*Journal of Developmental and Physical Disabilities, Vol. 8, No. 3, 1996*

# Teaching Requests for Food and Drink to Children with Multiple Disabilities in a Graphic Communication Mode

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*Graphic communication modes are often considered for children with multiple disabilities as an alternative to speech or gestures. However, there have been few empirical studies demonstrating effective procedures for teaching graphic mode requests to young children with multiple disabilities. In the present study, two children with multiple disabilities were taught to request preferred food and drink items by pointing to corresponding line drawings. Time-delay, prompting, reinforcement, and error correction procedures were implemented in a multiple-probe design to establish discriminated and generalized requests for preferred foods and beverages during morning snack time. The procedures were effective in teaching generalized and discriminated use of the food and drink symbols. Although effective in teaching children to request offered items, the procedures used in the present study need further development to ensure requests are controlled by the more natural conditions of hunger and thirst.*

KEY WORDS: requesting; augmentative communication; multiple disabilities.

## INTRODUCTION

Requesting preferred objects is an important and functional communication skill. It provides a means to access effective types of reinforcement and to exert some degree of control over the environment (Guess *et al.*, 1974; Reichle *et al.*, 1991). Requests for preferred objects typically emerge

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1056-263X/96/0900-0247$09.50/0 

early in the developing language of most children and usually without any deliberate or systematic instruction (Bates, 1976).

For children with developmental and physical disabilities, however, the natural environment is often not sufficient to ensure the development of functional requesting skills. Instead, deliberate and systematic instruction may be required to establish requests for preferred objects. Systematic instructional procedures for teaching requesting typically combine the use of time-delay, prompting, differential reinforcement, and error correction strategies into a discrete and massed-trial instructional format (Cipani, 1988). For example, a learner might be offered a preferred food item, prompted to make the corresponding request (i.e., "food") and then provided with a small amount of the offered item. Prompts might include the use of verbal, gesture, modelling, or physical assistance. Over successive opportunities, this assistance can be faded using a time-delay procedure until the learner spontaneously requests offered items in the absence of any verbal, gesture, model, or physical prompt (Halle, 1987; Sigafoos and Reichle, 1993). Several studies have demonstrated the effectiveness of these instructional procedures for teaching persons with moderate to profound mental retardation to request preferred objects in both vocal (i.e., speech) and gesture (e.g., manual signs) modes (Duker and van Lent, 1991; Gobbi *et al.*, 1986; McCook *et al.*, 1988; Sigafoos, 1995).

Physical limitations, however, often preclude the use of speech or gestures for requesting among some children with multiple disabilities. In such cases, a graphic mode of communication may represent a viable alternative (Goetz and Hunt, 1994). A graphic mode of communication can begin by teaching the learner to select graphic symbols (e.g., line drawings) to request preferred objects (Reichle *et al.*, 1991). However, there have been relatively few empirical studies demonstrating effective procedures for teaching young children with developmental and physical disabilities to request preferred objects using graphic mode communication (e.g., Sigafoos *et al.*, 1995; Turnell and Carter, 1994).

After teaching graphic mode requests, it may be necessary to implement procedures to bring the selection of symbols under appropriate stimulus control (Reichle *et al.*, 1991). Developing appropriate stimulus control is often difficult, especially as the number of symbols being taught increases. With two symbols, for example, the learner's response of pointing to a symbol must be controlled not only by the availability of an item to request (e.g., a food item being offered by the teacher), but also by the particular graphics which comprise the corresponding "food" symbol, as opposed to the distinct graphics which might comprise an alternative "drink" symbol (Michael, 1985; Shafer, 1993; Sundberg, 1993). Appropriate stimulus control involves both discrimination and generalization (Albin and

Horner, 1988). A discrimination would be demonstrated when a child pointed consistently to the "food" symbol when offered a preferred food item, but instead pointed to the "drink" symbol when offered a preferred beverage item. Generalization would be evidenced when the child pointed to the "food" symbol to request a variety of preferred food items and pointed to the "drink" symbol to request a variety of preferred beverage items.

