

Teaching Children with Autism Self-Initiations as a Pivotal Response

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The purpose of this study was to assess whether children with autism could be taught a child-initiated query as a pivotal response to facilitate the use of grammatical morphemes. Data were collected within the context of a multiple baseline design across two children who lacked the use of temporal morphemes. Results of the study indicated that both children learned the self-initiated strategy and both acquired and generalized the targeted morpheme. Additionally, generalized use of the self-initiation into other question forms and concomitant increases in mean length of utterance, verb acquisition, and diversity of verb use occurred for both children. These generalized effects and the applications of this procedure across linguistic targets are discussed. Key words: *autism, grammatical acquisition, language interventions, morphology, pivotal behaviors, self-initiations*

The communication of children diagnosed as having autism is marked by a lack of verbal and nonverbal social initiations (Mundy & Stella, 2000; Weiss & Harris, 2001). Initiations, such as question asking, have been recognized by researchers as important in prompting language acquisition (Hung, 1977; Taylor & Harris, 1995). They occur infrequently or are absent in children with autism (Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998; Koegel, Koegel, Shoshan, & McNeerney, 1999; Wetherby & Prutting, 1985). Through self-initiation, a child may spontaneously elicit teaching interactions from the surrounding environment. Furthermore, longitudinal outcome data from children with autism suggest that the presence of initiations

may be a prognostic indicator of more favorable long-term outcomes and therefore may be "pivotal" in that they appear to result in widespread positive changes in a number of areas (Koegel, et al., 1999). Thus the importance of comprehensive programs that include systematic teaching of child initiations are being discussed in relation to increasing the likelihood for positive long-term outcomes (Koegel, et al., 2001; McClannahan, MacDuff, & Krantz, 2002)

A number of studies have focused on teaching question asking to children with autism (Hung, 1977; Taylor & Harris, 1995). Question asking may be especially useful for speech and language specialists or other special educators who have large caseloads because question asking allows the child to evoke learning opportunities outside of the clinical setting. One investigator into teaching question asking was provided by Koegel and colleagues (1998) who designed a self-initiated strategy to increase noun vocabulary in three children with autism. Within the context of a multiple baseline design, the participants were taught to use the query, "What's that?" by prompting its use with highly desired items hidden in a bag. After the query, the experimenter removed a desired item from the bag and labeled it. The prompt was then gradually faded until children were asking the question spontaneously. At the same time, unfamiliar items were added until the self-initiated query was being used in response to only unknown

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labels of items. Results of the study indicated that all children learned to use the self-initiated strategy and all children made substantial gains in their vocabularies. Furthermore, participants demonstrated generalization of question asking to their home environments with their mothers. Other areas that have been shown to improve as a result of teaching child-initiations are prepositions, pronouns, and assistance and attention-seeking utterances (e.g., "Help me!" and "Look!") (Koegel & Koegel, 1995; Koegel, et al., 1999).

Another area in which children with autism have demonstrated difficulties is verb use. Tomasello (1992) asserts that verbs are responsible for much of the grammatical structure of language, and hence the acquisition of verbs marks a major turning point in children's passage to adult-like grammatical competence. It has even been argued that children's initial verb lexicon is a strong predictor of other aspects of early grammatical competence (Bates, Bretherton, & Snyder, 1988). However, it is well-documented that all children have more difficulty acquiring verbs than other linguistic items such as nouns (Bloom, Lightbown, & Hood, 1991; deVilliers, & deVilliers, 1978; Gentner, 1978; Gleason, 1993; James, 1990; Smith & Sachs, 1990; Tomasello, 1992, Tomasello & Kruger, 1992). However, in contrast to typical language developers, studies investigating morphologic development in children with autism have suggested that the use of grammatical morphemes in children with autism is delayed and the order of acquisition can be atypical (Menyuk & Quill, 1985; Paul & Alforde, 1993; Swisher & Demetras, 1985). This may be because particular difficulty is recognized in areas such as temporal morphemes, as it is in other children with language disorders (Broen & Santema, 1983; Wiig & Semel, 1980). A study by Bartolucci and Albers (1974) found that the production of the regular past tense was notably less frequent in children with autism compared with that of control groups. Similarly, a study by Bartolucci, Pierce, and Streiner (1980) discovered that children with autism lacked mastery of verb tense markers and uncontracted copula and auxiliary verbs, and that this atypical acquisition was inconsistent with other measures of syntactic complexity such as mean

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length of utterance (MLU). Moreover, children with autism often do not make overgeneralization errors on morphemes such as the regular past tense ending *-ed*, which is so illustrative of typically developing children (deVilliers & deVilliers, 1978; Kuczaj, 1977).

