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Comparing Explicit to Generalized Requesting in an Augmentative Communication Mode[1]

Jeff Sigafoos[2] and Joe Reichle[3]

The present study compared explicit to more generalized requesting strategies. Four adults with multiple disabilities were taught to request preferred objects by pointing to line drawings. Explicit requests were followed by access to a single specific item. Generalized requests were followed by access to any one of three related items. Percent of correct explicit and generalized requests were compared across sets of objects in a multiple-probe, single-subject design. Correct requests increased as a function of intervention, with little consistent advantage for one type of requesting strategy over the other. Analysis of error patterns suggested that while learners acquired reliable discriminations among the graphic symbols across object sets, establishing the conditional discriminations within each set proved difficult. Ecological factors for the selection of a requesting strategy and the sequencing of intervention are discussed.

KEY WORDS: requesting; augmentative communication; multiple disabilities.

INTRODUCTION

Graphic modes of communication are frequently taught to persons with multiple disabilities as an alternative to speech or to augment an otherwise deficient speech repertoire (Reid and Hurlbut, 1977). As most typi-

[1]Based on a dissertation submitted by the first author to the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

[2]Fred and Eleanor Schonell Special Education Research Centre, Department of Education, The University of Queensland, Qld. 4072 Australia.
[3]University of Minnesota, Minneapolis, Minnesota 55455.

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cally configured for learners with multiple disabilities, graphic systems of communication consist of an array of pictures, iconic line drawings, or other types of symbols (e.g., Blissymbols, Lexigrams, printed words). To communicate, learners are taught to point to or otherwise select symbols.

In beginning an augmentative communication system, an important issue is the selection of an initial class of communicative behavior to target for instruction (Reichle *et al.,* 1991). Establishing an initial repertoire of requesting offers several advantages. Requesting represents a class of behavior that benefits primarily the learner by enabling him or her to access those types of reinforcement which require the mediation of another (Skinner, 1957). Because of this direct benefit, learners exposed to requesting interventions may later be predisposed to participate in other types of communication interventions (e.g., conversation training) which offer less direct benefit (Michael, 1988). In addition, teaching more socially appropriate requesting skills may effectively replace existing repertoires of inappropriate requesting behaviors, such as yelling for or grabbing preferred objects (Horner and Budd, 1985). Teaching learners with severe intellectual and multiple disabilities to request preferred objects by selecting graphic symbols has been accomplished by systematic implementation of response prompting, prompt fading, error correction, and differential reinforcement procedures (Glennen and Calculator, 1985; Reichle and Brown, 1986; Romski *et al.,* 1988; Sigafoos *et al.,* 1989).

Operationally, when a learner requests, he or she is provided (as a consequence) with access to the item or event specified by the symbol selected. Symbols can be designed, however, to reflect different levels of generality, which in turn dictate somewhat the nature of the consequence provided when that symbol is selected as a means of requesting. Selection of a generalized symbol, such as "COOKIE" for example, might be appropriately reinforced as a request with any one of several items (e.g., oatmeal, raisin, or wafer cookies). In contrast, when the symbol is more explicit (e.g., "OREO") one specific type of cookie is the most likely consequence.

Learners with severe intellectual and multiple disabilities have acquired and maintained concurrently both generalized and explicit requests (Reichle *et al.,* 1989; Sigafoos *et al.,* 1990). Data on the comparative rate of acquisition for generalized versus more explicit requests are, however, lacking. Among children without disabilities, Anglin (1977) has shown that intermediate levels of vocabulary (e.g., Dog) are more readily acquired than either generalized (e.g., Animal) or explicit (e.g., Collie) terms. These findings, however, were obtained in the context of teaching children to name or "tact" a class of objects. Skinner (1957) has argued that naming or tact-

ing an object is a different class of behavior from requesting or "manding" that object. There is a growing literature supporting this distinction between tacts and mands (Hall and Sundberg, 1987; Lamarre and Holland, 1985; Savage-Rumbaugh, 1984). The same advantage found by Anglin (1977) for vocabulary representing an intermediate level of generality may not, therefore, remain valid when teaching requesting to learners with severe disabilities.

Other research, in fact, suggests that a practice of reinforcer specificity may speed the acquisition of communicative skills among learners with severe disabilities. Reinforcer specificity refers to the practice of reinforcing correct responses by delivering a single specific item related to the form of the response—a practice similar to the reinforcement associated with explicit requesting. In teaching receptive communication skills, for example, the learner is typically taught to select the one item named by the interventionist from a two-choice array. With this task, reinforcement is "specific" when correct responses are followed by receipt of the object selected. Reinforcer-specific conditions have been compared to arbitrary or nonspecific conditions in which correct responses are reinforced with some other equally preferred, but unrelated item.

Generally, acquisition of receptive object labels is more rapid under specific reinforcement conditions (Litt and Schreibman, 1981; Saunders and Sailor, 1979), but not for all learners (see Reichle *et al.,* 1986, for a review). In addition, there is substantial evidence that acquisition of receptive skills (e.g., selecting an object named by another) often has little effect on the acquisition of expressive skills, such as naming or requesting that same object (Guess, 1969; Guess and Baer, 1973; Lee, 1978, 1981; Miller *et al.,* 1977; Siegel and Vogt, 1984; Watters *et al.,* 1981). The same advantage found under specific reinforcement conditions in receptive tasks may not, therefore, remain valid when comparing the specific reinforcement associated with explicit requests to the more varied reinforcement associated with generalized requests. Egel (1980, 1981), in fact, has found that varied reinforcement (i.e., random delivery of any one of three items) sustained correct responding among learners with autism when delivery of a single constant reinforcer did not.

