C. Two cases had MLUs that placed them

Table 1. Means and standard deviations of chronological age, mental age, intelligence quotient (IQ), or developmental quotient (DQ), and receptive and productive language age.

Variable	Subjects			
	A	B	C	D
At initial baseline				
Chronological age in months	31	37	24	54
Mental age in months	22 ^a	29 ^b	18 ^a	39 ^b
IQ or DQ	71 ^a	75 ^b	67 ^a	75 ^b
Receptive age in months	22 ^c	32 ^d	14 ^c	48 ^c
Productive age in months	20 ^c	30 ^d	14 ^c	50 ^c
Average MLU in baseline	1.56	1.98	1.48	3.1
At second baseline				
Average MLU in baseline	na	3.36	na	na

^a Bayley Scales of Infant Development (Bayley, 1969).

^b Merrill-Palmer Scale of Mental Tests (Stutsman, 1948).

^c Receptive-Expressive Emergent Language Scale (Bzoch & League, 1971).

^d Preschool Language Scale (Zimmerman, Steiner, & Evatt, 1969).

in Brown's (1973) Stage IV (the complex sentence stage). These were subject B at the beginning of his second book (i.e., B-2) and subject D. Cases at different MLU levels were studied to test whether the intervention was effective with children in these two stages (I and IV) of language development. Having at least two cases within a stage allowed us to potentially replicate treatment effects across subjects within a particular stage.

We studied subject B's response to the intervention twice, instead of studying a different child, because we could not find another child in addition to subject D who was in the complex sentence stage (i.e., Stage IV) in the university-based early intervention program where the intervention was conducted. Subject B's MLU placed him in Stage IV at the beginning of his second book.

Subjects were recruited from a university-based preschool for children with developmental delays. The selection criteria were as follows:

- Children must use spoken utterances in which we could transcribe at least one word for 25% of the child's utterances. An intelligibility criteria was used because some of the children's utterances had to be intelligible for us to derive their MLUs. We selected 25% as an arbitrary criteria to exclude only the most unintelligible children.
- Children must have evidence of delayed cognitive development as evidenced by an intelligence quotient lower than 1.5 standard deviation (*SD*) below the norm accompanying the test.
- Children must have delayed productive language as evidenced by an MLU at least 1.5 *SD* under that expected for the child's chronological age using the systematic analysis of language transcripts program (SALT) (Miller & Chapman, 1983) reference database, which is recorded in Leadholm and Miller (1992). MLU was derived from 20-minute language samples with a trained staff member. MLU was calculated by the SALT (Miller & Chapman, 1983), which uses only complete and intelligible utterances to compute MLU.

Cognitive and language delay criteria were used because we wanted to study children with developmental delays. The language and intelligence tests were those judged to be most appropriate by a licensed psychologist. The language and intelligence tests differed between children because no one test had norms for all the children in the study. Children with severe hearing and visual impairments, as indicated by school records, were excluded from the study.

Design

To assess the effect of the intervention on MLU, a multiple-baseline-across-subjects design was used (Barlow & Hersen, 1984). The dependent measure, MLU, was taken from generalization sessions in both baseline and intervention phases.

Secondary Analyses: Measurement of the Independent Variables

The independent variables were verbal routines and adult expansions of child nonimitative utterances in the intervention sessions. We used a positive trend line in the number of nonimitative child utterances in the intervention sessions during the intervention phase as indirect evidence that a routine was being built. The number of adult expansions of non-imitative child utterances in the intervention sessions also was counted and was expected to increase as intervention progressed.

We did not take a baseline on nonimitative child utterances and adult expansions of nonimitative child utterances during picture book interactions (i.e., the intervention sessions). Interactions around the picture book were considered part of the intervention. If we had exposed children to the book during a baseline period, it would have amounted to beginning the intervention at that point. We present the data for nonimitative child utterances and adult expansions during the intervention sessions as measures of the independent variables. In the present context, one can only infer an association between time in the intervention and increases in nonimitative child utterances and adult expansions.

Procedure

Setting and equipment. Both the generalization and intervention sessions took place in a play laboratory equipped with a bean bag chair, table, and two chairs. The laboratory has a one-way mirror through which all sessions were video- and audiotaped. The child wore a vest with a wireless microphone sewn into the seams. An omnidirectional microphone was suspended from the ceiling. An audio mixer, audio recorder, video recorder, video camera, and date-time generator were in an adjoining room.