Although programming for appropriate stimulus control typically occurs after teaching the response, more recently it has been recommended that appropriate stimulus control can be established as the request is being acquired (O'Neill, 1990). However, when teaching graphic mode requests to young children with multiple disabilities, there are few guidelines on how to program instruction so as to simultaneously establish appropriate stimulus control. Furthermore, difficulties in achieving this dual goal have been reported. In one relevant study, Sigafoos and Reichle (1992) reported difficulty in establishing appropriate stimulus control when teaching an initial repertoire of graphic mode requests to four adults with severe disabilities. In that study, time-delay, prompting, and differential reinforcement procedures were implemented to teach the concurrent use of both explicit (e.g., "apricot") and more generalized (e.g., "fruit") requests. Although the procedures were effective in increasing the percent of correct requests during intervention, each adult continued to display systematic error patterns (e.g., selecting the "apricot" symbol rather than the "fruit" symbol when offered a pear). Analysis of these error patterns suggested that some of the difficulties in obtaining appropriate stimulus control may have resulted from attempting to teach two different types of requests for items within the same general class of objects (e.g., explicit request for apricot, but generalized request for other fruit items).

The present study was designed to address these potential difficulties in developing appropriate stimulus control when teaching requests for food and drink in the graphic mode. In the present study, two children with multiple disabilities were taught to request preferred items from two distinct stimulus classes (foods and beverages). In addition, requests for food and drink were taught separately and then intermixed, rather than using a concurrent instructional strategy from the beginning of intervention. These characteristics of instruction were designed to facilitate acquisition of the discrimination between the line drawings designated for food and drink items. In addition, although the children were taught initially to request only one food and beverage item, multiple foods and beverages were offered during a subsequent probe phase to facilitate acquisition of generalized requests for food and drink (Chadsey-Rusch and Halle, 1992; O'Neill, 1990). The study was intended to demonstrate effective procedures

and sequences for teaching generalized and discriminated graphic mode requesting to young children with multiple disabilities that would, in turn, go some way towards the development of effective instructional guidelines.

## METHOD

### Participants

Alison, aged 5, and Emily, aged 6, participated. Both girls attended a school for children with multiple disabilities. A team of professionals at the school nominated Alison and Emily for participation because neither spoke to request nor exhibited any alternative means of requesting food and drink. In addition, occupational and physical therapists from the school reported that both girls had sufficient visual acuity and physical dexterity to discriminate and point to the line drawings for food and drink that were used in the present study.

According to records maintained by the school, both girls were diagnosed with cerebral palsy and significant intellectual delay. No formal assessment of intellectual functioning had been conducted, but adaptive behavior was assessed for this study by each child's respective classroom teacher using the TARC Assessment System (Sailor and Mix, 1975). This device was normed on a sample of 283 institutionalized children with severe disabilities from 3 to 16 years of age. It yields an overall standard score with a mean of 50 and a standard deviation of 20, as well as standard scores in several specific domains (e.g., self-care, social skills, receptive and expressive language). Alison received an overall standard score of 60 on the TARC, with standard scores of 68 and 52 for the receptive and expressive language domains, respectively. Emily received an overall standard score of 54, with scores of 52 in the receptive language domain and 26 in the expressive language domain. These assessment results indicate the both children were within one standard deviation of the mean when compared to the standardization sample of 283 severely handicapped children.

### Setting

Alison and Emily attended separate but adjoining classrooms. Procedures associated with this study were implemented in a common area between these two classrooms during a morning snack time. The procedures were implemented by each child's respective classroom teacher. These two teachers worked individually with each child at two separate

tables. At the same time, approximately 8 to 11 children were situated at other tables in the common area for morning snack.