Methods to facilitate children's acquisition of morphologic and other linguistic structures are prominent in the literature, and intervention procedures have moved increasingly toward naturalistic learning contexts (Baker & Nelson, 1984; Camarata, Nelson, & Camarata, 1994; Conti-Ramsden, 1990; Farrar, 1992; Kaiser & Hester, 1994; Koegel, O'Dell, & Koegel, 1987; Pemberton & Watkins, 1987; Valdez-Menchaca & Whitehurst, 1988). Naturalistic interventions have been shown to be important because they are more apt to produce generalized changes in children's vernacular (Kaiser & Hester, 1994). Most interventions are based on conversational techniques that adults naturally employ in their everyday interactions with children, such as recasting, expansions, and negative evidence. Although these processes generally have been successful in facilitating correct language use with different populations of children, they are limited in that they rely on the child's production of words that are then repeated by the adult but corrected in some fashion (i.e., grammatically, semantically, or otherwise). Unfortunately, because of the generally lower levels of conversations and initiations in children with language delays, and especially children with autism, fewer opportunities exist for remediation (Koegel, 1995; Paul & Shiffer, 1991). Thus it would be helpful if children with autism were able to increase their rate of initiations, so that opportunities for linguistic feedback increase outside of the speech therapy or special education classroom. Therefore, the purpose of the present investigation was to assess whether children with autism could be taught a self-initiated query, and

once learned, whether this query would facilitate acquisition of temporal morphemes.

METHOD

Participants

Two male children, ages 6 years, 3 months, and 4 years, 4 months, participated in this study. Both were diagnosed as having autism by an outside agency and referred to the Autism Research Center at the University of California at Santa Barbara for intervention. The children demonstrated behaviors consistent with autism according to the *Diagnostic and statistical manual of mental disorders*, ed. IV (1994), including (1) a markedly abnormal or impaired development in social interaction, (2) qualitative impairment in verbal and nonverbal communication skills, and (3) a markedly restricted repertoire of activities and interests. Children were selected for participation based on (1) their MLU, (2) their stage of acquisition of Brown's 14 grammatical morphemes according to deVilliers and deVilliers (1973), and (3) their lack of acquisition or usage of temporal grammatical morphemes in their expressive language. Children included in the study were required to have an MLU at the same or higher stage as one in which the target morpheme was generally mastered, and to demonstrate use of grammatical morphemes that develop before, around, or after the acquisition of the targeted temporal morpheme. Before intervention, the following standard tests were administered: the Test of Early Language Development (Hresko, Reid, & Hammill, 1981), the Leiter International Performance Scale (Leiter, 1979), the Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981), the Expressive One Word Picture Vocabulary Test-Revised (Gardner, 1990), and the Stanford-Binet Intelligence Scale (Thorndike, Hagen, & Sattler, 1986). Individual child descriptions follow.

Child 1

Child 1 was 6 years, 3 months, at the start of the study. He lived at home with his parents and three siblings and was fully included into a regular education kindergarten class. Results of the Leiter International Performance Scale did

