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Teaching Spontaneous Requests to Children with Autism Using a Time Delay Procedure with Multi-Component Toys

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Children with autism were taught spontaneous requests through a time delay procedure. Unlike previous research, which usually employed food as the target stimuli to be requested, the present study used toy pieces from multi-component toys. The procedure involved presenting a child with the target stimulus, with the trainer prompting the child by immediately modeling the request response. When the response was imitated without error, prompting was delayed with the time interval gradually being increased over trials. A spontaneous or imitated response was reinforced by giving the child the requested object. As the stimulus/model interval increased, children with autism were expected to initiate the request by themselves prior to the prompt. The efficacy of the time delay procedure was assessed using a multiple baseline across subject design with three Chinese boys with autism. Results showed that the three children acquired a 100% performance within five to nine sessions of training and the skill was maintained at the one-month and three-month followups. Furthermore, the learned response transferred to various conditions when tested across setting, person, toy, and food items. These results suggest that toys, the multi-component ones in particular, served well as reinforcers for language training. Furthermore these findings confirmed the practical utility of the time delay procedure for promoting spontaneous communication skills in children with autism.

KEY WORDS: spontaneous request; time delay procedure; children with autism; multi-component toy.

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Among impairments commonly associated with childhood autism, language deficits represent the principle concern. Given the important role played by language in psychological development and social interaction, the majority of current intervention studies have focused on the remediation of communication in children with autism (Howlin, 1989). With few exceptions, children with autism hardly speak, and it is even more rare to see them initiating a conversation with other people. Since spontaneous speech is a common and essential form of communication, it would be of great practical value to promote such skills in these children. For example, a child with autism who wants an apple would simply take it without asking for permission from the owner. It would be socially more appropriate if the child could first obtain consent from the other party by making a relevant request. The verbal response required for getting an object, an event, or assistance from another person in order to fulfill certain needs constitutes a common form of social communication known as spontaneous request. The present study attempted to teach spontaneous requests to children with autism.

A common method of teaching spontaneous requests is by presenting the child with an object which is not given to the child until a request is made. Being autistic, the child normally does not produce the required response and the trainer prompts the child by modeling the response. Upon a correct imitation, the requested object is given to the child. The behavior is then reinforced by food and verbal praise. With successful imitation over a period of time, the appearance of the object elicits the desired verbal response (Halle, Baer, & Spradin, 1981). But this may or may not occur because the prompt, instead of the target stimulus, can take control over the child's request responses. This diversion is referred to as "stimulus overselectivity" whereby attention is restricted on one or a small number of components of a stimulus complex presented (e.g., Lovaas, Koegel, & Schreibman, 1979; Schreibman & Charlop, 1981). Overselectivity is quite possible since children with autism have a tendency to echo other's speech and therefore the verbal prompt may be more salient than the stimulus object in eliciting the request.

One procedure that shows promise for teaching spontaneous speech is the time delay technique (Wolery, Ault, & Doyle, 1992). Halle, Baer, and Spradlin (1981) and Halle, Marshall, & Spradlin (1979) applied this procedure to promote language use in persons with mental retardation. The time delay procedure has also been employed on a number of occasions for increasing spontaneous speech, including requests for food and drink (Charlop, Schreibman, & Thibodeau, 1985), verbalization for affection (Charlop & Walsh, 1986), and general social responses (Matson, Sevin,

Fridley, & Love, 1990). Furthermore, the skills taught were transferrable to a number of untrained conditions.

In general, training with a time delay-procedure consists of two parts. Initially the target behavior must be fostered in the child's verbal repertoire even when such responses are the result of echoing. Hence the trainer first presents an object to the child (e.g., an apple) and immediately models the appropriate response (i.e., "I want apple"). Once the child starts imitating, modeling is delayed for a short time, say 2s. The delay between the target stimulus (apple) and the prompt ("I want apple") is progressively increased until the child spontaneously requests the stimulus. If the response occurs before the onset of the prompt then training is considered successful and the child capable of initiating a request without prompting.

Like all behavioral approaches, the success of the time delay procedure partly depends on the choice of relevant, natural, and yet powerful reinforcers. Given these requirements, food has been commonly used as a reinforcer with children. Charlop *et al.* (1985) used food and drinks for increasing spontaneous requests whereby children learned to ask for these items from an adult. Satisfactory results were found when the adult simply reinforced the child by handing over the requested food or drink. However, edible reinforcers do have their limitations. An obvious problem is satiation. When immediate consumption is allowed, the reinforcing power of food is reduced as the deprivation level for that food decreases during the course of training. In addition, edible reinforcers also raise health concerns. In determining the appropriate reinforcers for training, children often favor "junk food" which often contains excessive colorings, salt or sugar. These substances may cause harm to children's health.

