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Setting Generalization of Question-Asking by Children With Autism

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We examined whether motivational procedures incorporated into teaching question-asking to children with autism, who lack verbal initiations, would result in generalization without additional teaching, prompting, or reinforcement in other settings. Specifically, we assessed whether such children could learn to use questions and whether the spontaneous use of question-asking would generalize across stimuli, settings, and people. All children learned to use questions in relation to items they had previously been unable to label and demonstrated generalization of spontaneous question-asking to new items and to their home environments with their mothers, with concomitant gains in expressive vocabulary. Results were discussed in terms of teaching response strategies, such as question-asking, to promote spontaneous child-initiated social interactions and expressive language development.

Self-initiated verbal behaviors, such as question-asking, are often absent or occur infrequently in children with autism and other language disabilities (Paul & Shiffer, 1991; Wetherby & Prutting, 1984). Yet, for typical language developers language forms such as question-asking are noted very early in life. For example, one common utterance during initial vocabulary development in children without disabilities is "That?" (/dæt/?), which is often used while pointing to items. This verbalization and nonverbal cue can be a very specific prompt for a parent to label the item (Halliday, 1975). Question-asking becomes more sophisticated and varied throughout development and leads to learning and social opportunities. Thus, a number of researchers have stressed the importance of teaching children with disabilities to use questions and have provided encouraging data to suggest the feasibility of teaching these skills (e.g., Hung, 1977; L. Koegel, 1995; Taylor & Harris, 1995; Warren, Baxter, Anderson, Marshall, & Baer, 1981).

In contrast, the lack of acquisition of such skills may be important in terms of the direct and indirect effects on a variety of other behaviors. Inadequate communicative abilities negatively affect reciprocal social interactions with parents (Yoder, Davies, & Bishop, 1992) and peers (Haring & Breen, 1992; R. Koegel, Frea, & Surratt, 1994), and, in more severe cases, can result in challenging behaviors such as

aggression and self-injury (Carr & Durand, 1985; R. Koegel, Camarata, & Koegel, 1994; R. Koegel, Koegel, & Surratt, 1992). Because of this, researchers have developed procedures designed to teach children with language learning difficulties, particularly those who are likely to exhibit a multitude of behavior problems associated with the failure to develop communication, to use and initiate verbal behaviors (cf. Carr, McConnachie, Carlson, Kemp, & Smith, 1994).

A number of investigators have explored the feasibility of teaching verbal initiations such as question-asking (Guess, Sailor, & Baer, 1978; Twardosz & Baer, 1973), and a few have assessed the extent to which such verbalizations generalize in populations with severe disabilities. For example, Warren et al. (1981) assessed generalization of the question "What's that?" (previously taught by Guess et al., 1978) for eight children with severe mental retardation. To do this, the experimenters went to the children's state residential institution, hid reinforcers in a box or brown bag, and then shook the box/bag to get the children's attention when necessary. Two of the eight children displayed some degree of stimulus generalization in that they asked the previously taught question once the bag was placed in front of them, and the other children asked the question after various combinations of re-training and/or peer modeling of question-asking.

Question-asking has been particularly important to study in children with autism, who lack verbal initiations to others and usually fail to develop question-asking (L. Koegel, 1995; L. Koegel & Koegel, 1993, 1994; Wetherby & Prutting, 1984). A few investigators have assessed whether question-asking could be taught to children with autism. In an early study, Hung (1977) taught four children to ask "What is ____ (name of object) for?" and "What is/are _____ (name of person[s]) doing?" These children demonstrated the use of questions in another setting but did so only after a token reinforcement system that had been used in the original teaching setting was introduced. In a later study Taylor and Harris (1995) used a time delay procedure with picture cards at school to teach three children with autism to ask, "What's that?" Question-asking also occurred using new objects placed along the way while on a walk in the school building. However, the authors noted that a brief pause and/or prompt to orient the children to the novel stimuli may have served as a stimulus for question-asking on these walks. Therefore, although these studies provide an important foundation, the authors noted the problem of generalization of spontaneous language.