Given these equivocal data, a logical question when beginning an augmentative communication system is how explicit and generalized requesting strategies compare in terms of acquisition and maintenance. The purpose of the present study was, therefore, to compare the relative effectiveness of teaching explicit versus more generalized requests when beginning a graphic system of communication among learners with severe intellectual and multiple disabilities.

METHOD

Subjects

Four adults with severe disabilities participated. All four were described as "nonspeaking." According to recent physical examinations, the visual and hearing acuity of each subject was sufficient for participation in this study. Assessments prior to the study indicated none of the learners imitated speech and none performed above chance in an object naming task involving the symbols used in this study. Preliminary observations indicated all subjects had sufficient motor control to point to line drawings of the size used in the current study. Further characteristics of the subjects are listed in Table I.

Setting and Trainers

Bill and Gary lived in a community group home serving six adults with mental retardation. Training was conducted by a senior direct-service staff at the dining room table of the home. Ann and Jack attended a day activity center serving approximately 60 adults with developmental disabili-

Table I. Additional Subject Characteristics

Name	Age (in years)	Sex	Disabilities	Communication Skills/ Intervention history
Bill	36	M	Profound mental retardation	Symbol use "inconsistent" Intervention to teach requesting discontinued due to lack of progress
Gary	31	M	Severe mental retardation Down Syndrome	Symbol use "variable" No systematic effort to teach requests in graphic mode
Ann	22	F	Severe mental retardation Cerebral palsy Microcephaly Spastic quadraparesis (nonambulatory)	Communicates through gestures and facial expressions Signs "bathroom" No systematic effort to teach requesting in graphic mode
Jack	31	M	Severe mental retardation Spastic quadraparesis (nonambulatory)	Vocalizes "ya" and "mama" Shakes head to indicate "no" Signs bathroom No systematic effort to teach requesting in graphic mode

ties. Their training was conducted at a table in a separate (20′ × 20′) room by a B.A. level speech pathologist employed by the center. In both settings, procedures were implemented by the respective interventionists and individually for each learner.

Prior to each phase of the study, interventionists were taught to implement the procedures. Interventionist training consisted of providing written "task analyses" of the steps involved, verbal explanations of these steps, and a demonstration of proper implementation and data collection techniques.

Materials

Preferred Object Sets

To identify sets of preferred objects that learners would be taught to request, a three-stage reinforcer preference assessment was implemented. First, interventionists were asked to list four items the learner seemed to "like" from each of several stimulus sets (e.g., four fruit items, four cookie items, four cracker items). Second, learners were offered each of 12 items compiled from the interventionist survey. Daily assessment sessions consisting of 20 trials were implemented. Each daily session involved the four items from one particular set. A trial was initiated when the interventionist brought a tray containing one of the items within reach of the learner. Five seconds were then allowed for the learner to make a selection. Jack, because of physical impairments, was allowed 10 seconds to make a selection. One of the four items from a set was offered five times in succession, then a second item from that same set was offered on five consecutive trials and so on until all four items had each been offered five times.

At the end of each trial the interventionist recorded which, if any, item was selected. A selection required the learner to take the item from the tray and if edible, eat the item, or if nonedible, manipulate the item (e.g., shake a tambourine) for approximately 5 sec. Based upon previous research (Pace *et al.*, 1985), items selected on 80% or more of the opportunities were defined as preferred and retained for use in subsequent phases of the study.

The outcome of this second assessment was the identification of three stimulus sets for Bill, Gary, and Ann, and two sets for Jack. Each set consisted of four preferred objects from a socially defined class of objects (e.g., four cookies, four fruit items, four crackers). A third reinforcer preference test was then conducted to determine the relative degree of preference for items within a given set.

This third reinforcer preference test consisted of offering simultaneously all four items from a given set with learners allowed to select one

item per offer. After the fourth trial, the tray was replenished with additional exemplars of the items and the process repeated for a session total of 16 trials. One session, involving a single set of items, was conducted per day.

Following all sessions, the mean percentage of selections per opportunity was calculated to compare preferences. Specifically, an item selected on the first offer received a percentage score of 100, because it was available once and selected once, therefore, 1/1 × 100 = 100%. The item selected second was available twice, selected once, thus 1/2 × 100 = 50%, and so on for the third and fourth item selected. Items with higher overall scores were assumed to be preferred over items with lower mean scores.

These scores were used to designate items within a set as either the one *explicit* item or one of the remaining three *generalized* items. Because this study sought to compare explicit to generalized requests, it was important to ensure items being requested in each respective strategy were relatively equally preferred. Thus, the second most preferred object was designated as the explicit item to achieve a balance between the most and least preferred items. Table II shows the outcome of this assessment. In parentheses are the mean percentages of selections per opportunity for individual items. The resulting designations of items into explicit and generalized categories are indicated.

Symbol Arrays

Symbol arrays were constructed to correspond to each learner's preferred explicit and generalized items. Symbol arrays consisted of 5×5 cm black and white line drawings selected from Rebus Glossary Cards (Clark *et al.*, 1974) or Picture Communication Symbols (Johnson, 1981). When symbols for items (e.g., tambourine, musical instruments) were not available within either system, similar styled line drawings were developed by a graphic artist. Symbols representing explicit items were selected which contained a single line drawing (e.g., a single drawing of a cookie). Generalized symbols, because they would be used to request three items, contained three overlapping drawings (e.g., three cookie shapes).