Baseline sessions and generalization sessions in the intervention phases. Baseline sessions were conducted before the intervention phase began. Baselines were ended when we had at least three data points and when the baseline data had a flat or downward trend. Generalization sessions were taken during the intervention phase every other day intervention sessions were held. On days that a generalization and an intervention session were to occur, the generalization sessions always occurred before the book reading session to prevent that day's intervention session from affecting performance during the generalization session. The baseline and generalization sessions were conducted in the same manner, by the same people, and with the same materials.

The generalization sessions were designed to test three types of generalization. That is, there was one type of generalization session that differed from the intervention sessions in three ways.

- To allow a test of across-person generalization, the staff member implementing the generalization sessions was not the child's interventionist.

- Objects, instead of pictures, were used in generalization sessions to allow a test of cross-modal transfer. That is, this test determined whether children could take the grammatical knowledge they had learned from talking about pictures and use this knowledge in talking about objects. The objects selected for baseline and generalization sessions were those that afforded displaying the common semantic relations (e.g., agent action, entity location, action object, etc). However, there was not a systematic attempt to prevent objects that were depicted in the book from being present in the generalization sessions. Therefore, across-material generalization was not systematically tested.
- During baseline and generalization sessions, the staff members were instructed to avoid the use of expansions. Because expansions were avoided in the generalization sessions and were used frequently in the intervention sessions, the generalization sessions also offered a test of across-interaction style generalization (Kaiser et al., 1992).

During all baseline and generalization sessions, the staff was instructed to follow the child's attentional lead and ask questions about and comment on the child's focus of attention. It was important to avoid teaching semantic relations during the generalization sessions so that changes in the generalization sessions could be attributed to the intervention. Although following the child's focus of attention (i.e., playing with the child's focal object at the child's level of play) is a component to many language interventions, there is no reason why it would facilitate language development on its own. Following the child's lead may set the context of language intervention, but it is not an instructive technique by itself. Additionally, there is no evidence that asking questions and commenting on the child's focus of attention should directly facilitate semantic relations in children with developmental delays. Finally, three different sets of objects were used systematically in generalization sessions to reduce the probability that the child would build a routine during these sessions.

Intervention sessions. After establishing a baseline for MLU in the baseline sessions, the intervention phase began. Intervention sessions took place four times a week, provided the child was present at school. These sessions were video- and audiotaped daily. The intervention included two components.

First, repeated exposure to the same book was used to help the child develop a verbal routine. A verbal routine is a familiar, predictable activity in which at least one turn from each participant is verbal. Selected books displayed clear representations of the common objects, actions, and adjectives, and displayed common examples of frequently occurring semantic relations. Books were assigned to the subjects based on two criteria. First, books were assigned to particular children if the children's parents reported that the children produced at least 5 of 10 target words selected for each book. The target words were those that represented referents that were displayed at least three times in the book. This criterion was used to ensure that the child had in his lexicon at least some of the words needed to talk

about the pictures in the book. Second, if there were more than one book that met the first criterion, we asked the parents which of the books that met the first criterion would most likely be enjoyed by the child. If no preference was stated, the book was randomly selected. *Big Bird's Color Game* (Cooke, 1980) was assigned to subject A. *What Bunny Loves* (Szekeres, 1990) was assigned to subject B during his first intervention phase. *It's Not Easy Being a Bunny* (Sadler, 1983) was assigned to subject B during his second intervention phase and to subject D. *Dinner's Ready, Jesse* (Ziefert & Smith, 1990) was assigned to subject C.

The second component of the intervention was to ask the child questions about the pictures on the page, pause for the child's response, and expand the child's nonimitative utterances. The purpose of asking questions was to elicit from the child verbal engagement about the book's pictures and story so that the child's utterances could be expanded. The purpose of pausing after a question was to allow the child time to respond. In between adult question-child response-adult expansion sequences, the adult commented on the child's focus of attention. An example transcript of the intervention sessions is in the Appendix.

Observational measurement. Trained observers transcribed and coded the baseline, intervention, and generalization sessions from audio- and videotapes. In all sessions, child utterances were transcribed verbatim with morphological coding using the format described in the manual for the SALT (Miller & Chapman, 1983). Adult utterances in the intervention session were coded as (a) an expansion, (b) a question, or (c) other. An expansion included the noun, verb, or adjective of the immediately preceding child's nonimitative utterance; maintained the topic; and added a major grammatical component to the message (e.g., subject, action, object, modifier).