As a whole, the pervasive problem of a lack of self-initiated verbal interaction tends to persist for children with autism, which extremely limits their social and verbal learning opportunities. Therefore, an important extension of the literature in the area of autism would be to determine whether a treatment can be developed that will produce greater generalization and spontaneous child-initiations of verbal interactions without direct training, prompting, or systematic use of extrinsic reinforcement outside of the original treatment setting.

Outcomes from research assessing generalization of other areas of language use has emphasized the reciprocal nature of the communicative interaction and accentuated the child's role as an active communicative partner in the dyad. This emphasis on social language builds upon arranging the environment to motivate the use of functional language in a social context. Through such paradigms specific variables known to influence motivation have been added, resulting in greater generalization of linguistic gains. Similar strategies have been demonstrated in incidental teaching (Hart & Risley, 1968), mand model paradigms (Warren, McQuarter, & Rogers-Warren, 1984), time delay procedures (Halle, Marshall, & Spradlin, 1979), conversational recasting techniques (Camarata & Nelson, 1992), and the natural language paradigm (R. Koegel, O'Dell,

& Koegel, 1987).

Several important motivational techniques incorporated in these approaches may also positively affect generalization while teaching question-asking. These components include following the child's lead or interest in the verbal interaction and using naturally rewarding consequences for asking questions (Camarata & Nelson, 1992; Charlop, Schreibman, & Thibodeau, 1985; L. Koegel, 1995; R. Koegel, Dyer, & Bell, 1987; R. Koegel, O'Dell, & Koegel, 1987; Yoder, Kaiser, Alpert, & Fischer, 1993). The present study was designed to assess whether incorporating these variables would increase the use and generalization of child-initiated question-asking in children with autism, who are notably resistant to learning such generalized verbal initiations. In this study, generalization to new persons, settings, and items was assessed.

Method

Participants

Participants were 2 boys and 1 girl. All were diagnosed by professionals from an outside agency as having autism and were referred to our clinic for treatment. The children demonstrated behaviors consistent with autism, including impairments in social interaction, qualitative impairments in verbal and nonverbal communication, and restricted repertoires of activities and interests. Although at the start of the study, the children were 3.92, 5.42, and 3.75 years of age, they were estimated to be communicating at language ages between 15 to 20 months. These children rarely, if ever, asked questions, exhibited a general lack of spontaneous language, and demonstrated numerous disruptive behaviors prior to the start of the study.

Child 1. Child 1, who was 3.92 at the start of the study, could say at least 50 recognizable words, occasionally said words and a few phrases at home to express his needs and desires, could point to at least one major body part, and sometimes could follow a simple message according to maternal report. During baseline he did not respond verbally or nonverbally to most questions and commands, such as "What's this?" or "Show me the ball." His only intelligible spoken vocabulary consisted of naming animals and letters, counting objects, and saying a few other single words, such as *bye-bye, jump,* and *hot.* However, all of these were out of context and were unrelated to any of the previous adult utterances. According to both parental report and baseline measures taken at home and in a clinic setting, he had no question-asking responses. On the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984), his age equivalent score on the communication domain was 1.67 years.

Child 2. Child 2 (5.42 years of age at the beginning of the study) was described variously by other agencies as having developmental delays, autism, and mental retardation and autism. He exhibited frequent tantrums and aggression in the form of pinching the inside region of the forearms of others (often resulting in bruising and drawing blood). During baseline measures he never produced any questions, and his foster parents reported that they had never heard him ask a question. Child 2's foster father reported that he could say about 50 words (e.g., *ball, go, bubble*), and he could sometimes follow a simple instruction requiring an action and object. His estimated functioning level on the Vineland Adaptive Behavior Scales indicated that communication skills were at 15 months.