not indicate an impairment in cognitive level; his performance on the Stanford-Binet Intelligence Scale yielded an average score of 96. Results of the Peabody Picture Vocabulary Test-Revised yielded a score of 5 years, 3 months, and his score on the Test of Early Language Development indicated a language age of 4 years, 5 months. However, his performance on the Expressive One-Word Picture Vocabulary Test-Revised indicated an age equivalent of 7 years, 2 months. In initial probes, child 1 demonstrated that he had understanding of the concept of "past" and could describe and demonstrate actions in the past, but used verbs in the present tense to explain actions that had already occurred. In natural conversation, child 1 frequently answered "He goes like this!" followed by a physical movement to answer questions requiring him to verbally describe the past, such as "What happened?" Analysis of language samples revealed that child 1 had acquired of all of the morphemes in stages II and III, and almost all of the morphemes through the V+ stage, including irregular past. However, child 1 rarely used the regular past tense; the instances when he did produce *-ed* words seemed to be memorized versions of a verb that he did not use in the present (i.e., "crashed"). Thus the target morpheme selected for child 1 was regular past. Additionally, it was noted that he used the same verbs numerous times during discourse and displayed no question-asking behavior in baseline language samples or probes.

Child 2

Child 2 was 4 years, 4 months, at the start of the study. He lived at home with his parents. Child 2's use of verbs was minimal for his age. Results of the Leiter International Performance Scale indicated that child 2's mental age was at the 4-year, 11-month level; his IQ as obtained on the Stanford-Binet Intelligence Scale was in the average range at 107. On the Expressive One-Word Picture Vocabulary Test-Revised he scored at the 3-year, 9-month level, and his score on the Peabody Picture Vocabulary Test-Revised score was 3 years, 8 months. Finally, his score on the Test of Early Language Development yielded a language age of 2 years, 2 months. In conversational interactions, child 2 often failed

to respond to adults' questions. Spontaneous interactions functioned as requests for desired items (e.g., "Can I have the race car?"). Regarding morphologic development, child 2 displayed a scattered acquisition of a number of grammatical inflections from stages II through V+; however, he had not acquired the present progressive morpheme *-ing*.

Setting and materials

The study was conducted across three settings: (1) the child's home, where baseline and generalization language samples were collected, (2) a large clinic room located on the university campus, where in-clinic language probes and intervention sessions took place, and (3) a large extra-clinic playroom, where extra-clinic probes and language samples were collected. All sessions were videotaped. Based on clinician observations and feedback from each of the children's mothers regarding items of special interest, a number of pop-up picture books featuring a desired subject were chosen as stimuli for each of the participants.

Experimental design and procedure

A multiple baseline across subjects design (Barlow & Hersen, 1984) was used and consisted of the following three phases: (1) baseline, (2) intervention, and (3) generalization. All sessions were approximately one half-hour long and were conducted twice weekly.

Baseline

Three different measures were collected during baseline: (1) home language samples, (2) in-clinic language samples, and (3) probes. Unstructured language samples were collected at each child's home while interacting with his mother or mother and siblings with the child's own toys or books. For these language samples, the participant's mother was instructed to play with her child as she normally would and was not given details of the study. Unstructured language samples were also collected in the clinic, wherein the interventionist or a student who the child did not know interacted with the child with toys or books. Language probes were collected in the clinic, wherein opportunities were

provided for the child to use the target temporal morpheme by interacting with the child using toys or books not used in the intervention sessions. Twenty-five verbs that the child used with regular past tense ending *-ed* were selected as targets for child 1, and 15 verbs were chosen for child 2.

Intervention

The intervention phase was designed to teach the child to use a self-initiated query as a method to access verbs together with a temporal morpheme. Using child chosen pop-up books, the interventionist first taught the child to self-initiate a question that would be likely to evoke a communicative partner's use of the target temporal verb ending. Child 1 was taught to ask "What happened?"; child 2 was taught to ask "What's happening?". For both participants, this was done by manipulating the pop-up feature of the book and prompting the child to use the self-initiation. For the regular past tense ending, the query, "What happened?" was prompted after the completed action of the pop-up feature; for the present progressive, the query, "What's happening?" was prompted while the pop-up feature manipulation was ongoing. After the child asked the question, the clinician responded with the appropriate verb stem-plus-temporal morpheme targeted for that specific pop-up action. A typical dialogue for child 1 was as follows.

Clinician manipulates the pop-up feature in a book about sea animals, a crab using his claws, and stops the action.