Symbols were housed in 12×18 cm manila folders which measured 24×18 cm when opened. Inside, symbols were arranged in two vertical columns, with three symbols per column. Velcro backing allowed the position of individual symbols to be altered to any of the six positions in the folder.

Eighteen graduate students rated the line drawings in terms of how much each looked like a color photograph of the actual item(s). Ratings were made on a 1 (not at all) to 5 (exactly) scale. The overall mean rating for explicit symbols was 2.31. For generalized symbols, the mean rating was

Table II. Stimulus Sets Identified for Participants Through Reinforcer Preference Assessments[a]

Learner	Set	Stimulus Sets							
		Explicit item		Generalized items					
Bill	Set 1 (cookies)	Sandwich Creme	(62.5)	1 Chocolate Chip	(38.5)	2 Wafers	(66.6)	3 Nilla Wafers	(40.37)
	Set 2 (crackers)	Graham	(59.5)	1 Saltines	(69.5)	2 Oyster	(28.0)	3 Ritz	(49.5)
	Set 3 (cereal)	Frosted Flakes	(62.5)	1 Toasted O's	(44.75)	2 Corn Pops	(66.62)	3 Fruit Loops	(34.12)
Gary	Set 1 (cookies)	Sandwich Creme	(58.25)	1 Chocolate Chip	(45.75)	2 Wafers	(68.75)	3 Nilla Wafers	(35.25)
	Set 2 (crackers)	Ritz	(62.5)	1 Saltines	(33.0)	2 Oyster	(37.5)	3 Graham	(75.0)
	Set 3 (cereal)	Fruit Loops	(50.0)	1 Toasted O's	(45.75)	2 Frosted Flakes	(45.75)	3 Corn Pops	(66.5)
Ann	Set 1 (musical)	Tambourine	(52.0)	1 Bells	(41.0)	2 Spoons	(64.5)	3 Maracas	(49.87)
	Set 2 (fruit)	Apricot	(62.5)	1 Peaches	(50.0)	2 Pears	(33.0)	3 Pineapple	(62.5)
	Set 3 (jewelry)	Hair comb	(57.0)	1 Necklace	(79.0)	2 Bracelet	(41.0)	3 Ring	(29.0)
Jack	Set 1 (crackers)	Saltine	(56.25)	1 Graham	(37.5)	2 Ritz	(49.75)	3 Oyster	(64.5)
	Set 2 (fruit)	Apricot	(62.5)	1 Pears	(68.75)	2 Peaches	(31.0)	3 Applesauce	(45.75)

[a]Explicit and generalized items for each set were based upon comparison of mean percentages of selections per opportunity. These percentages appear in parentheses to the right of each object name.

2.19. These ratings indicate little difference between explicit and generalized symbols, with both judged to look "somewhat" like the actual items.

Design and Procedural Overview

To compare explicit to generalized requests, procedures were implemented concurrently to teach learners to point to the appropriate *explicit* symbol when offered the one explicit item from a given set and point to the appropriate *generalized* symbol when offered any one of the three generalized items from that same set. To demonstrate a functional relationship between the introduction of intervention procedures and changes in the percent of correct symbol selections, a multiple-probe design (Horner and Baer, 1978) across stimulus sets was used.

Procedures

Baseline and intervention opportunities were implemented in a discrete-trial format. All trials began when the interventionist placed one item from a given stimulus set on a tray, showed the tray to the learner and said "Ask for it." Five seconds (10 for Jack) were allowed for a response. At the end of each trial, learner performance was recorded and 5-10 sec later the next trial was implemented. Performance was recorded as "correct" if the learner pointed to the designated line drawing corresponding to the item offered, and only that line drawing, within the allotted interval. Selection of a noncorresponding symbol was considered incorrect. When the trial elapsed without a symbol selection, a "no response" was recorded.

Baseline

During baseline, learners were allowed to select the item offered from the tray at the end of each trial, regardless of performance. When food items were offered, the learner was provided with only a small piece (e.g., one flake of cereal, a small spoonful of pears, 1/4 of a cookie) of the displayed item as reinforcement during both baseline and intervention. Reinforcement with musical instruments consisted of continuous access to the item for 5 sec. Selected jewelry items were given to the learner and she was allowed to wear such items until the session ended. In addition to recording learner performance during baseline (but not prompting nor differentially reinforcing symbol selections), interventionists also recorded if the offered item was selected on a trial by trial basis. A selection was de-

fined in the same manner during baseline as in *reinforcer preference testing.* Intervention procedures were implemented subsequent to obtaining stable baseline measures.

Intervention

During the first intervention session for each set of items, correct responses were immediately prompted and then reinforced. Specifically, after offering one item and saying "Ask for it," the interventionist immediately prompted a response by guiding the learner's finger to the correct symbol and holding it there until the learner looked at the symbol or up to a maximum of approximately three seconds. Access to the offered item or piece of the item was provided after the response had been prompted. During these first intervention sessions all responses were scored as "prompted."