Child 3. This child was 3.75 years of age at the start of the study. Her paternal grandparents and father spoke Spanish, but English was the primary language spoken at home by both parents. She occasionally exhibited self-injurious behavior (head-banging with a closed fist) when she was required to communicate. A few instances of question-asking occurred during baseline sessions in a clinic room. For example, she asked "where O?"

when looking for the letter *O* to complete a puzzle once and "what that?" twice, while pointing to a smudge on a page of a book. However, no question-asking was noted during baseline measures at home. Parental reports indicated that her spoken vocabulary consisted of at least 100 recognizable words, she sometimes spoke in simple sentences with a noun and verb (e.g., "want baby," "don't like it"), and she could name some friends. With regard to responding to receptive language, they described her as being able to point to some body parts and follow simple instructions. She was estimated to be functioning at about 20 months communicatively on the Vineland Adaptive Behavior Scales.

Settings

Measures were collected in two settings during the study: (a) a small room (3 m × 3 m) containing a table, two chairs, and a video camera, located on the university campus; and (b) each child's home while the child was interacting with his or her mother. All sessions throughout the study were videotaped.

Design and Procedure

Sessions were conducted in the context of a multiple baseline across-children design. The sessions in all conditions were approximately 30 minutes long and were implemented twice weekly, with the occasional exceptions of holidays and illness. All baseline, intervention, and generalization sessions are plotted in Figures 1 and 2 in order to show the specific length of conditions for each child.

Baseline. Baseline data were collected in the clinic while the child interacted with a clinician and at the child's

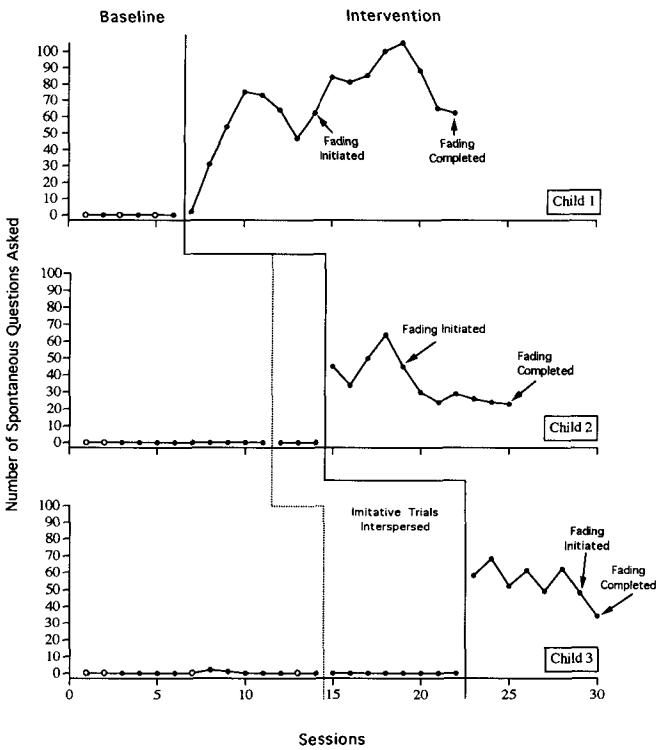

Figure 1. Number of questions asked by the children during baseline and intervention sessions.

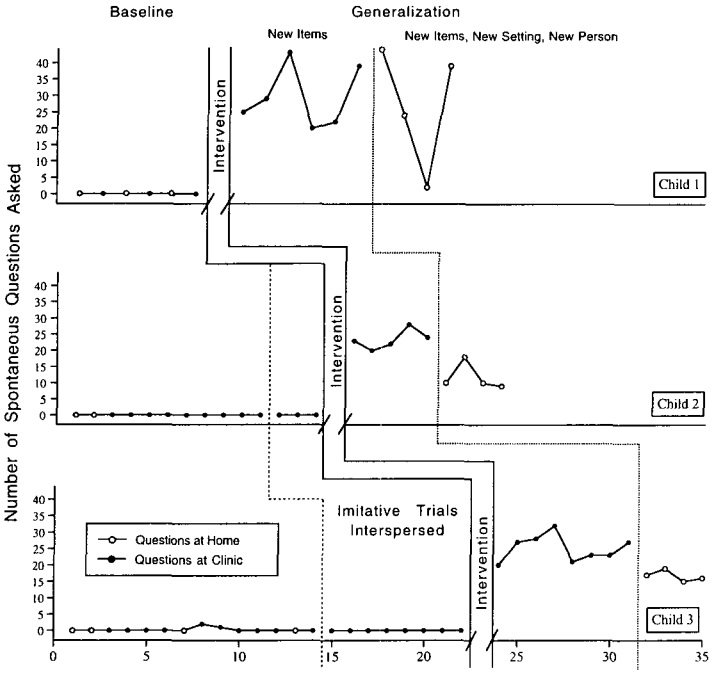

Figure 2. Number of questions asked by the children during baseline and generalization sessions, with new items in the clinic sessions (closed circles) and new items in a new setting (home) with a new person (their mothers) (open circles).