Child says, "What happened?"
Clinician says, "He pinched!"
Child repeats "He pinched."

Similarly, the typical dialogue for child 2 was as follows:

Clinician manipulates the pop-up feature in a book about ABCs and animals, a kangaroo hopping.

Child says, "What's happening?"
Clinician says, "He's jumping!"
Child repeats "He's jumping."

If the children expressed a desire to manipulate the pop-up tab by themselves, this opportunity was provided.

Generalization

A primary goal of this study was to assess whether the children would acquire and use the targeted morpheme, either *-ed* or *-ing*, through use of a self-initiated query. We also assessed whether the children would generalize the use of the target morpheme to verbs other than those used in the intervention. Generalization was considered to occur if the child used his or her particular target morpheme with a new verb that was not included in the intervention. This was assessed by analysis of unstructured language samples taken both in the clinic setting and at the child's home after the intervention condition was completed. Also, a generalization probe session was conducted before every fifth intervention session to assess progress in acquisition of the temporal morpheme. In addition, we assessed the participants' use of the self-initiated query during the home and clinic postintervention generalization sessions and during a follow-up session for child 1, who had fewer opportunities to use the past tense during the generalization probes.

All generalization sessions, including the home and clinic unstructured language samples and the in-clinic generalization probes, were conducted with an adult other than the interventionist who conducted the intervention sessions, and with different materials (i.e., games, toys, and pop-up books not used in intervention sessions) (Yoder, Spruytenburg, Edwards, & Davies, 1995).

Dependent measures

The research questions that this study addressed were: (1) if the child is taught a self-initiated query, will acquisition of a specified grammatical morpheme occur, and (2) if so, were any other positive linguistic changes apparent that could be associated with the procedure? To assess if the procedure resulted in acquisition of the target morpheme for child 1, the following data were collected.

1. Number of occurrences of regular past tense verb productions. An event-recording system was used to tally the occurrence of productions of regular past

tense verbs online during the intervention sessions and from the orthographic transcriptions of language samples during unstructured spontaneous speech in baseline and generalization sessions. Occurrences recorded within the clinical sessions during the intervention phase were imitative, following the interventionist's model. Only spontaneous productions were graphed, not imitative.

2. Number of productions of the query "What happened?" by the child. Use of the targeted query was scored on a point-by-point basis online and via videotape from baseline, intervention, and generalization sessions.
3. Percent correct response using regular past tense. For the baseline and generalization conditions, this was computed by dividing the number of correct productions of a regular past tense verb in answer to the interventionist's or mother's question requiring a verbal response using a regular past tense verb by the number of adult questions requiring a verbal response by the child using a regular past tense verb. For the intervention sessions, this was calculated by dividing the number of correct imitative productions of the target regular past tense verb by the number of opportunities available.

To assess if the enhanced naturalistic procedure resulted in acquisition of the target morpheme for child 2, the following data were collected.

1. Number of occurrences of present progressive verb productions. An event recording system was used to tally the occurrence of productions of present progressive verbs online during the intervention sessions and from the orthographic transcriptions of unstructured spontaneous speech during baseline and generalization language samples. Again, occurrences were tallied whether the production was an answer to a question requiring the child to verbally describe the action, was produced spontaneously, or was produced imitatively following the adults' production of the same pres-

ent progressive verb. Imitative responses were *not* included in the graphed data.

2. Number of productions of the query "What's happening?" by the child. Use of the query was scored on a point-by-point basis on line and via videotape from baseline, intervention, and generalization sessions.
3. Percent correct responses using the present progressive. For the baseline and generalization conditions, this was computed by dividing the number of correct productions of a present progressive verb in answer to the interventionist's or mother's question requiring a verbal response using a present progressive verb by the number of adult questions requiring a verbal response by the child using a present progressive verb. For the intervention condition, this was calculated by dividing the number of correct productions by the child of the target present progressive verb by the number of opportunities available following manipulation of the pop-up feature and subsequent child-initiated query "What's happening?"

To assess whether any other positive linguistic changes occurred after intervention, the following data were collected for both participants.