Adults were instructed to use complete sentences when expanding. Questions were prompts for the child to talk and included commands to talk (e.g., Tell me what this is.), but excluded tag questions (e.g., You want this, don't you?). Child utterances in the intervention sessions were coded for imitativeness of adult utterances (exact or reduced imitations vs. nonimitations). Exact or reduced imitations were child utterances that had all or some of the words in the preceding adult utterance, but did not add any new words. Nonimitations were child utterances that added words to the immediately preceding adult utterance or did not occur immediately after an adult utterance.

The variables used in the analyses were as follows:

- The number of nonimitative child utterances from the intervention sessions was recorded to measure indirectly the construction of routines (an independent variable). Nonimitative child utterances could be, but did not have to be, delayed imitations of previous adult utterances.
- The number of adult expansions of child nonimitative utterances was recorded from the intervention sessions as a measure of this independent variable.
- Child MLUs were computed from the baseline and generalization sessions as the dependent variable.

Child MLU in morphemes was computed from the complete and intelligible child utterances in the transcript by the SALT program (Miller & Chapman, 1983).

Reliability of the measures. To estimate interobserver agreement, a second staff member randomly selected and independently transcribed and coded 20% of each subject's baseline, generalization, and intervention sessions. If 20% of the sessions within a phase was less than one session, then the entire session was coded. We used intraclass correlation coefficients (Cronbach, Gleser, Nanda, & Rajaratnam, 1972) to estimate interobserver reliability on the independent and dependent variables in the study. These intraclass correlation coefficients correct for chance agreement (Berk, 1979; Mitchell, 1979) due to very high frequency events but low between-session variance. Intraclass coefficients were derived for each subject across sampled sessions. The mean of the intraclass correlation coefficients within child across sessions for the variables of interest were as follows:

- MLU in baseline and generalization sessions (mean = .87; *SD* = .15)
- child nonimitative utterances in intervention sessions (mean = .98; *SD* = .008)
- adult expansions in intervention sessions (mean = .91; *SD* = .11)
- adult questions in intervention sessions (mean = .95; *SD* = .05)

RESULTS

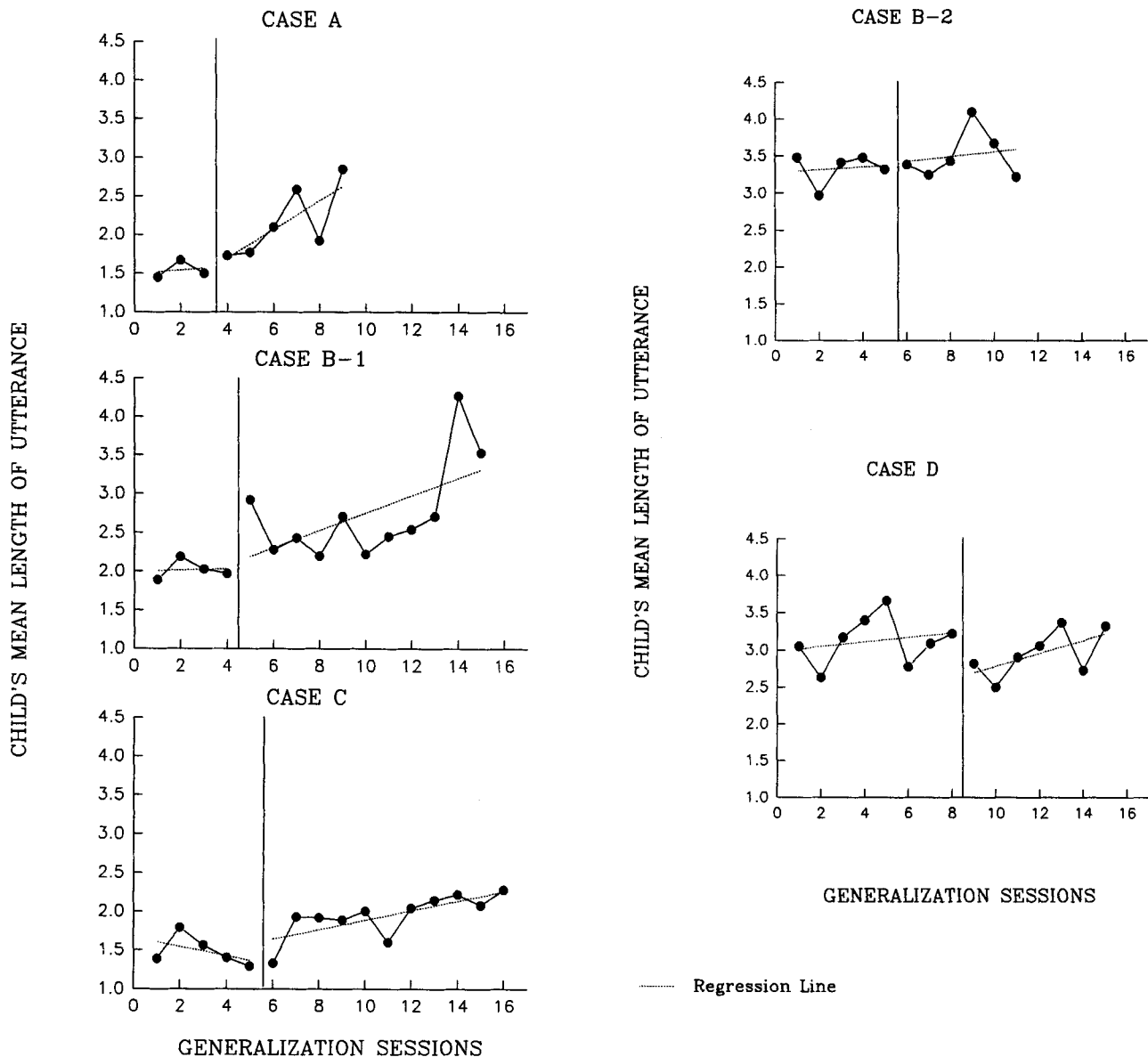
To allow us to clearly refer to a particular leg of the design, separate legs will be referred to as "cases" regardless of whether they come from the same subject at different intervention phases or from different subjects. Particular cases within subject B will be distinguished and referred to by whether the data come from the first book (e.g., B-1) or the second book (e.g., B-2). Cases with only one book will be referred to by their subject ID alone (e.g., A, C, and D).