home while the child interacted with his or her mother in order to determine whether the children asked the question "What's that?" In both settings a variety of objects were placed around the room, and the adult engaged in play/social interactions with the child. No specific protocol was followed; the adults interacted in activities as they normally would. With respect to the home sessions, each mother was told that we were interested in listening to her child's language and that she should play and interact with her child as she usually did at home. Baseline sessions ranged from 6 (for Child 1) to 22 (for Child 3).

During the final sessions of the baseline phase, prompts were interspersed in order to determine whether the children could say "What's that?" imitatively. Child 1 responded immediately when prompted to say "What's that?" so he proceeded immediately to the intervention phase. Children 2 and 3 remained in the baseline condition for 3 and 8 additional sessions, respectively (see Figure 1), while approximately 15 to 20 imitative trials were interspersed. This was accomplished by teaching them to repeat words following the prompt "Say _____," such as "Say, candy," and "Say, gummy bear," and, eventually, "Say, 'What's that?'" Data continued to be collected on the children's spontaneous question-asking while the imitative trials were interspersed.

Intervention. The intervention phase, conducted in a small clinic room, was designed to teach or increase (for Child 3) the use of the targeted question, "What's that?" The following procedure was instituted in order to stimulate the child's interest in asking what was inside the bag. The initial treatment step incorporated two variables to improve the children's motivation to ask the question. First, we incorporated child preferred items (Dunlap,

Kern-Dunlap, Clark, & Robbins, 1991; Dyer, 1987; R. Koegel, Dyer & Bell, 1987; Yoder et al., 1993) by analyzing the children's pretreatment videotapes for items that were highly desired for each child, such as pieces to favorite puzzles, food treats, etc., then hiding them inside an opaque bag. Second, we provided natural reinforcers (Charlop et al., 1985; Skinner, 1979; Williams, Koegel, & Egel, 1981) for the children's use of the question "What's that?" regarding what was inside the bag (i.e., the children were verbally prompted to say "What's that?"). After the children asked the question "What's that?" the clinician showed the child what was inside the bag (one of the highly desired items) while labeling it, and the child could take the item if he or she so desired. Within the first intervention session, the clinician provided a delay to give the child an opportunity to ask the question spontaneously in order to find out what was in the bag. This procedure allowed the child unlimited opportunities to spontaneously use the question within a given session.

Next, when the child was spontaneously asking the question "What's that?" over several sessions, the clinician began to gradually fade (see arrows in Figure 1) the highly desired items that were hidden in the bag and replace these with neutral items (that the child did not show an interest in during the pretreatment videotapes) and that the child did not label during the pre-subset vocabulary assessment (see below). Initially, these neutral items were varied systematically by interspersing them every fourth trial, then every third trial, and so on (on a variable schedule over 2 to 7 sessions, as long the child was continuing to ask approximately one question per minute), until all were neutral items the child did not previously label. In addition, the opaque bag was gradually faded so that the neutral items were merely sitting on the table. The intervention phase was terminated when all fading was complete (see arrows in Figure 1).

Generalization

In a manner identical to the baseline condition, generalization data were collected in half-hour sessions under two separate conditions (in order to prevent multiple assessment interference): (a) in response to new items in the clinic while the child engaged in play/social interactions with a clinician and (b) in response to new items at the child's home while the child engaged in play/social interactions with his or her mother. In both settings a variety of new items were placed around the room. Care was taken to ensure that the brown bag and the stimulus items used in the intervention for each particular child were not present in any of the baseline or generalization sessions. In addition, none of the parents had participated in or observed the intervention sessions nor were they informed of the experimental phases of the study.