1. Mean length of utterance. This was computed as described in Miller (1981) for the first three and the last three sessions; that is, the first three baseline sessions and the last three generalization sessions.
2. Generalized use of the child-initiated query. This was determined by analysis of the postintervention unstructured language samples and the follow-up probe with child 1.
3. Total number of occurrences of verbs produced. This was tallied from the orthographic transcription of unstructured language samples for baseline and generalization sessions and from the scoring sheets of intervention sessions. This included a point-by-point count of all verbs, including stems from the baseline and generalization sessions and verbs used with the targeted morphemes for

all sessions, that the child had used in the baseline sessions.

4. Diversity of verbs. This was tallied in the same manner as described previously; however, to assess diversity of verb use, the number of different verbs the child used during spontaneous unstructured speech was tallied.

Reliability

Reliability for child 1 was obtained by direct comparison of independently prepared transcriptions from videotapes between the experimenter and an undergraduate honors student majoring in psychology who was selected from a pool of 12 undergraduate students. Reliability for child 2 was obtained by direct comparison of online data collected during sessions between the clinician and a graduate student. All were blind to the experimental hypothesis of the study and sessions were presented in random order. Percentage interobserver agreement was calculated by dividing the total number of agreements by total agreements plus disagreements and multiplying by 100. Agreement was defined for the intervention sessions as both observers recording that the child had said the targeted structure correctly and for the baseline and generalization sessions as both observers recording that the child said the targeted structure correctly as well as recording the occurrence of productions of a verb and diversity of verbs. Reliability measures were calculated for 50% of the sessions with child 1 and for 29% of the sessions with child 2. Percentage agreement for child 1 was 93% (range 81%–100%), and for child 2 was 96% (range 88%–100%).

RESULTS

The first question asked in this study was whether children with autism could learn a self-initiated query to facilitate the acquisition and generalization of temporal morphemes. The results pertaining to this question are presented in Figure 1. The data show that both participants acquired and generalized the targeted grammatical inflection in very few intervention sessions.