The Effect of the Intervention on Generalized Child MLU

Figure 1 presents the baseline and intervention phase data for child MLU in the generalization sessions. A regression line was computed and drawn to aid interpretation of the results. It should be remembered that these data represent MLU in a situation different from the intervention sessions in many ways, thus offering a strong test of generalization. In general, the results support the hypothesis of an intervention effect on generalized MLU in cases A, B-1, and C, but do not support the intervention effect in cases B-2 and D.

There is strong evidence of an intervention effect on case A. Looking at the data for case A, there was an immediate

Figure 1. Mean length of utterance by sessions in baseline and generalization sessions.



Note: The vertical line within each graph indicates the end of the baseline.

increase in the intercept (or level) of the trend line for MLU with the onset of the treatment phase. There also was a slightly delayed (by two sessions) increase in the slope (or trend) of the increase in MLU after the beginning of the treatment phase. The slope of the trend line for the MLU data in the baseline was almost zero. The slope of the trend line for the MLU data in the intervention was clearly positive and quite steep.

There is moderately strong evidence of an intervention effect on case B-1. The results for case B-1 show an immediate increase in the intercept of the trend line for MLU with the onset of the treatment phase. There also was a clear delay (of six sessions) in the increase in the trend for increases in MLU after the onset of the treatment

phase. Again, the slope of the trend line for the MLU data in the baseline was approximately zero. The slope of the trend line for the MLU data in the intervention was positive, but less steep than seen in case A, due to the marked delay in the increase in the slope during the intervention phase in case B-1.

There was strong evidence of an intervention effect on case C. The results for case C show an almost immediate increase in the intercept of the trend line and an immediate increase in the slope of the trend line of MLU with the onset of the treatment. The slope of the trend line for the MLU data in the baseline phase was actually negative as a result of a much higher MLU in the second baseline session than was seen in the rest of

the baseline for this case. The slope of the trend line for the MLU data in the intervention phase was positive, with relatively little variability around the trend line.

In contrast to the above three cases, case B-2 shows virtually no change in either the intercept or slope of the trend line of MLU from baseline to intervention phase. The shorter intervention phase, much variability, and delayed change in the slope of the trend line of the MLU data in the intervention phase also are obstacles to confident interpretation.

In case D, an unusually long baseline was necessary because of the extreme variability of MLU and because of the ascending trend in MLU up to session five. There actually was a slight decrease in the intercept of the trend

line for MLU in the intervention phase. The slope of the trend line for MLU in the intervention phase was slightly higher than that seen in the baseline.

Secondary Analyses

Measurement of the independent variables. Figure 2 presents the number of child nonimitative utterances per minute during the intervention sessions. In all five cases, the rate of nonimitative child utterances increased with the number of intervention sessions in which the child was exposed to the same book. No baseline was taken because exposing the children during the baseline would have amounted to beginning the intervention at that point.

Figure 2. Rate of nonimitative child utterances in intervention sessions for each case.