## Materials

### *Reinforcers*

Teachers identified food and drink items to which each child showed a preference. Preference was based initially on observation of the food and drink items the children had brought from home and consumed for morning snack in the past. Once a list of potentially preferred food and drink items had been generated, a reinforcer sampling procedure was implemented to validate these preferences. Specifically, small amounts of each food and drink item were offered one at a time. If the child selected and consumed the item within 10 sec of it being offered, that item was retained for use in subsequent phases of the study. Using these procedures, 10 food items and 10 drink items were identified and retained for each child. Examples of the food items that were identified and retained for Alison included cookies, cheese, and raisins. Examples of drink items for Alison included fruit-flavored cordial, chocolate milk, and water. Emily's food items included bananas, crackers, and potato chips and her drink items included fruit-flavored cordial, milk, and lemonade.

### *Communication Symbols*

Black and white COMPIC symbols (Compic Development Association, 1986) were selected initially to represent food and drink items. Both symbols measured 10 × 7.5 cm and showed the outline of a person from the waist up. In the "food" symbol, this person was holding an apple to the mouth, whereas in the "drink" symbol, the person was holding a cup. The words "eat" and "drink" were printed in lower case letters above each respective line drawing. At a later point in the study, line drawings were colored to facilitate discrimination training (see *Procedures*).

## Design and Procedural Overview

Procedures associated with this study were designed to teach Alison and Emily to request a variety of food and drink items by pointing to corresponding line drawings. Baseline observations were implemented initially

to verify that neither child pointed to the correct symbol consistently when offered a variety of food and drink items. Intervention procedures were then implemented across food and drink items in a multiple-probe design (Horner and Baer, 1978). Sessions were implemented three to four times per week. During each session, the teacher provided 10 or 20 opportunities for the child to request food and/or drink items depending on the phase of the study. During sessions when opportunities to request both food and drink items were scheduled, the 10 food items were offered in succession and then after a short break (e.g., 2–3 min), the drink items were offered in 10 successive opportunities. However, at a later point in the study (see *Concurrent Instruction*), opportunities to request both food and drink were intermixed. When providing opportunities, the teachers sat directly across from the child with the communication symbols placed on the table approximately 15–20 cm in front of the child and centered approximately 10 cm to the left and right of midline. The left/right placement of symbols was altered randomly across opportunities. In all phases of the study, a correct request was recorded when the child pointed to the corresponding line drawing, and only that drawing, within 10 s of being offered the item. An incorrect request was recorded when the child pointed to the symbol for food when offered a drink item and vice versa. A "no response" occurred if the child did not point to a symbol within 10 s of being offered a food or drink item.

## Procedures

### *Baseline*

To initiate each baseline opportunity, the teacher held a plate containing a small amount of one of the food items or a cup containing a small amount of one of the drink items in view of the child. As the item was offered, the teacher said "If you want this, point to eat (drink)." During the ensuing 10 s, the teacher recorded if the child was correct, incorrect, or made no response. At the end of the 10 s interval, the child was given the item that had been offered, regardless of whether the correct symbol had been selected. After the child had consumed the item, the next opportunity was initiated by the teacher with a different food or drink item. Opportunities continued until all 10 food (drink) items had been offered once, in a predetermined random order.

### *Single-Instance Training*

Intervention began with single-instance training. During these sessions, a single item was selected randomly from the array of preferred food and drink items and only this item was offered on 10 successive opportunities by the teacher. For Alison, the food item was a cookie and the drink item was fruit cordial. Banana and fruit cordial were selected for Emily. Requesting opportunities were again initiated by the teacher who displayed the item and said "If you want this, point to eat (drink)." When the learner pointed to the correct symbol and only that symbol, the teacher gave the child the offered item. If the child did not point to the correct symbol within 10 s, the teacher physically guided the child's finger to the correct symbol while repeating the question "If you want this, point to eat (drink)." These physically prompted requests did not result in access to the offered item and were followed approximately 5 s later by initiation of the next opportunity. If the child pointed to the incorrect symbol, the teacher said "No" and simultaneously placed her hand over the incorrect symbol. Keeping her hand in this position, the teacher put the cup (plate) on the table out of the child's reach and then repeated "If you want this, point to eat (drink)" while modeling simultaneously the correct response by placing her index finger at the top edge of the appropriate symbol. If the child responded correctly to this level of prompting, praise was given (e.g., "Right. That's eat [drink].") and approximately 5 s later the next requesting opportunity was initiated. If the child did not point to the correct symbol within 10 s, the teacher physically guided the child's finger to the correct symbol and again initiated the next opportunity approximately 5 s later.