All subsequent intervention sessions consisted of implementing a constant time-delay (Striefel and Owens, 1980) and error-correction (Snell, 1983) procedure. Specifically, after offering one item and saying "Ask for it," the interventionist waited 5 sec (10 for Jack) for a response. If during this 5-sec interval, the learner pointed to the correct line drawing, and only that line drawing, access to the offered item was provided immediately. If an incorrect symbol was selected during the interval, the learner was immediately told "no" and the offered item was removed. That trial was then repeated—this time with the correct response prompted immediately. These prompted responses on repeated trials were reinforced, but only the initial [incorrect] response was recorded and figured into the data analysis. Finally, if a trial elapsed without selection of a symbol, a prompt was delivered at the end of the trial. Again these prompted responses were reinforced by access to the offered item, but recorded as a "no response."

Session Schedule

Sessions were scheduled three to four times per week, but occasionally occurred less frequently due to staff or participant absences. Sessions for Bill and Gary occurred in the afternoon approximately two hours before their evening meal and three hours after they had eaten lunch. Sessions for Ann and Jack occurred in the morning approximately two hours before and two hours after lunch and breakfast respectively. This schedule provided some control for deprivation with respect to food items.

One session was conducted per day at the scheduled time although occasionally with Gary two sessions were conducted, one after another. Each session consisted of 20 trials. Ten of these trials involved the explicit

item from a particular set. The other 10 trials involved the generalized items from that same set. The exact generalized item offered on any given trial was randomly determined with the constraints that each generalized item was offered at least three times during the session and that no generalized item was offered on more than two successive trials.

Explicit and generalized trials were presented in a constant mixed order. Specifically, the first two trials involved the explicit item, followed by two generalized trials, then two more explicit trials and so on until all 20 trials had been implemented. This sequence was selected to control for order effects (Sidman, 1960, pp. 170, 171). In addition, any potential position-bias effects were controlled by altering the placement of line drawings within the array after every fifth trial.

Reliability

An independent observer collected reliability data on learner performance during all phases of the study. Data collected by the interventionist and observer were compared on a trial-by-trial basis. An "agreement" was scored for each trial that the observer and interventionist recorded the same type of response (correct, incorrect, no response, prompted) *and* the same (yes or no) type of selection. "Disagreements" occurred if either data sheet listed a different type of response or selection. A percentage of agreement was calculated using the formula: Number of agreements/number of agreements + number of disagreements x 100%.

In addition to observing learner performance, data were also collected on procedural reliability. Specifically, during baseline and intervention, the independent observer preselected three trials per session and, on those trials, recorded if the procedures were implemented properly or improperly. If all steps of the procedures were implemented correctly, a "yes" was recorded. If any of the steps was not implemented correctly or not in its proper order, a "no" was recorded. In addition, the nature of any impropriety was noted in narrative.

RESULTS

Reliability Measures

Reliability data on learner performance were collected on 77, 88, 52, and 44% of the baseline and intervention trials for Bill, Gary, Ann, and

Jack, respectively. Percentages of agreement ranged from 85 to 100% with an overall mean of 96%.

Procedural reliability was assessed on 23% of the baseline and intervention trials for Bill. On 90% of these trials, the procedures were recorded as having been properly implemented. For Gary, procedural reliability measures were collected on 25% of the trials. Ninety-five percent of these were recorded as properly implemented.

Procedural reliability was also high (95%) for Jack and Ann (100%) with measures calculated on the basis of 42 and 77 trials, respectively. With Ann, however, there were two trials scheduled for procedural reliability measures for which neither a "yes" or "no" were recorded. These were omitted from the calculation of procedural reliability.

Acquisition of Explicit and Generalized Requests

Figures 1-4 show the percent of correct requests for Bill, Gary, Ann, and Jack, respectively. Data from the first intervention session for each stimulus set are not plotted. During these initial intervention sessions, all responses were prompted immediately; therefore, no opportunity existed for learners to be correct, incorrect, or make no response.

Bill

During baseline across all three stimulus sets for Bill, percentages of correct requests were generally low with no consistent difference in explicit or generalized trials. A majority of the initial baseline trials (91%) ended with Bill making "no response."

As intervention began with Set 1, an immediate increase in the percent of correct generalized requests occurred, but then declined and eventually stabilized at 50% correct. The percentage of explicit requests gradually increased to near 50% correct. A follow-up maintenance probe after intervention had ended with Set 2, showed Set 1 requests had returned to baseline levels. The final maintenance probe, which followed Set 3 intervention, indicated that the percent of correct Set 1 requests had recovered to levels obtained at the end of intervention.

With Set 2, intervention was again associated with an immediate increase in the percent of correct generalized requests followed by a descending trend. By the third intervention session shown on Figure 1 for Set 2, however, both types of requests had reverted to near baseline levels. At this point (A), a minor change in procedure was made. Specifically, prompted responses were no longer reinforced by access to the offered