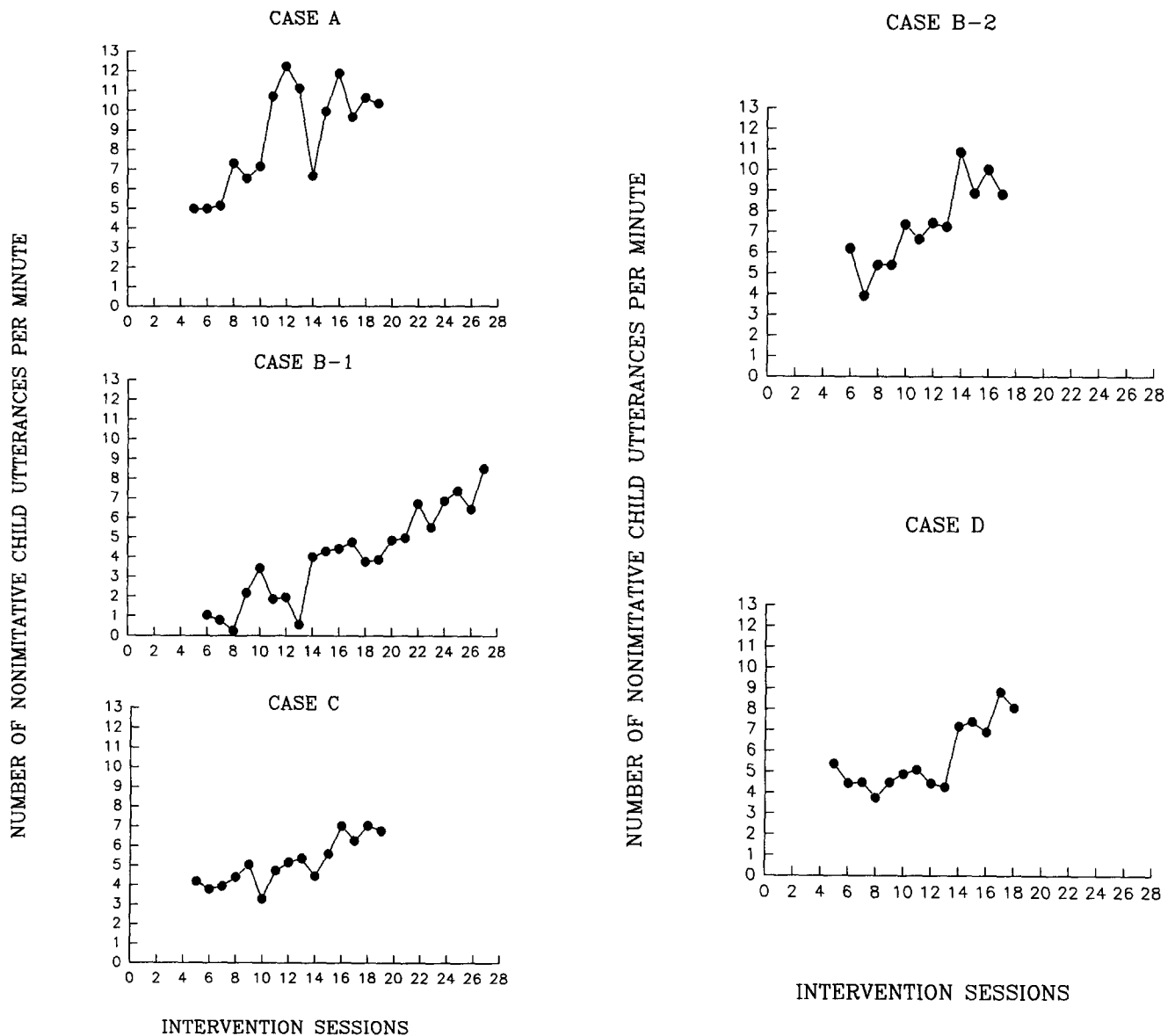


Figure 3 presents the number of adult expansions per minute during the intervention sessions. Again, no baseline was possible for this variable. In all five cases, the rate of adult expansions increased with the number of intervention sessions.

Exploring whether a possible increase in adult questions accounted for the increase in nonimitative child utterances. Because adults asked questions during the intervention, one possible explanation for the increase in nonimitative utterances may have been that adults increased the rate of questions as the intervention progressed. Examination of the rate of questions per minute averaged across the sessions in the first half of the intervention versus that in the last half of the intervention sessions suggest that the rate of question asking was greater in the second half of the intervention phase in

only one case (B-1). It was approximately equal in two other cases (A and D), and was less in the second half of the intervention phase for the remaining two cases (B-2 and C) (see Table 2).