After several responses had been prompted in this manner, subsequent error correction no longer involved covering the incorrect symbol. Instead the teacher said "No" and modeled the correct response. Towards the end of single-instance training, the verbal "No" was often sufficient to prompt correct responses. Single-instance training was designed to establish the requesting responses in the presence of a single exemplar from each class of objects. Once established, generalization of the requesting responses to the remaining food and drink items was assessed during multiple-instance training sessions.

### Multiple-Instance Training

During multiple-instance training for food items, the teacher provided one opportunity for the child to request each of the 10 food items within

each session. However, only one type of beverage was offered within a multiple-instance training session for drink items. The exact beverage item that was offered varied across sessions to ensure the child was offered the full array of preferred beverages over the course of the study. For example, during one session the child might be offered a cup containing water. In the next session, the child might be offered a small amount of milk on each of the 10 requesting opportunities. Because beverage items were always offered in the same opaque cup, it was reasoned that the cup itself would become the discriminative stimulus for selecting the "drink" symbol. In addition, only a single beverage item was used within a session because of the undesirability of providing the child with a small amount of 10 different beverages within a relatively brief period of time. Procedures for initiating requesting opportunities and reinforcing and prompting correct responses were identical to those used during single-instance training. This phase of the study was designed to test for generalization of the food and drink requests to the remaining exemplars from these two respective stimulus classes that were not the direct focus of intervention during single-instance training.

### *Concurrent Instruction*

In this phase, the child was provided with five opportunities to request food items and then five opportunities to request the selected drink item for that session. This sequence was then repeated until a total of 20 opportunities (i.e., 10 food, 10 drink) had been implemented. These concurrent opportunities were implemented to determine if the discriminations established under the previous instructional sequence (i.e., serial instruction) would be maintained when opportunities to request food and drink items were intermixed. Except for this change from serial to concurrent sequencing, the procedures used were identical to those described for multiple-instance training.

### *Serial Instruction*

Because Alison's performance under concurrent instruction diminished somewhat (see *Results*), requesting opportunities were again arranged in a serial sequence. Specifically, Alison was provided with one opportunity to request each of the 10 preferred food items and then, following a short break (2–3 min), 10 opportunities to request the selected beverage item

were provided. Procedures replicated those implemented during multiple-instance training.

### *Add Color*

In an effort to increase the difference between symbols, color was added to the line drawings and then removed at various points in the study. For Alison, the drawing of the apple in the "food" symbol was colored red and the cup in the "drink" symbol was colored green. These colors were added to the symbols during the four sessions prior to the follow-up phase because of difficulty in maintaining acceptable levels of accuracy during concurrent instruction (see *Results*). The symbols were returned to their original black and white configuration for the three follow-up sessions. For Emily, the symbols were enlarged to 12 cm × 15 cm and the apple in the "food" symbol was colored green. These changes to Emily's symbols occurred during single-instance training for food because of deteriorating performance. Her symbols were returned to their original size and color in the five sessions prior to follow-up. It was hypothesized that the difficulties noted above for Alison and Emily were due in part to the fact that the food and drink symbols looked quite similar. Adding color to each symbol was considered the easiest way to make the symbols look different. This modification was made after the initial intervention phase when the data suggested that the children were having difficulty discriminating between the two symbols. Although it may have been better to have used colored symbols from the onset, we started with the standard food and drink symbols because we wanted to establish a discrimination on the basis of the differing configurations of the drawing. If color had been maintained as the basis for symbol discrimination, the total number of symbols these children could acquire in the future may have been limited by the need to associate each symbol with a distinct color.