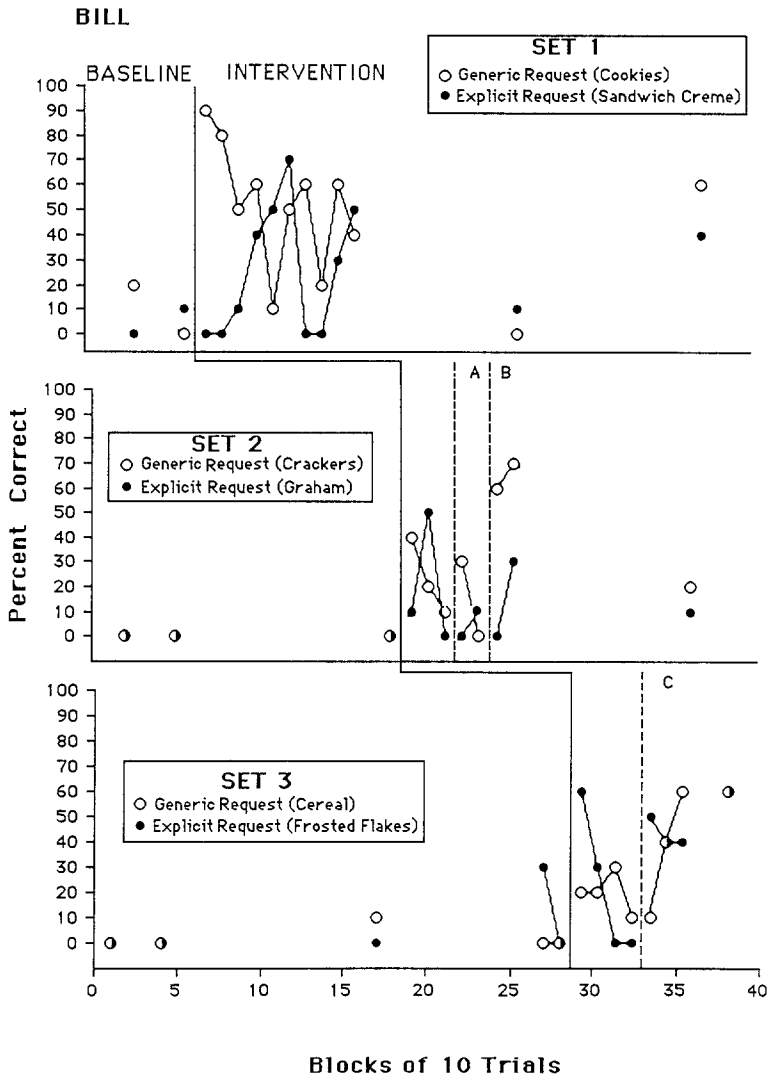

Fig. 1. Percentage of correct explicit and generalized requests during baseline and intervention across each of three stimulus sets for Bill.

item. This change was made because it appeared that Bill was simply pointing to any symbol and then waiting to be prompted (and reinforced). Evidence for this comes from the observation that Bill was no longer scanning the symbol array before making a selection as previously occurred during Set 1 intervention. This procedural modification, however, also reduced the

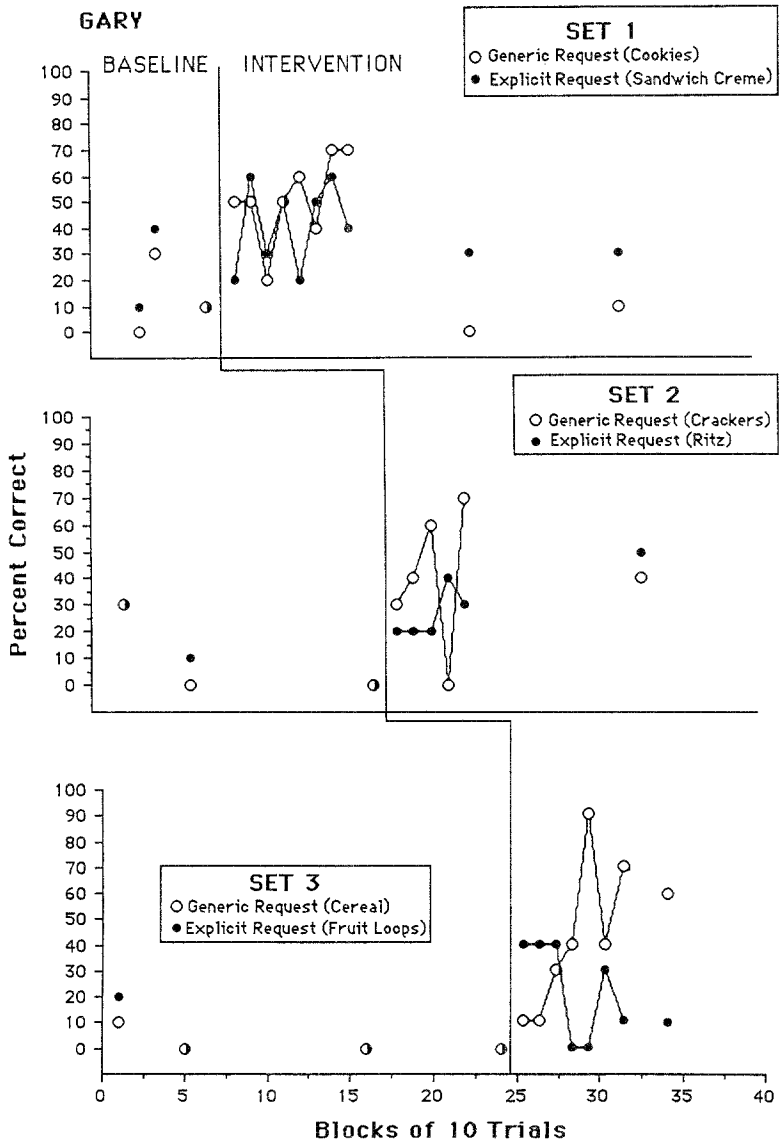

Fig. 2. Percentage of correct explicit and generalized requests during baseline and intervention across each of three stimulus sets for Gary.