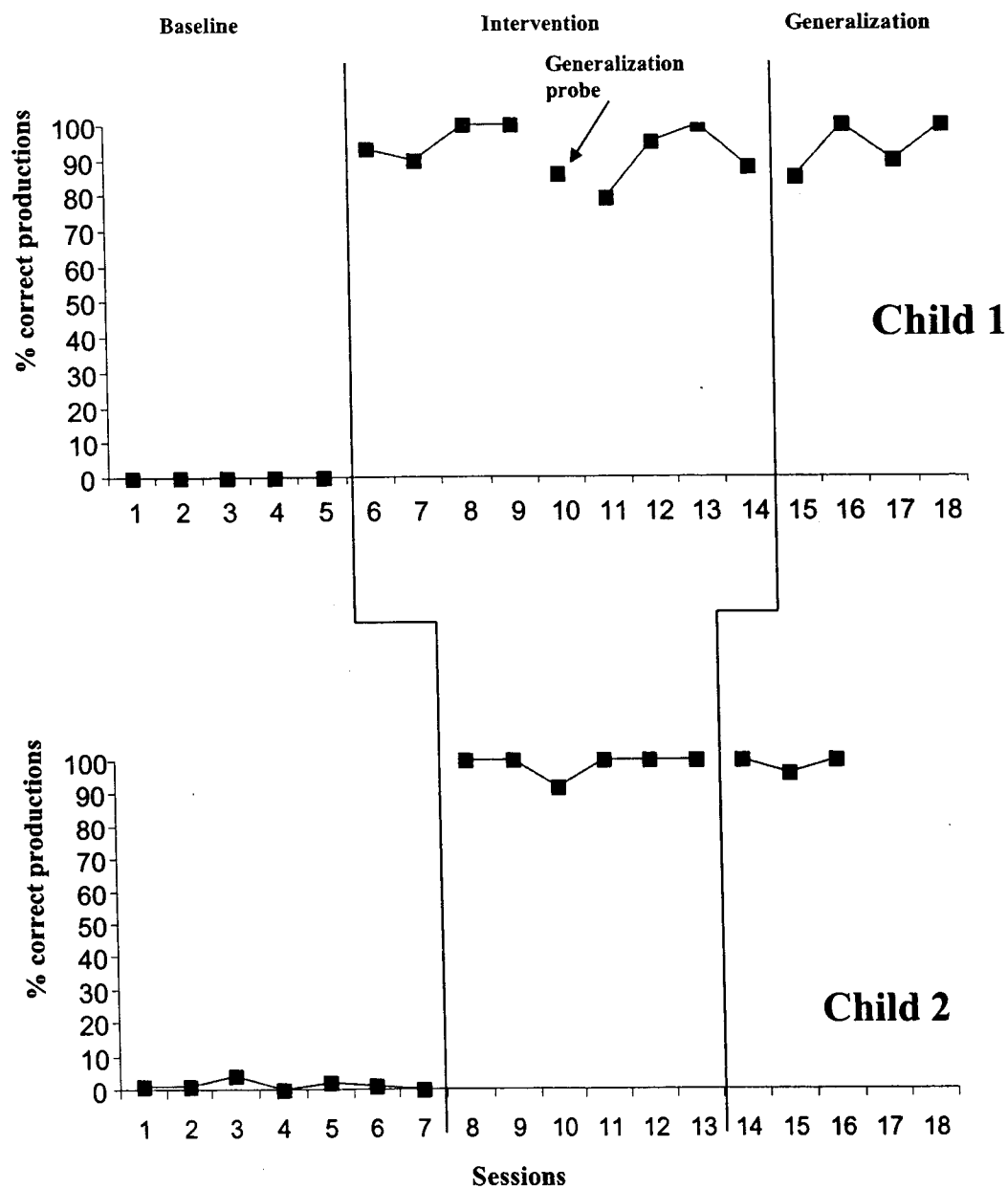


Figure 1. Percent correct productions of the targeted morpheme for child 1 (-ed) and child 2 (-ing) in baseline, intervention, and generalization phases.

That is, during baseline, child 1 did not use the regular past tense morpheme with verbs correctly, and child 2 did not use the present progressive morpheme with verbs correctly. In

contrast, both children increased their correct use of the targeted grammatical morpheme in conjunction with a verb stem during intervention, and postintervention language samples in

both the clinic setting and in the participants' natural home environments showed that these results had generalized.

A second and equally important issue was also investigated: If the child's use of the query produced the desired result, would any other

linguistic changes occur in the participants' productive language which could be associated with the intervention? The results pertaining to this question are presented in Figure 2. As shown, there were positive concomitant results for both children in the number and diversity of verbs