### *Follow-up*

Follow-up sessions occurred at two-week intervals. The procedures used during follow-up sessions replicated those implemented during concurrent instruction. Opportunities to request food and drink at morning snack were not provided in the interim between follow-up sessions. Instead, Alison and Emily became involved in another study designed to increase their repertoire of graphic mode requests.

### Interobserver Agreement

One of two independent observers collected agreement data on the children's responses during all phases of the study. For Alison, 37% of the baseline opportunities and 42% of the intervention opportunities were scored for agreement. With Emily, 37% and 32% of the respective baseline and intervention opportunities were observed. Agreement was calculated on a trial-by-trial basis by comparing the type of response (correct, incorrect, no response) recorded by the teacher with that recorded by the independent observer. Interobserver agreement was calculated using the formula: Agreements/(Agreements + Disagreements) × 100%. Agreement ranged from 80% to 100%. Mean agreement on Alison's responses was 100% in baseline and 99% during intervention. The means for Emily were 98% and 97% during baseline and intervention, respectively.

## RESULTS

Figures 1 and 2 show the percent of correct requests for Alison and Emily. In each figure, requests for food are plotted in the upper panel and requests for drink are plotted in the lower panel. The percent of correct requests for food and drink are shown on a session-by-session basis across all phases of the study.

During initial baseline sessions, Alison's performance (Fig. 1) was characterized by a position-bias. Specifically, Alison always pointed to the symbol placed to the left of her midline, except on three occasions during which no response was made. This position-bias accounts for the ascending trends in baseline as the "correct" symbol was placed to the left of midline on 6 of the 10 opportunities during the second and third baseline sessions for drink and food, respectively. With the introduction of single-instance training involving cookies, the percent of correct "food" requests increased. Baseline sessions with drink items that were implemented at the end of single-instance training for cookies produced no correct responses as Alison now exhibited a systematic error pattern consisting of always pointing to the "food" symbol. When single-instance training was extended to "drink," the percent of correct requests increased. Correct selection of the "food" symbol continued under the multiple-instance training phase, except during one of the three sessions when performance dropped to 20% correct. When opportunities to request both food and drink were intermixed (i.e., concurrent instruction), the percent of correct requests for both food and drink items decreased. A return to the serial instructional sequence produced a recovery in terms of percent correct. A second attempt to intermix food

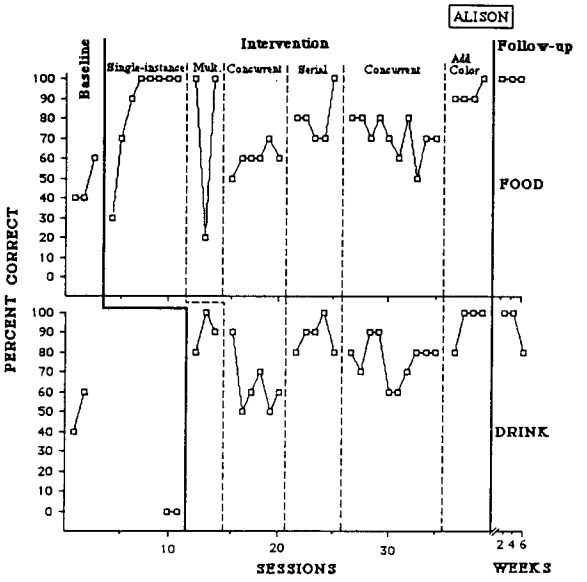


Fig. 1. Percentage of correct requests for food (upper panel) and drink (lower panel) across sessions for Alison.