density of reinforcement. Perhaps as a result, Bill began attempting to escape from the intervention sessions. Thus another procedural change was made at (B). Specifically, reinforcement was reinstated for prompted re-

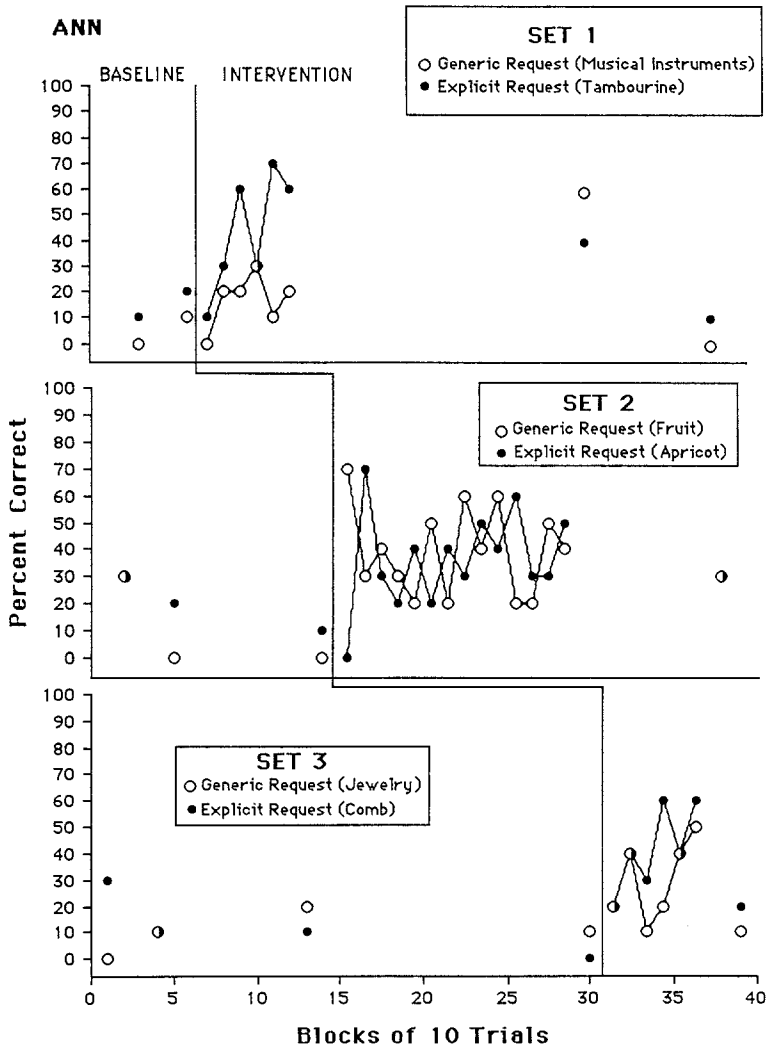

Fig. 3. Percentage of correct explicit and generalized requests during baseline and intervention across each of three stimulus sets for Ann.

sponses. In addition, social praise ("That's right," "Good job") was delivered following each correct response, producing an increase in correct requests.

The changes made at (B) continued during the initial intervention sessions of Set 3. During these first four intervention sessions, generalized requests were stable at approximately chance (20% correct) levels; whereas

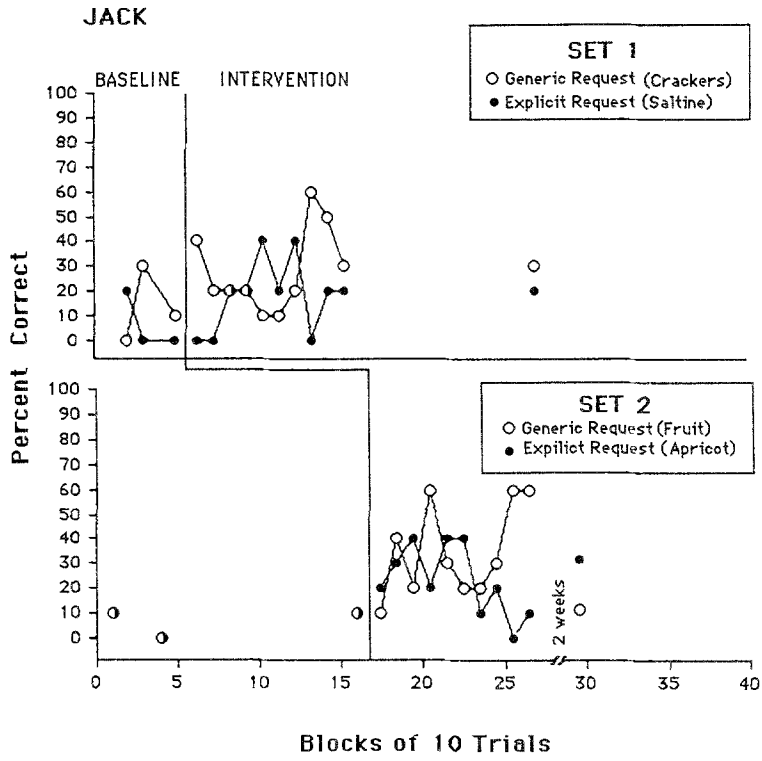

Fig. 4. Percentage of correct explicit and generalized requests during baseline and intervention across each of two stimulus sets for Jack.

explicit requests showed a descending trend from 60 to 0% correct. It appeared that the reinforcing effects of social praise were waning as once again escape behaviors were observed. As a result, physical contact (e.g., a pat on the back) was added for correct responses at (C). This change was associated with an increasing trend for generalized and a stable (50%) trend for explicit requests.