For the above mentioned shortcomings and others, this study sought reinforcers other than food for conducting language training. Specifically, the efficacy of multi-component toys for teaching spontaneous requests using the time delay procedure was explored. Further, this study aimed to replicate and extend Charlop *et al.*'s (1985) findings with ethnic Chinese children. For the training, children were taught to request the toys using the format "[Name], I want [toy] please." Each of the toys consisted of a number of parts which assembled into a complete object or pattern. For example, a jigsaw puzzle consisted of a few pieces from which a figure could be formed when properly arranged. Compared to other toys, multi-component toys had an additional advantage when serving as a reinforcer in the present context. With these toys, once play began, it tended to persist until the final products were assembled. This characteristic was expected to enhance motivation in the children during training.

METHOD

Subjects

Participants were three boys (S1, S2, and S3) diagnosed as autistic by the Hong Kong Psychiatric Center or Arran Street Child Assessment Clinic based on DSM-III-R criteria. S1 was 5.5 years old and had an IQ of 80. His performance in school was satisfactory but he had difficulties comprehending speech. He could say a number of words but seldom initiated a conversation with others. S2 was the oldest (11 years) of the three children but he had the lowest intellectual ability (IQ = 57). Apart from common autistic language deficits, he also liked to use foul language when upset. S3 was a 7-year-old who liked to echo TV advertisement slogans. He had an IQ of 70 and learned well in class.

Materials and Setting

Multi-component toys were used for both training and testing. Each toy consisted of a number of components and the child had to assemble the components in order to construct a complete object or pattern. The toys for each child were determined during warmup sessions when the trainer became acquainted with the child. He brought along a collection of multi-component toys and observed the amount of time a child spent on each type of toy. The toy set selected for each child had to fulfill two conditions. First, the child spent most of his time playing with it (i.e. preference) and, second, the child showed a tendency to complete the task. Based on these criteria, the most preferred toy was selected for training while the next preferred toy was reserved as untrained stimuli for one of the generalization tests. Five multi-component toy sets were eventually selected including the Figure-shape Board (6 shapes), Shape 'N' Egg Sorter (6 pieces), one cardboard jigsaw puzzle (an elephant with 6 pieces), one wood-block jigsaw puzzle (a house with 5 blocks), and the Stacking Bear (4 colored rings and one head). S1 had the Stacking Bear and the Figure-shape Board, S2 had the Figure-shape Board and the Shape 'N' Egg Sorter set, and S3 had the two jigsaw puzzles.

Except for the Stacking Bear, assembly of the toy sets did not have to follow a specific sequence and the components were presented to a child one at a time, in random order. For the Stacking Bear, order was essential, and the child was always presented with the largest of the remaining rings, while the bear head was put on last.

Based on parental reports of the child's food preference, one food item was selected for each child (M&M chocolate for S1, potato chips for S2, and sliced cuttlefish for S3). The food was used for assessing generalization across another stimulus class.

Training was conducted at each child's own home. One male graduate student, who was experienced in behavior modification with children, served as the trainer. He sat in front of the child in a face-to-face position when conducting testing and training. A small table separated the child and the trainer. A tape recorder, placed under the table, recorded each session for reliability scoring (Matson *et al.*, 1990).

Assessment and Reliability

Correct and incorrect verbal responses were recorded for each trial. A response was scored correct only when it consisted of all the required elements and format of the specified request response. The audio tapes from 60% of the sessions were scored by another graduate student who was not aware of the purpose of the experiment. Percent agreement for occurrences and nonoccurrences of correct responses on a trial-by-trial basis was calculated by dividing the total number of agreements by the total number of agreements plus disagreements then multiplied by 100. The interobserver reliability was 98% (range = 95% to 100%) when assessed across all conditions for all children.

Procedure

Pretests

Prior to the experiment, the trainer ensured the children could label the toys and address him by name. A child was taught to do so if he could not. The children were also assessed for spontaneous requests of any format over 10 trials. No child attempted to make any verbal contact with the trainer before snatching a toy and, thus, confirmed the need for training. Generalization pretests were then conducted to determine the transfer of spontaneous requests in various situations as described later.

To assess the effectiveness of the time delay procedure with toys as the training stimuli, a multiple baseline design across subjects was used with three phases: baseline, training, and followup.

Baseline

In baseline sessions, the trainer presented the child with a piece from the selected toy by holding it in his hand but out of the child's reach. The occurrence of spontaneous responses for the training stimuli was assessed over 10 trials. During the first trial, the trainer presented the stimulus and immediately modeled the request response. For example, the trainer held up one piece of the toy and said, "Mr. Chan, I want jigsaw puzzle please" and the child was given 10s to repeat the request. The trainer reinforced the correct response by handing over the toy piece to the child. After the first trial, the trainer continued presenting the next component of the toy but without further modeling/prompting. If no response was made within 10s or a response was incorrect, then the toy component was removed. This phase lasted 3 sessions for S1, 4 sessions for S2, and 5 sessions for S3.