Dependent Measures

Two dependent measures were collected in this study: (a) the number of times the child spontaneously used the targeted question in the baseline, intervention, and generalization settings and (b) the number of stimulus items the child labeled correctly (in pre- and postassessments in a separate testing setting) related to the specific spontaneous questions the child asked during earlier sessions. The procedures for obtaining each of these two measures were as follows.

Spontaneous Use of the Targeted Question in Baseline, Intervention, and Generalization Settings. Throughout each half-hour baseline, intervention, and generalization session in the study, data were collected on the number of times each child spontaneously asked the question, "What's that?" with respect to a subset of items placed in the room (see selection of stimulus subset items that follow). Each spontaneous occurrence of the target question was tallied on a point-by-point basis.

Stimulus Items the Child Labeled Correctly Following Question-Asking. Weekly pretests were used to determine the 10 stimulus items the child did not label correctly, which was the criterion for inclusion in subsequent question-asking sessions. Pretests were conducted by gathering a large pool of items, which the children were asked to label. To keep the number of stimulus items manageable, we constructed subsets of 10 items each week (see Table 1 for examples). These subsets were then tested again during post-subset assessments once per week, which occurred at least 2 days following the question-asking session, to determine whether the children learned to label any of the items. Each item in a subset was tested once, for a total of 10 unprompted trials per assessment session, and items the child labeled correctly were replaced with new items. A total of 24 subsets (7 to 9 subsets per child—see Figure 3), consisting of 10 targeted vocabulary items each (a total of 240 test items), were employed

Table 1
Two Successive Weekly Examples of 10-Item Stimulus Subsets

Stimulus subset	Subsequent week's stimulus subset
1. dollar	*1. scissors
2. bell	*2. quarter
3. purse	3. purse
4. knife	*4. cards
5. whistle	*5. necklace
6. crayon	*6. keys
7. fork	*7. paper clip
8. penny	8. penny
9. pen	*9. button
10. pencil	*10. tape

*New item added to replace items the child labeled correctly during the previous week's testing.

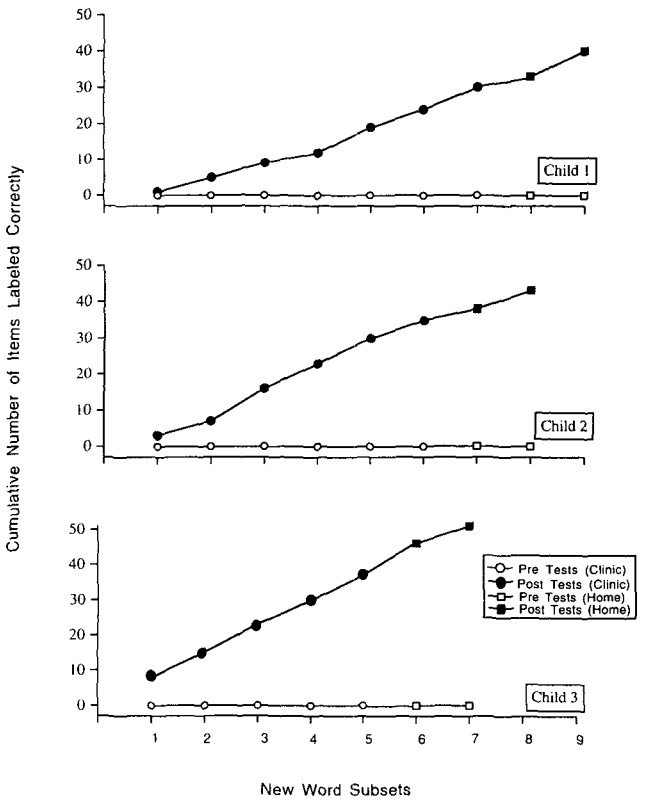

Figure 3. Cumulative number of new stimulus items labeled correctly for each stimulus item subset shown for assessments collected before and after the respective question-asking sessions.

for the 3 children. To maintain the children's motivation during the assessments, we interspersed highly desired items (e.g., small candies) that the children were able to label and gave them to the children following a correct label of the item. All of these assessments were conducted in a separate setting where no treatment had been implemented.