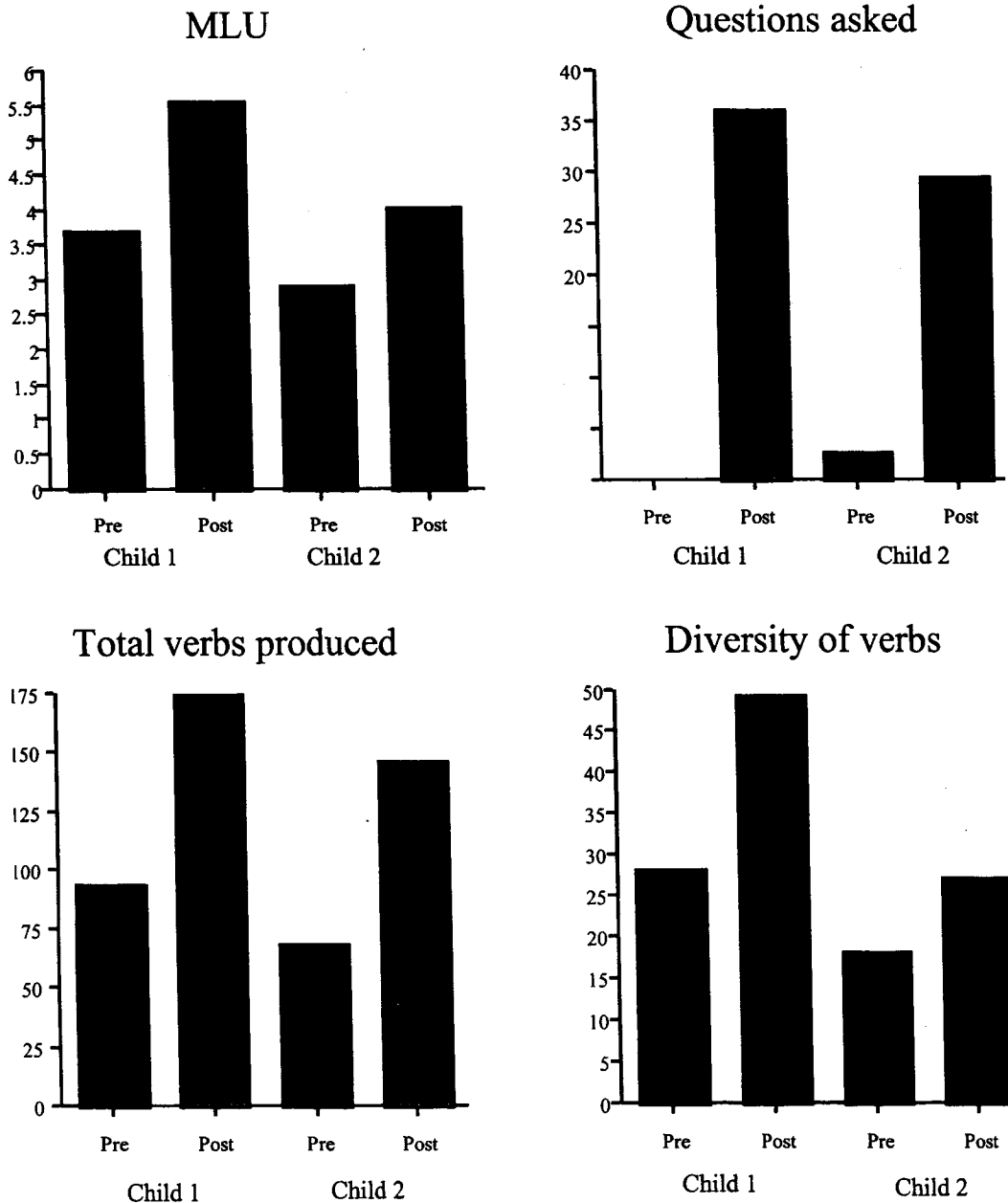


Figure 2. Mean production of mean length of utterance, questions asked, total number of verbs, and diversity of verbs for each child during baseline and postintervention.

produced, MLU, and in question asking. For instance, the average MLU produced by child 1 during baseline sessions was 3.69 (range 3.23–4.24) but increased to 5.54 (range 4.64–6.82) in postintervention language samples. Similarly, child 2's MLU increased from an average of 2.89 (range 2.5–3.17) in baseline sessions to 4.07 in generalization sessions.

The total number of verbs produced by child 1 in the baseline sessions averaged 93 (range 73–121) but increased to 174 (range 74–309). Child 1's production of different verbs averaged 28 (range 19–40) in baseline and increased to 49 (range 37–60) in generalization language samples. Likewise, child 2's production of verbs increased from a mean of 68 (range 16–106) to 146 in generalization, and his diversity of verb productions increased from an average of 18 (range 9–28) in baseline to 27 in generalization sessions.

Whereas child 1 displayed no question-asking behavior in baseline sessions, he asked 36 information-seeking questions in the postintervention follow-up. Child 2's question use showed a dramatic increase as well; his question use increase from an average of 2.5 (range 0–7) in baseline to 29 (range 28–30). The findings concerning each of these areas and their implications will be considered in the discussion section.

DISCUSSION

The results of this study suggest that a child-initiated query can be a useful intervention strategy to facilitate both within-clinic intervention effects with generalized language gains. These findings may be especially helpful for speech pathologists or other educators who see children for relatively short periods, but desire procedures that encourage child-initiated learning outside of the clinical setting. There are several factors that may have influenced these results and that point to this language teaching procedure as having implications for correct language use and future spontaneous language learning.