Gary

As with Bill, baseline was associated with few correct requests across all three stimulus sets for Gary. When intervention was introduced with each stimulus set, the percent of correct requests increased. A relatively small difference in correct requests, favoring the generalized strategy, emerged at the end of Set 1 intervention. Two follow-up probes, however,

indicated this advantage had shifted in favor of the explicit request. With Set 2, the slight advantage for the generalized strategy during intervention disappeared at the follow-up as well. Generalized requests began below, but rose steadily and eventually surpassed the explicit request in Set 3. This advantage in Set 3 was maintained at follow-up.

Ann

With Ann, baseline procedures generated a combination of position-biased and non-responding. When Ann did point to a symbol during baseline, she tended to select whichever symbol was in the lower right or left location. Occasionally, of course, Ann was "correct" with this strategy. The ascending trend during Set 1 baseline reflects such position-biased responding.

Overall, Ann's performance plotted in Fig. 3, shows that intervention was associated with increased percentages of correct requests across all three stimulus sets. While no differences between explicit and generalized requests were obtained in Set 2, explicit requests were associated with higher percentages of correct responses in Set 1 and to a lesser extent in Set 3. With the exception of the first follow-up probe in Set 1, the percentage of correct requests declined from intervention levels during the follow-up probes.

Jack

Performance across the two stimulus sets for Jack can be seen in Figure 4. As with the other learners, non-responding tended to be concentrated during baseline and the early stages of intervention. In contrast, the trend in the number of "non-responses" during intervention decreased across sessions. Thus compared to baseline, Jack ended more trials with a response and a greater overall percentage of these responses were "correct" during intervention. Jack's data suggest, however, that intervention had a less powerful effect in increasing the percent of correct requests in comparison to Bill, Gary, and Ann.

Error Analysis

Although intervention was associated with an increase in the percent of correct responses, learners continued to make errors during intervention. Figure 5 provides an analysis of these errors.

In Figure 5, the percentage errors to the within-set symbol is shown during the final baseline and all Set 2 intervention sessions for each learner. A within-set error was recorded when the learner pointed to the generalized symbol (e.g., "COOKIE") when offered the explicit item from that same set (e.g., when offered an OREO cookie) and vice versa. Data from Set 2 were selected as representative due to its middle position in the over-

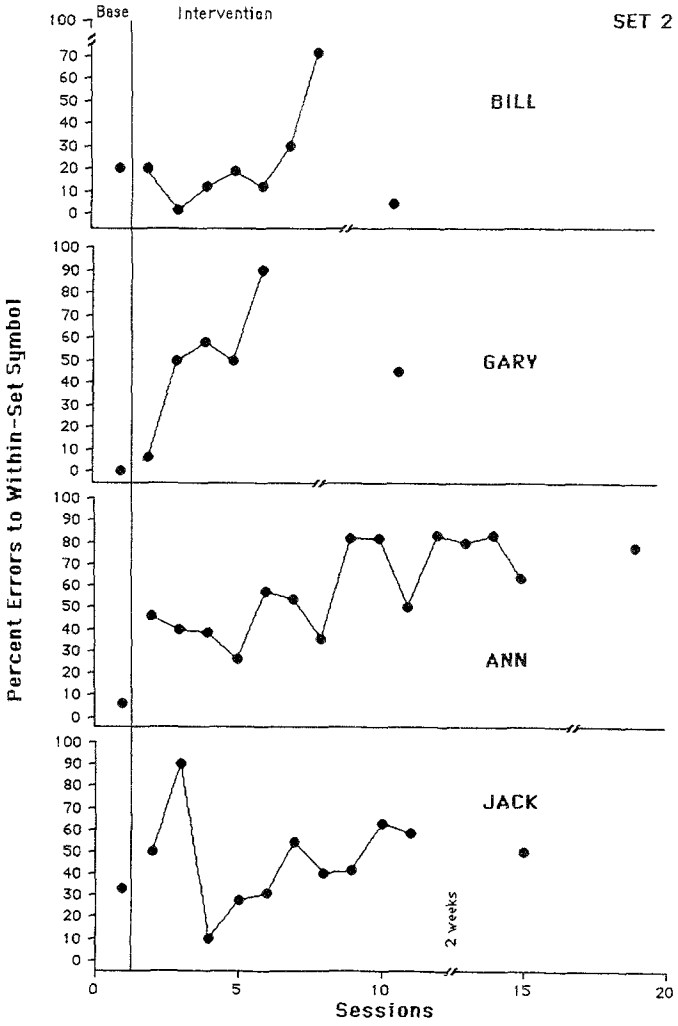

Fig. 5. Percentage of within-set errors during the final baseline and all intervention sessions involving Set 2 items.

all experimental design. The percentage of within-set errors increased steadily with continued intervention on Set 2 items for each learner. Thus not only did intervention correlate with an increase in the percentage of correct requests—sometimes favoring one type of request over the other (but not consistently), it [intervention] also generated an orderly pattern of within-set errors, whereas errors emitted during baseline were more random, position-biased, and less probable owing to more "non-responses."