Data Recorders

Data recorders were 11 university students, rotated unsystematically based upon schedule availability (to prevent observer drift), who were naive to the experimental hypothesis. They scored question-asking on line while watching a television monitor in a different room. Pre- and post-subset assessments were scored in vivo. All home sessions were videotaped while the mother interacted with her child, and these sessions were scored in a random order.

Reliability

Two observers independently recorded data throughout all conditions of the study for question-asking and vocabulary acquisition for 46% and 25% of the sessions, respectively. Percentage agreement between the two observers was calculated for each measure by dividing agreements by agreements plus disagreements multiplied by 100. *Agreements* were defined as both observers recording identical responses. *Disagreements* were defined as the observers recording different responses. Mean interobserver agreement for question-asking was 98% (range = 85% to 100%) and for acquisition of new vocabulary items, 100%.

Results

Use of the Target Question

All sessions (baseline, intervention, generalization, and vocabulary assessments) conducted throughout the entire study are plotted in Figures 1, 2, and 3. The first question asked in this study was whether children with autism would acquire the spontaneous use of the question "What's that?" using an intervention procedure incorporating motivational components. The results pertaining to this question are presented in Figure 1. The number of spontaneous questions asked is plotted on the ordinate, and sessions are plotted on the abscissa. The children were free to ask an unlimited number of questions per session. The data show that, consistent with the literature, during baseline Children 1 and 2 never asked any questions whatsoever, and Child 3 rarely asked any questions. In contrast, during intervention in the clinic setting, all 3 children consistently and spontaneously asked the target question "What's that?" Although there was some decrease in the number of questions asked as the highly desired items were being gradually faded, all 3 children continued to spontaneously ask the target question.

The second, and perhaps most important, focus in this study was assessment of whether question-asking would continue to occur when the motivational items used during acquisition had been completely faded, and most important, whether the question-asking would generalize to new stimuli, people, and settings. These results are presented in Figure 2. During baseline, the children rarely or never asked questions, regardless of setting, stimuli present, or communicative partner. The closed circles in the first panel in the generalization portion of Figure 1 show that following intervention (when fading was completed), all 3 children continued to ask questions about many new items in the clinic setting. Further, the open circles in second panel in the generalization portion of the figure show that even though intervention had been completed for several weeks and there were many distractions in the home setting, the children continued to ask questions. Thus, the children demonstrated

generalization across settings (i.e., to the home), to new stimulus items, and over time, by asking their mothers questions about new items in their homes, where no intervention had occurred.

Acquisition of New Vocabulary

An additional purpose of this study was assessment of whether acquisition of new vocabulary words would occur in relation to the child's questions. Figure 3 shows the cumulative number of new stimulus items labeled correctly by the 3 children with respect to each of the 24 targeted subsets (range = 7 to 9 subsets across children) of 10 items located in the room during the question-asking sessions. The children were tested on vocabulary subsets once per week in a separate room before (open symbols in figure) and after (solid symbols) every two intervention and generalization sessions. These assessments show that following the sessions in which the children asked questions about the new stimulus items, they correctly labeled items that they did not label correctly prior to the question-asking sessions. The children averaged almost six new expressive noun labels on the new stimulus item subsets each week (i.e., following every two 30-minute question-asking sessions in the clinic and home). This trend continued at a steady rate on new stimulus items throughout the intervention and generalization sessions.

Discussion

Lack of spontaneous language initiations has been a pervasive and characteristic problem in children with autism, and structures such as question-asking are often nonexistent during their communicative interactions (Wetherby & Prutting, 1984). Only a small number of investigators have attempted to teach question-asking to children with autism, and even those examiners have reported difficulty in achieving generalized spontaneity. The present study extends the work of Hung (1977), Warren et al. (1981), Taylor and Harris (1995), L. Koegel and Koegel (1993; 1994), and others by showing that generalization of spontaneous question-asking could be achieved without the use of further intervention, prompts, or extrinsic rewards outside of the treatment setting. Of further importance is that gains in these spontaneous language interactions were associated with increases in expressive vocabulary labels. Thus, the pervasive problem of a lack of generalized spontaneous language initiations in this population may be amenable to treatment, and these initiations in natural settings can result in further language acquisition. These findings can be related to several issues.