First, this method made use of child choice by selecting pop-up books with child-desired themes, which has been shown to have a posi-

tive effect on motivation, and thus replicates previous findings (Koegel & Mentis, 1985). It is likely that incorporating child-desired themes not only had an impact on the effectiveness of the technique in facilitating grammatical morpheme acquisition, but may have also had a positive effect on the promptness of acquisition of the temporal morpheme. That is, both children showed intervention gains within only eight intervention sessions.

Second, the intervention was based on a procedure involving turn-taking by the clinician and the child during natural activities (i.e., looking at books) wherein the child was taught to initiate interactions that led to opportunities for correct verb use to be modeled. It is feasible that teaching the child the use of this pragmatically correct verbal exchange in the context of a simple verbal routine could be extended to home and school environments. Because communicative competence has been found to be a major deficit in children with autism in areas such as discourse rules (Swisher & Demetras, 1985), this method may be important to facilitate correct language pragmatics in children with autism. Further research is needed in this area.

Third, in addition to producing changes in the targeted structure, this method produced changes in the participants' overall language. There are a number of possible reasons for these effects. For example, it may be that the procedure itself produced the gains in temporal morpheme acquisition and verb use. As previously mentioned, it has been stated in the literature that the development of temporal expressions with morphemes is dependent upon the child's cognitive construction of the time dimension (Antinucci & Miller, 1976). Similarly, as mentioned earlier, there are a number of articles addressing the time and aspect of verbs in verb and temporal morpheme acquisition. Investigators have asserted that the confusion associated with the abstractness and changes in the expressive form of verbs may be the reason verbs enter the lexicon more slowly and at a later rate than nouns (Antinucci & Miller, 1975; Behrend, 1990; Gleason, 1993; Harner, 1981). Perhaps using a pop-up book was the crucial feature in making the time concept more understandable and in turn simplifying verb acquisition for

these children. Thus it is possible that when the time and aspect is made more obvious as in the method employed, acquisition of verbs is made less complicated.

Regarding the generalized effect of increased MLU, the literature suggests that as children acquire parts of speech, their MLU simultaneously increases (Brown, 1973). This finding is consistent with research by Yoder and colleagues (Yoder & Davies, 1992; Yoder, et al., 1995) who reported that using verbal routine contexts increased MLU and produced more diverse language in children with developmental delays. Thus increased MLU was an understandable result of this language training method. However, when the length of the intervention phase of this study is considered, the improvement in MLU evidenced is quite impressive. The rapid acquisition of the targeted goals, with very little direct intervention, suggests that this procedure may be especially helpful for speech and language specialists who may see children with severe language disabilities just a few times weekly.

Perhaps the most important finding of this study was the generalized use of question forms by the participants. Typical children ask questions early in their language development (Brown, 1973), but this skill is often severely lacking in children with autism (Taylor & Harris, 1995). Self-initiated question asking allows a child to solicit information, thereby increasing learning opportunities. Whereas baseline language samples of child 1 revealed no ques-

tion-asking behavior whatsoever, and baseline measures of child 2 showed limited question use, generalization measures indicated that both children were using questions to obtain new information. Hence, this generalized effect implies a significant impact for future language learning. Again, the use of procedures that teach the child with disabilities to evoke language learning opportunities in the natural environment may be particularly useful for speech and language specialists or other special educators who desire ongoing learning outside of language teaching sessions.

Because this investigation achieved equal success using two different morphologic inflections as targets, it is likely that extension to other grammatical inflections is feasible, and concomitant changes in children's overall language use could also occur. It is conceivable that this method could be used with other morphological structures such as irregular past (e.g., He *fell*) or regular third person singular (e.g., He *plays*) by virtue of the pop-up feature and pop-up books available. Replication of this study with other targets and participants with different levels of language disability is necessary to determine the potential success of this procedure with other linguistic structures and the extent of generalized gains. However, the present results point to self-initiations as a promising way to improve the language of children with autism, with positive improvements in other linguistic and social pragmatic areas.

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