Examining whether adults used expansions during the generalization sessions. It was important to measure whether the adults were successful in avoiding expansions during baseline and generalization sessions because we did not want to facilitate semantic and grammatical structures during these sessions. Therefore, we coded and counted the number of adult expansions in five randomly selected baseline and generalization sessions across baseline and intervention phases for each subject. The mean number of expansions was .5 per 10-minute session ($SD = .7$; range = 0-2). The adult interactors conducting the baseline and generalization sessions were quite successful in virtually

Figure 3. Rate of adult expansions in intervention sessions for each case.

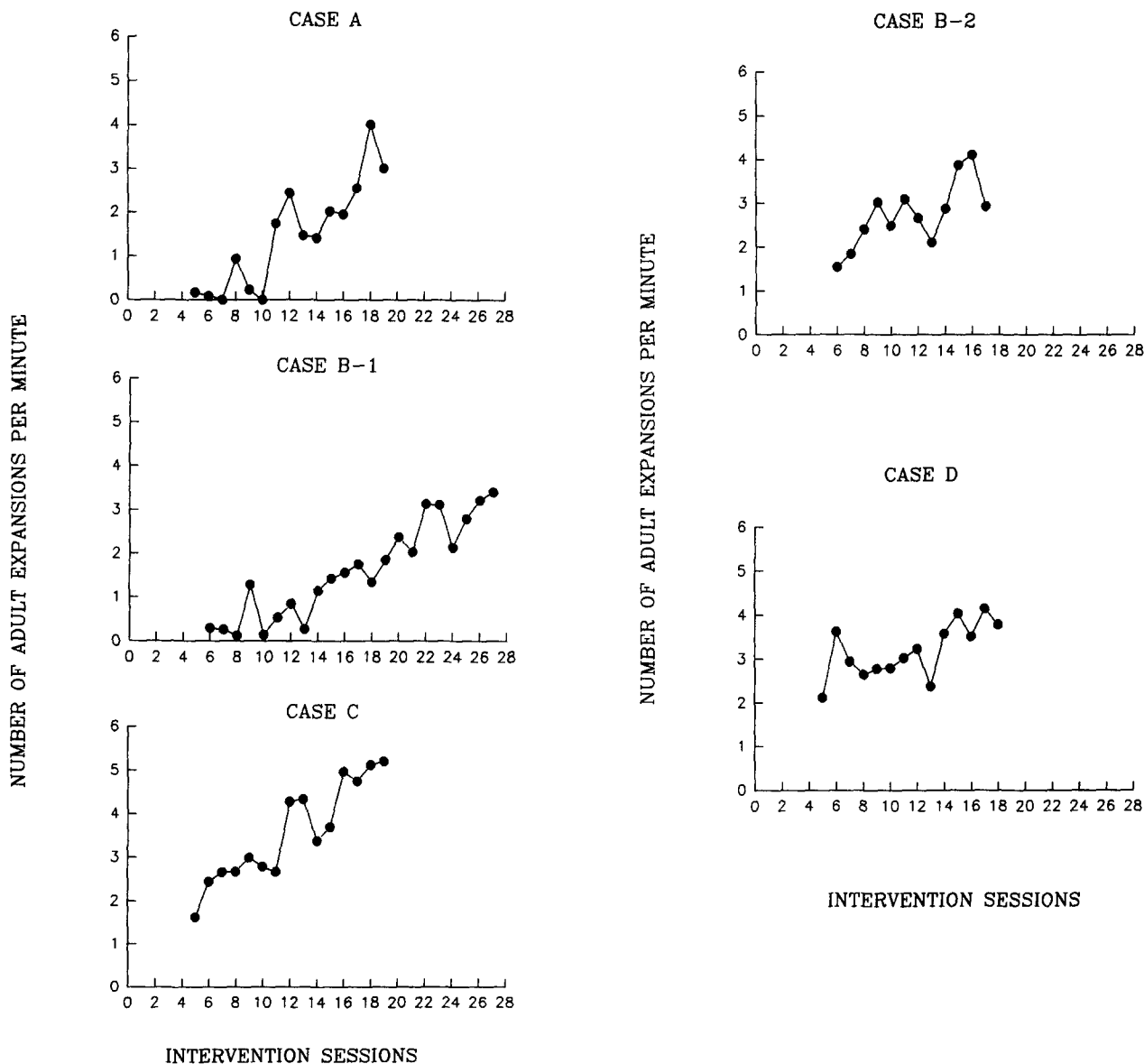


Table 2. Average rate of question-asking per minute in the first and last half of the intervention phase.