First, the generalization of question-asking may have occurred because the treatment procedures used in this study incorporated variables known to improve motivation and responsivity, which are core problems in autism. For example, researchers have shown that responding is improved when a child is provided with a choice of stimulus items and/or choice of the order of interaction with the items (Dunlap & Kern, 1993; Dunlap et al., 1991; R. Koegel, Dyer, & O'Dell, 1987; Reichle & Wacker, 1993; Yoder, Kaiser, & Alpert, 1991; Yoder et al., 1993). During the generalization sessions in the present study, the children had the choice of asking or not asking questions and could ask about stimulus items in any order they chose.

The initial steps of the present intervention included items for which the child repeatedly showed an interest, which was determined from analyzing the pretreatment videotapes. Then, we gradually introduced neutral items from the subsets only after the children experienced several sessions with preferred items. This sequencing could have created a behavioral momentum, which was likely to be reinforced on a partial reinforcement schedule as the children periodically interacted with items that were interesting to them.

Because new neutral items were gradually and systematically introduced, it is possible that the neutral stimulus items in the subsets may have acquired reinforcing properties. For example, when a Kleenex (previously unfamiliar label) was included in a target item subset for Child 3, she not only asked questions about it and learned the label, but she also picked it up and began to play with it, pretending to blow her nose, then put it on the adult's nose and said, "blow nose." Such play interactions with the targeted items were negligible during baseline. This suggests that some of the subset items may have acquired reinforcing properties, thus providing a partial reinforcement schedule for question-asking. It also is interesting that the children continued to ask questions about neutral items without prompting. Thus, it appeared as if the question-asking form resulted in reinforcement in the form of information, even though such reinforcers are not usually associated with autism. Further research in this area might prove to be valuable.

A third variable may relate to the relatively low complexity and high predictability of this particular question form ("What's that?"), which is typically the earliest question learned by children without disabilities (Miller, 1981). Teaching a simple question that does not require the child to use other environmental information, with a predictable adult response (the item's label), may provide a relatively low demand and predictable social interaction (cf. Horner, O'Neill, & Flannery, 1993). This predictability and low demand, also found in the Taylor and Harris (1995) study, combined with the motivational variables discussed earlier may have produced a particularly strong outcome.

There are several areas that may be interesting to pursue in further research. For example, some children with autism inappropriately use questions to gain attention (Hurtig, Ensrud, & Tomblin, 1982). Recall that the children in the present study initially asked few or no questions and had generally low rates of social interaction. It is an empirical question as to whether attention-seeking children who ask numerous inappropriate questions would benefit from the present intervention by learning to use question-asking appropriately. Second, the applicability of the present question-asking intervention was not assessed with children who were unable to combine words. Although typically developing children use simple question-asking, such as vocalizing "Dat?" while pointing to an item within the earliest part of their word acquisition, it may be that at least some previous expressive language is required for this procedure to be effective.

Finally, it is interesting that the parents whose children participated in this study reported that they preferred the types of interactions with their children that occurred following intervention. Teaching child-initiations may have provided a preferable alternative to the solely adult-initiated interactions that occurred prior to intervention. This type of interaction parallels the findings of research on child-recruited reinforcers (Mank & Horner, 1987). In this case, the children's question-asking would have recruited both learning opportunities as well as interspersed natural reinforcement opportunities.

In summary, results of this study extend previous research by suggesting that children with autism who demonstrate significant language delays and rarely or never ask questions can be taught to use a generalized self-initiated question. Moreover, the generalized use of the query that the present children demonstrated suggests that the self-initiated question "What's that?" can be utilized as a tool in natural environments to further access vocabulary labels. Such strategies, which are frequently used by typical language developers, may be a potentially powerful learning strategy in the development of linguistic and social competence (L. Koegel, 1995; Paul & Shiffer, 1991).

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