Training

Training began once the child's attention focused on the trainer. During the early trials, the toy piece was presented and the request modeled. Ten seconds were allowed for the child to imitate the request or the stimulus was removed. Once the correct response was imitated for three consecutive trials, the time delay procedure was initiated. Initially, the trainer waited for 2s after the presentation of the target stimulus before modeling the request. If the child asked for the toy within this time, the response was immediately reinforced by giving the child the requested component. Spontaneous requests prior to or imitated requests after the trainer's prompt were both recorded as correct. When the child successfully made three consecutive correct responses the delay interval was lengthened by two seconds. Thus, the time delay between stimulus presentation and prompting was progressively increased to 10s. Training continued until the child spontaneously requested the item within 10s of its presentation and prior to the experimenter's model during 9 out of 10 consecutive trials.

To maximize the reinforcing power of the multi-component toy, a session usually ended with the toy set fully assembled by the child. The only exceptions were early training sessions when the response was not yet firmly established. In these cases, a training session consisted of 10 to 15 trials depending on the child's progress.

Followup

Followup sessions were conducted one month and three months after the training was completed. They were carried out in the same manner as in baseline, using a 10s delay interval with the training stimuli. Each training stimulus was presented for 10 trials.

Generalization

In order to assess the effects of training across different situations, generalization tests were run before the baseline assessments (pretests) and after training (posttests). Only one type of generalization test was administered in a session and each consisted of 10 trials:

1. A generalization test across setting was conducted in a public park with the training toy set.
2. A generalization test across person was conducted by the author with the training toy set.
3. A generalization test across stimuli was conducted with the untrained toy set.
4. A generalization test across stimuli was conducted with one food item selected for each child.

RESULTS

Given that the number of training trials differed across sessions, session to session performances are presented in terms of percentages of correct responses. Data for baseline, training and followup sessions for each child are presented in Fig. 1. During Baseline, no correct responses were recorded, which confirmed parents' concerns about the lack of spontaneous speech in their children.

All children acquired the request response during the training phase: S1 in 5 sessions; S2 in 9 sessions; and S3 in 6 sessions. Both S1 and S3 had relatively smooth improvements over the sessions. However, training with S2 was more problematic as he performed erratically throughout training. He threw tantrums easily when he could not get the toy he wanted. On a number of occasions, the trainer had to suspend training until S2 calmed down again. Fortunately, he was much more cooperative in later sessions as his rate of correct responses increased.

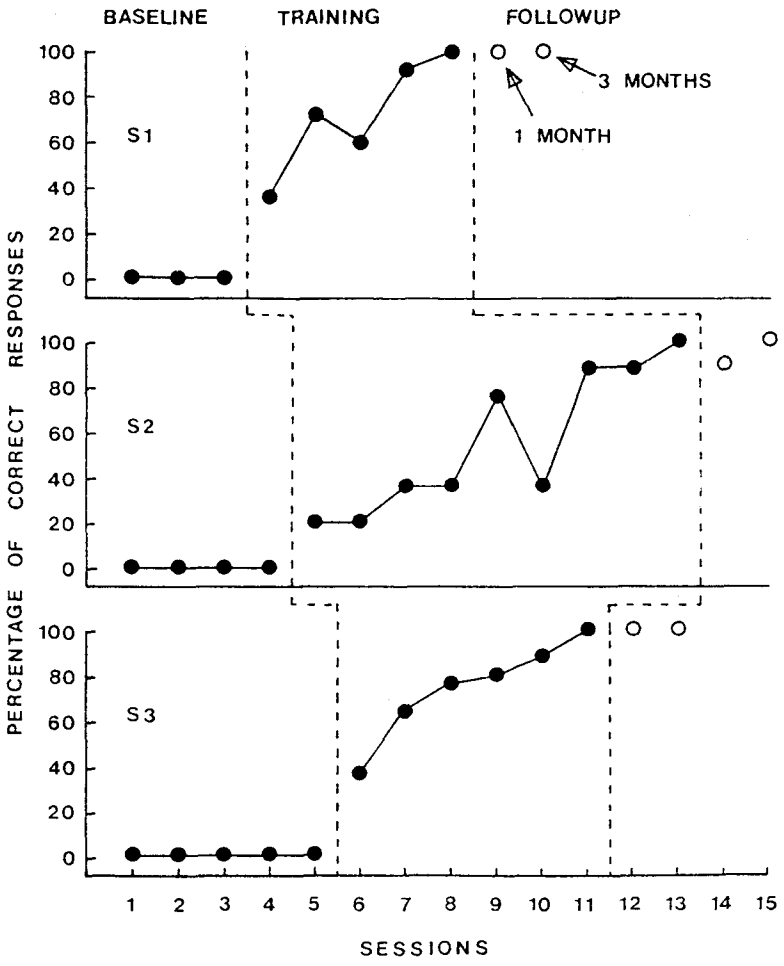

Fig. 1. Percentage of correct responses across sessions for baseline, training, and followup phases for each child.