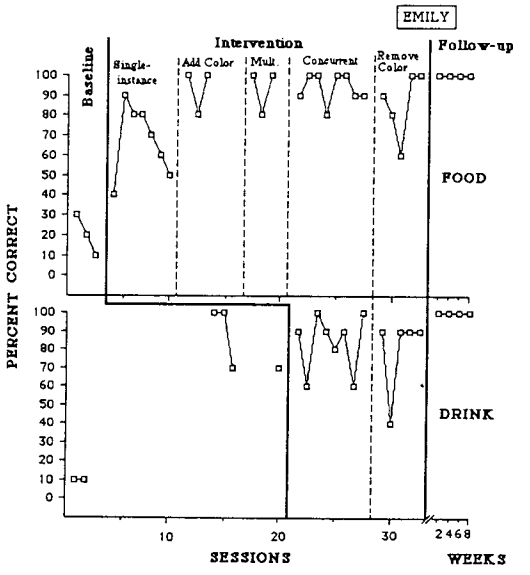


Fig. 2. Percentage of correct requests for food (upper panel) and drink (lower panel) across sessions for Emily.

and drink opportunities resulted again in a gradual deterioration. At this point, it was decided to continue concurrent instruction and to color parts of the symbols to increase the visible difference between the two line drawings. Accurate levels of requesting associated with these symbol modifications were maintained during follow-up sessions when the original black and white line drawings were used.

Emily (Fig. 2) typically pointed to both line drawings in rapid succession during initial baseline opportunities. Single-instance training with banana was associated with an increase in the correct selection of the "food" symbol and only that symbol. However, a descending trend emerged over the last four sessions within this phase owing to an increase in the number of incorrect and no responses (i.e., pointing to the "drink" symbol when offered a food item and failing to point to the "food" symbol within 10 s). Because of this trend, the symbols were enlarged and color was added to the "food" symbol in an effort to facilitate the discrimination between the two line drawings. After these changes were made, the percent of correct requests for banana stabilized above 80%. Implementation of baseline opportunities for drink items at this point (Sessions 13–15 and 20) revealed an increase in correct selection of the "drink" symbol when Emily was offered the cup. Although this result could suggest that intervention to teach requests for food had generalized to offers of beverages, the results from Emily's final four baseline sessions compromise the integrity of the multiple-probe design. However, when opportunities to request both food and drink items were then arranged with the introduction of concurrent instruction, correct requesting was maintained, indicating that Emily was in fact using her two symbols in a discriminated manner. It is therefore possible that teaching Emily to point to the food symbol when offered something to eat was sufficient to ensure that she would come to select the other [drink] symbol when offered the cup. In the next phase (*Remove color*), the original sized black and white line drawings were used with no detriment to performance. Follow-up sessions revealed that Emily continued to make requests for food and drink items accurately.

## DISCUSSION

Results of the present study suggest that the procedures associated with intervention were effective in developing appropriate stimulus control over requests for food and drink. Over several intervention phases, a discrimination between the two line drawings appeared to develop as the children came to select the "food" symbol when offered a food item and, alternatively, the "drink" symbol when offered a beverage. These requests

appeared appropriately generalized as well, given that correct responses were maintained when the children were offered a variety of food and drink items.

These results are consistent with previous studies which have demonstrated the effectiveness of behavior analysis procedures for teaching children with developmental disabilities to request preferred objects in vocal and gesture modes (Duker and Remington, 1991; Duker and van Lent, 1991; Gobbi *et al.*, 1986; McCook *et al.*, 1988; Sigafoos, 1995). In addition, these results are consistent with a small, but growing literature demonstrating the potential viability of beginning communication intervention for some individuals by teaching requests for preferred objects in a graphic communication mode (e.g., Glennen and Calculator, 1985; Reichle and Brown, 1986; Romski *et al.*, 1988; Sigafoos *et al.*, 1995; Turnell and Carter, 1994). When beginning intervention to teach requesting, it is important to select communication modes which best match individual needs and abilities (Goetz and Hunt, 1994; Reichle *et al.*, 1991). For some, a graphic mode may represent an appropriate means of communicating requests, but for others, gesture, vocal, or some combination of these three modes may be indicated (Butterfield *et al.*, 1995).