<i>Case</i>	<i>Mean rate of questions per minute over sessions in first half of intervention</i>	<i>Mean rate of questions per minute over sessions in last half of intervention</i>	<i>Difference in rate of questions per minute between halves of intervention</i>
A	1.86	2.08	.22
B-1	2.63	5.76	3.13
C	4.08	3.18	-.90
B-2	4.30	3.18	-1.12
D	2.91	2.85	-.06

eliminating expansions from their speech during these sessions.

DISCUSSION

The results more strongly support an intervention effect on generalized MLU for cases A, B-1, and C than for cases B-2 and D. The degree of confidence for inferring that a treatment facilitated the changes in the dependent variable in the context of a multiple-baseline-across-cases design is partly dependent on the immediacy of the changes with the onset of the treatment and the degree of replication of the effects (Barlow & Hersen, 1984). There was an immediate increase in either the intercept or slope of the MLU trend line with the onset of the treatment in cases A, B-1, and C. Therefore, we have strong confidence that the treatment had an effect on the generalized MLU for cases A, B-1, and C. However, there was a delayed change in the slope of the trend line for MLU in case B-2, and a decrease in intercept with only a slight increase in slope in case D. Therefore, we are less confident the treatment affected MLU increases in case B-2 and conclude no treatment effect on case D.

Although the absence of a baseline for the intervention sessions prevents causal inferences, it is probable that the large increase in nonimitative child utterances in the intervention sessions were caused by expansions and/or the verbal routines that were built through repeated experience with the same book. Expansions are a type of topic-continuing utterance. Topic-continuing utterances have been found to precede child talk more than expected by chance in young children with developmental delays (Yoder, Davies, & Bishop, 1992). Additionally, child talk has been associated with routines in past research on young children with developmental delays (Yoder & Davies, 1992).

The data in the present study eliminate the possible explanation that increases in nonimitative child utterances during the intervention phase were caused by increased question use during the last half of the intervention. Question use was about the same or lower in the second half of the intervention for four out of five cases. Regardless of why the children increased the number of

nonimitative utterances in the intervention sessions, doing so provided the opportunity for more expansions. This increase in verbal participation in the intervention sessions may be particularly important for some children who are reticent to converse with adults (Yoder, Davies, & Bishop, 1992). The adults increased their use of expansions as the intervention progressed and the children increased their verbal participation.

The importance of the effect on cases A, B-1, and C is partly due to the nature of the generalization sessions. Many language intervention studies investigate generalization in situations that differ from the intervention sessions on only one dimension, such as setting (Kaiser et al., 1992). Changes in such generalization sessions may not indicate changes in the child that will show up in naturally occurring conversations because the child may still be responding to stimulus conditions that lead him to develop a special way of interacting used only in intervention sessions or similar interactions (Johnson, 1988).

In the present study, the generalization session used a different adult interactor, different modality for the stimuli (i.e., objects instead of pictures), and different interaction style than was used during the intervention sessions. Such a strong test of generalization is more likely to reflect changes in MLU performance that reflect language development in the child than are more common tests of generalization that vary only one stimulus dimension (Kaiser et al., 1992).

However, it should be noted that MLU does not allow one to distinguish between novel combinations of words and memorized phrases that may have been learned in the intervention sessions and transferred to the generalization sessions (Peters, 1983). If the children used more novel combinations of words in the generalization sessions than in the baseline sessions, it would be more convincing evidence that the children had learned semantic relational or syntactic knowledge from the intervention sessions. It should be noted that we did not select objects in the generalization sessions in a systematic manner to be similar to objects pictured in the books. Additionally, the set of objects changed across generalization sessions. Therefore, it is unlikely that child use of unanalyzed phrases in the generalization sessions accounts for all the changes in MLU seen in cases A, B-1, and C.

We cannot know for certain why the intervention did not appear to have as strong an effect on cases B-2 and D. The small sample size prevents us from testing alternative hypotheses for the different results for different cases. However, it is interesting that all the cases having strong evidence for an effect (A, B-1, and C) began the intervention in the single word stage of language learning (Brown's, 1973, Stage I). The two cases in which there was less evidence (B-2, D) of an effect began the intervention when they were well into the complex sentence stage of language development (Brown's, 1973, Stage IV). Other studies have shown that a child's developmental level affects the efficacy or efficiency of several language interventions (Cole, Dale, & Mills, 1991; Yoder, Kaiser, & Alpert, 1991).