DISCUSSION

Results of the present study demonstrate reliable increases in the percentage of correct requests when intervention procedures were implemented. These results thus replicate previous findings (e.g., Glennen and Calculator, 1985; Reichle and Brown, 1986; Romski *et al.,* 1988; Sigafoos *et al.,* 1989; Sigafoos *et al.,* 1990) demonstrating that learners with severe disabilities can be taught functional requesting skills in the graphic mode through a combination of prompting, differential reinforcement, and error correction procedures.

Across all four learners, a total of 11 comparisons were made between explicit and generalized requesting strategies. Of these comparisons, generalized requests were associated with a consistently higher percent of correct responses in four cases (i.e., Bill, Set 2; Gary, Sets 2 and 3; Jack, Set 2). Explicit requests, in contrast, proved superior in two comparisons (Ann, Sets 1 and 3). In the remaining five comparisons, there was little difference between explicit and generalized requests and considerable oscillation between the two in terms of percent correct. Follow-up probes often revealed a reversal of the trends obtained during intervention. In addition, performance on follow-up probes was generally below the levels obtained during intervention.

Although there were differences in the number of drawings embossed on symbols (i.e., generalized symbols consisted of three drawings; explicit symbols consisted of one), the results suggest neither an advantage nor disadvantage related to the number or "complexity" of the line drawings embossed on a symbol. Given that the parameters of symbol differences were rather constrained in the present study (one versus three drawings), more in-depth comparisons of symbol sets in relation to their complexity appear warranted.

Results of the present investigation are somewhat limited, however, since mastery of requests was not obtained. In addition, gains made during intervention were not always maintained. Extended training with Ann in Set 2 suggests these limitations did not stem from too brief an intervention.

And Bill's variable performance appeared related to reinforcement of insufficient power.

Despite these limitations, the analysis of errors revealed an orderly pattern of responding consistent with basic principles of reinforcement and extinction. During initial baseline sessions, for example, access to offered items did not require any particular symbol selection. As a result, learners most often made "no response" during baseline or pointed to incorrect symbols with errors based occasionally upon symbol position, but also frequently showing no consistent overall pattern.

As intervention was introduced with items from the first training set; access to those items required selection of two particular symbols. Symbol selections, in turn, came under the control of this contingency, as learners tended to restrict their symbol selections to either the explicit or generalized symbol or oscillated between the two Set 1 symbols. Pointing to symbols outside this set was followed by the error correction procedure perhaps functioning as an extinction or punishment operation; this may account for the continued poor performance during subsequent baseline sessions for Sets 2 and 3.

When intervention was introduced to the other sets of objects, learners came quickly to select the two symbols leading to reinforcement and tended to avoid pointing to the other symbols. Intervention in one set could thus be viewed as effectively extinguishing selection of symbols from outside that set and this may account for the generally poor performance on maintenance probes for previously trained requests.

Such response patterns suggest that the intervention procedures were effective in establishing discriminations among individual line drawings. The fact that these patterns were detected by examination of errors highlights the importance of such analyses (Horner *et al.*, 1984). In addition, some within-set errors (e.g., pointing to the "FRUIT" symbol when offered an apricot) would not necessarily be considered incorrect outside the confines of the present study.

To some extent, however, all four learners experienced difficulty in mastering the more conditional discriminations inherent in this study. In a typical conditional discrimination task, the learner is presented with two samples and two choices. Selection of one choice is reinforced in the presence of one sample; whereas selection of the other choice is reinforced in the presence of the other sample (Catania, 1979). A more complex conditional discrimination was involved in the present study. Specifically, the learners in the present study were presented with up to six choices—those being the line drawings comprising their systems. In addition, the samples consisted of one (explicit) and three (generalized) items. During intervention, selection of the explicit symbol was reinforced when offered the one

explicit item; whereas selection of the generalized symbol was reinforced when offered any of the three generalized items. Given the problems reported in attempting to establish even the more typical conditional discrimination among learners with moderate mental retardation (Saunders and Spradlin, 1989), it is perhaps not surprising that the more complex conditional discrimination required in the present study proved difficult to teach to Bill, Gary, Ann, and Jack. Whether these same difficulties would have been obtained had comparisons been made across object classes (e.g., explicit FRUIT compared to generalized COOKIE), in other communication modes (e.g., speech, manual sign), or when teaching other functional relationships (e.g., rejecting, naming) remains to be determined.

Because of the complex conditional discriminations involved, concurrent instruction to teach both explicit and more generalized requests may be less efficient than establishing one type of request and then the other (i.e., serial intervention). Several studies have demonstrated that explicit requests can be taught subsequent to more generalized requests, with both types of requests then maintained concurrently (Reichle *et al.,* 1984, 1989; Sigafoos *et al.,* 1990). Additional research is needed, however, to investigate the relative advantages, in terms of acquisition, generalization, and maintenance, of the two optional training sequences (i.e., explicit-to-generalized versus generalized-to-explicit).

Other, ecological factors may help to determine which type of request is taught initially. One advantage of a generalized request is that it enables the learner to access a variety of reinforcers with a single symbol. Explicit requests, in contrast, may be more effective for those settings that require specificity (e.g., ordering at a restaurant). The ease with which preferred items can be offered may also determine which type of request is taught. Generalized requests could be taught for items which are easy to display, because the learner could then select from among the available alternatives. Explicit symbols would instead be available to request objects or events which are not easy to offer in an array. Because of such ecological factors, however, a complete requesting repertoire would seem to require both the explicit and more generalized forms.

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