Despite the generally favorable effects of intervention, there was some difficulty in obtaining appropriate stimulus control over requesting. Alison, for example, exhibited an increase in the number of incorrect responses as requests for food and drink were intermixed. Similar problems in teaching discriminations to children with developmental disabilities have been reported (e.g., Lovaas, 1977). Sigafoos and Reichle (1992), for example, noted significant difficulties in obtaining discriminations among line drawings when intervention to teach requesting began with concurrent instruction. In comparison, somewhat fewer difficulties were evident in the present study, which may have resulted from first establishing requests for food and drink separately and only then adopting a concurrent instructional strategy. Saunders and Spradlin (1989) also found a gradual introduction of concurrent instruction was effective for two adults with moderate mental retardation who experienced initial difficulty on a discrimination task.

Because opportunities to request food and drink were intermixed, but never randomized, it is possible that the children performed accurately by adopting a win-stay, lose-shift strategy. If this were the case, performance during concurrent instruction could have stabilized, as it generally did, near 80%-90%, even if the child continued to make errors each time the item offered was switched from food to drink and vice versa. A review of the raw data indicated that incorrect responses during concurrent instruction did occur at these shift points, but not exclusively. In addition, if such a strategy had been adopted it may have been used only temporarily as both

children made relatively few errors during follow-up sessions. Alison, however, made two errors during her last follow-up session and both of these occurred as the item offered was switched from food to drink. Given the plausibility that Alison and Emily may have adopted a win-stay, lose-shift strategy, the present data must be viewed with caution.

Further limitations also necessitate a cautious interpretation of the data. Specifically, Emily began to request drink items before intervention, making it difficult to attribute improvement to the intervention procedures. Nonetheless, in three of the four cases, the percent of correct requests increased only when intervention procedures were introduced. Another limitation stems from the numerous phases that comprised intervention. Most of these phases were not introduced and withdrawn in a systematic manner and thus their effects on requesting were not demonstrated equivocally. For example, it appeared that adding color facilitated discrimination among the line drawings, but it is possible that the percentage of correct requests would have increased with continued intervention and without any modification to the symbols. Sequential introduction of various intervention phases represented a formative or "radical" methodology (Skinner, 1956; Sundberg, 1980). Changes were made to the independent variable (i.e., the intervention procedures), based on changes in the children's behavior. While responsive to the learner's ongoing behavior, it is often difficult to implement such formative modifications in a manner that conforms precisely to a specific research design.

Opportunities to request food and drink were arranged differently in some phases of the study. During multiple-instance training and concurrent instruction, for example, a variety of food items were used, whereas only one drink item was offered within a given session. In addition, the drink item was always offered in the same cup. As a result, "food" and "drink" may have represented different types of requests. Pointing to the "food" symbol could be interpreted as a rather generalized request, in that it was eventually emitted in the presence of a variety of food items. In contrast, pointing to the "drink" symbol may have been taught as a more explicit request, under the control of a particular item (i.e., the cup). The extent to which such differences influence stimulus control remains an area for further study. In both paradigms, however, opportunities to request were initiated by the teacher who offered an item and said "If you want this, point to eat (drink)." Because requests for food and drink would be of greater benefit when controlled by hunger and thirst, respectively, further research is needed to develop procedures for bringing requests under the control of such private events (Schnaitter, 1978; Skinner, 1945). One method by which to achieve this desired outcome might be to use transfer of stimulus control procedures to bring requests for food and drink under

the control of certain public accompaniments to hunger and thirst (Sigafoos and Reichle, 1993). For example, if the teacher were to hear the child's stomach growling, then an opportunity to request food could be provided. Alternatively, opportunities for requesting might be provided in the presence of certain collateral behaviors. For example, a child sitting in the shade fanning herself might assumed to be thirsty and this could set the occasion for requesting a drink. In the present study, requests were taught during the regular morning snack time when the children were likely to be hungry and thirsty due to a natural schedule of mild deprivation. It remains to be determined, however, if requests taught under these latter conditions would occur at other times when the child was hungry or thirsty.

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