Developmental level of the subjects could explain the differential effects across cases for two reasons. First, the

adult expansions might have been more likely to model grammatical structures that the children did not have in their productive repertoire if the children were in Brown's Stage I than if the children were in Stage IV. For example, if the child says, "Ball," and the adult expands the utterance with, "The ball is red," it is more likely that the Stage I child will have the prerequisite knowledge to learn, but not yet have mastered the use of the article (Brown, 1973) and modifier semantic role (Bloom & Lahey, 1978). In contrast, the Stage IV child will probably already have mastered the article and modifier semantic role. It should be noted that the adults were instructed to expand any nonimitative child utterance by using a complete sentence that added a clausal element to the child's utterance. No specific grammatical targets were used to guide expansions. Specific, developmentally appropriate targets may increase the efficacy of expansions for developmentally older children (Nelson, 1989). We do know that expansions can be effective in facilitating grammatical structures in children in the simple and complex sentence stages when they target specific, developmentally appropriate, grammatical structures (Nelson et al., 1973; Camarata & Nelson, in press).

Second, MLU is a more valid measure of grammatical development for children with MLUs under 3.0 (i.e., cases A, B-1, and C) than it is for children with MLUs above 3.0 (i.e., cases B-2 and D) (Scarborough et al., 1991). Scarborough et al. (1991) found that MLU correlated with a more detailed measure of grammar (i.e., Index of Productive Syntax, [IPSyn]) more strongly for the former group than for the latter. However, we doubt that this would completely account for the difference in the present results because even in the children with MLUs over 3.0, the correlation between MLU and IPSyn is positive and significant (Scarborough et al., 1991). The presence of the correlation indicates that increases in MLU continue to reflect increases in some aspects of grammar even in children with MLUs above 3.0. The correlation between MLU and IPSyn in children with MLUs above 3.0 is nonsignificant only in autistic children (Scarborough et al., 1991). The subjects in the present study were not autistic according to informal observation and file review.

Our use of picture books differed from two other uses of picture books in the early intervention literature. First, we were not reading to the children, as is done in many "early literacy" studies (e.g., Fitzgerald & Needlman, 1991). Second, unlike Whitehurst et al. (1988), we used the same book each day. Whitehurst et al. (1988) used different books across sessions, thus reducing the probability that a verbal routine would be established.

The use of repeated exposure to the same picture book as the method of developing the routine had advantages and disadvantages. On the plus side, interactions around books are a common part of preschool activities. Such books allow a consistency in presentation and order that may allow children to rapidly acquire a routine. On the minus side, anecdotal reports from the trainers indicated that children began to show signs of "boredom" near the end of the intervention (e.g., more acting out). Therefore, it is probably important to vary the routine when children become increasingly distracted.

Because the experimental stimuli were pictures in the books and the generalization stimuli were objects, one might wonder if it would have been more efficient to establish verbal routines with objects, thus avoiding the necessity for cross-modal transfer. Although several studies have investigated whether concept training with objects is more efficient in producing generalization with objects than is training with pictures, none of the reviewed studies supported this hypothesis with children who are developing typically (Becker, Rosner, & Nelson, 1979; Daehler, Perlmutter, & Myers, 1976) or with children who are mentally retarded (DeHaan & Wischner, 1963; Hupp, 1986). Therefore, at the very least, it is unclear whether object training would have been more efficient in producing meaningful results. However, there is no reason not to use objects in establishing routines, particularly if the child seems to enjoy these more than books.

Future research is needed to identify which children benefit most from expansions embedded in routine interactions as a method for facilitating grammatical development. The present study's use of only five cases is not sufficient to adequately study such aptitude by treatment interactions. Future research should select children that vary by developmental level and make sure the expansions use target-specific structures that are just beyond the children's current abilities.

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APPENDIX

Example of Intervention Session

Adult: This is Jessie.
She is building a birdhouse.
Child: Bird house.
Adult: Yes, her bird house.
Here is her hammer.
Child: Hammer.
Adult: She is building something with the hammer.
What is Jessie building?
Child: Bird x.
Adult: What?
Child: Bird house.
Adult: Yes, she's building a bird house [expansion].
What's this?
Child: Hammer.
Adult: Jessie's hammer [expansion].
Child: {points to next page} Big trees.
Adult: Those are big green trees [expansion].

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Paul J. Yoder, Heidi Spruytenburg, Anne Edwards, and Betty Davies
Lang Speech Hear Serv Sch 1995;26;21-32

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