The followup showed encouraging results at both one month and three months, with training gains being maintained for each child. S2 had 90 and 100% for the first and second followups, while S1 and S3 achieved 100% on both occasions. The children were able to make spontaneous requests for a toy component well within 10s upon its presentation.

Generalization results are presented in Table I. Because no child made any correct requests during the generalization pretest, performances

Table I. The Percentage Correct Responses in Generalization Across Another Setting, Person, Toy, and Food

	Generalization tests (%)			
Subject	Setting	Person	Toy	Food
S1	100	100	100	100
S2	80	70	90	70
S3	100	90	100	90

were therefore based on post test results measured at the conclusion of training. S1 had no problem transferring the trained skills to another setting, person, toy, and food by achieving 100% on all tests. S3 performed slightly less well and scored-90% in the test with food and the test with person. The worse generalization performance was observed with S2 who scored 100% in none of the conditions. He missed 3 of the 10 trials on both tests across person and food.

DISCUSSION

The effectiveness of the time delay procedure for teaching spontaneous communication to children with autism was demonstrated. Given sufficient training, all three children successfully learned to request toy components without needing any verbal prompts. This study extends previous findings by showing that the time delay procedure can be used for training socially appropriate verbal behavior whereby the children addressed another person by name and said "please."

Food had been typically used as reinforcers for teaching children, but when food is ruled out, the next best choice is toys. Since no direct comparison has been made between food and toys, one cannot determine their relative effectiveness in terms of training outcome. In this case, the choice of reinforcers was guided by feedback from parents and the efficacy of toys for teaching spontaneous speech was explored. The present data showed that the toys selected served well as reinforcers with our children. Although other toys could have been selected, multi-component toys/games were chosen because they required more than one step to play. Children demonstrated a willingness to continue the game once started and they persisted until the toy was successfully assembled or completed. Given the fact that this training procedure involved interrupting the continuation of a task with multiple steps, it is comparable with a training procedure known as the "interrupted behavior chain strategy" (see Hunt

& Goetz, 1988). The specific intervention makes use of some well-established behavioral sequences within which instructional trials are inserted. For example, a child often turns on the TV for a favorite program by coming through the family room door, moving toward the TV set and pressing the power button. The child's action can be interrupted at each of these steps if desired. For instance, the trainer blocks the child from pressing the button (e.g., by physical restraint) and prompts a request response for permission. A highly predictable routine provides a convenient context for intentional communication. Most important of all, "the violation of anticipated occurrences provides the motivation to act in such a fashion that the anticipated sequence of events is restored" (Schuler, 1987, p. 3). Successful cases in promoting intentional communication of severely disabled children has been reported in the literature (e.g., Goetz, Gee & Sailor, 1985). By the same token, the use of time delay with multi-component toys was therefore analogous to the interrupted chain procedure where motivation to continue a blocked routine served as a strong reinforcer for communicating such an intention.

Generalization data (see Table I) showed that the learned verbal communication skills transferred well. Some features of the present training procedure with time delay facilitated the transfer. For example, the reinforcers for the children's responses were the objects (i.e., toys) requested rather than some other irrelevant reinforcer foreign to the context. Hence similar responses made in the future would be reinforced in normal social communication situations. The spontaneous speech also gave children a sense of control over other people and their environment (Howlin, 1989). Furthermore, training was undertaken in the children's home environment where they experienced less anxiety. Although it required a relatively long time (four days in the case of S2) before the children accepted the trainer appearing in their home, training went smoothly once a friendly relationship was established. Obviously, the natural setting helped to enhance the transfer of behavior (cf. Stokes & Baer, 1977).

Often, in previous research in this area generalization tests in untrained settings have been confined to the stimulus class being trained (e.g., Charlop *et al.*, 1985). Generalization across a different stimulus class (i.e., from toy to food) was also assessed in this study. The encouraging results further demonstrated the usefulness of the present language training program with multi-component toy. The skills acquired by these children were transferrable to daily life situations. For example, they were capable of initiating a communication through requesting various kinds of items from their parents after the completion of the program, even though parents were not involved in the training.

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