

ACQUISITION AND FUNCTIONAL ANALYSIS OF MANDING WITH AUTISTIC STUDENTS

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Three autistic students were trained to request a specific object from an adult "supplier" with the sentence, "Give me —" and to deliver that object to another adult, the "director." Subsequently, the degree to which the object offered by the supplier controlled the "Give me —" verbal response was assessed by delivering to the student an object other than the one requested. Despite knowing the names of all objects used in the experiment, students accepted and delivered to the director any object offered by the supplier regardless of its match with the requested object. After training to say "That's not it. Give me —" when nonrequested objects were offered, students responded differentially to requested and nonrequested objects, suggesting control of the "Give me —" response by the requested object, a characteristic of a mand. These results generalized across settings and objects. Results are discussed in terms of the training technique to establish manding and the functional analysis of the resulting verbal behavior.

DESCRIPTORS: manding, functional language, social behavior chain, generalization, autistic students

Requesting an object or an action of another person is a type of verbal behavior called a "mand" (Skinner, 1957); it is defined as "a verbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation and aversive stimulation" (pp. 35-36). It is thought to be one of the earliest classes of verbal behavior that emerges in language development and is often the focus of training for language-deficient children.

In teaching manding to language-deficient children, one may wait for incidental occasions in which naturally occurring deprivation conditions and aversive stimulation evoke a mand (Hart & Risley, 1975). Unfortunately, relying on naturally occurring deprivation and aversive stimulation may provide few convenient and repeatable learning opportunities (Deguchi & Yamamoto, 1985). To increase learning opportunities, one may manipu-

late an "establishing operation" (Michael, 1982) that motivates a mand. However, manipulation of certain types of establishing operations that involve deprivation or aversive stimulation is precluded because of ethical problems.

In recent studies (e.g., Rogers-Warren & Warren, 1980; Simic & Bucher, 1980; Warren, McQuarter, & Rogers-Warren, 1984), antecedent conditions have been manipulated to increase teaching opportunities for mands. In the mand-model technique (Rogers-Warren & Warren, 1980), a teacher provided materials (e.g., ball) and/or verbal cues (e.g., "Tell me what you want.") to induce retarded students to emit verbal responses specific to the materials. When the student emitted an appropriate verbal response, the teacher offered the requested material. When an appropriate response did not occur, the teacher modeled the correct response. Using a similar training strategy, Simic and Bucher (1980) trained retarded students to emit two verbal responses, "I want a —" and "Out," in the presence of edibles on a tray and a miniature door, respectively, and found little transfer of manding to more naturalistic manding opportunities outside the training setting.

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In both of the previously described experiments, the target object was used as a cue for manding in an effort to increase teaching opportunities. The presence of target objects on training and probe trials suggests that the acquired verbal response might function as a "tact," a label for the target object, rather than as a mand in which the target object was requested, even in its absence. If a verbal statement functioned *solely* as a tact under control of a target object used in training, that verbal response would typically not occur under control of relevant mand-establishing operations (e.g., hunger, social needs) that occur in the absence of the target object and would probably be useless in allowing the learner to request what he or she "wants."

A defining feature of manding is that the response is controlled by the consequent event specific to the establishing operation: a mand "specifies" its reinforcement. In the two cited experiments, however, there were no procedures to assess control of the mands by the consequent event specified by the mands, thus calling into question the classification of the verbal responses as mands.

The purpose of this experiment was to establish in autistic students a functional verbal response set "Give me —" that would request a consequent event. To determine the degree to which the verbal response was controlled by the specified consequence (a mand), we assessed the occurrence of the student's statement "That's not it" when given an object other than the one requested. To set the occasion for a mand, we established the reinforcing value of specific objects by instructing the student to request and bring that object from one adult to another. This social behavior chain allowed the occasional presentation of objects other than the one requested as a probe for the controlling variables of the mand. This research thus replicates prior research on mand training and extends the research by assessing the controlling variables for the mands.

Given suggestions that severely retarded and autistic children need intensive teaching to establish functional language (e.g., Fay & Schuler, 1980; Guess, Sailor, & Baer, 1974, 1978; Lovaas, 1977),

the social chain technique used in this research may prove useful in providing more teaching opportunities for mand training than do child-initiated procedures such as the incidental teaching method (Hart & Risley, 1975).

METHOD

Subjects

Three autistic students participated in this experiment. They attended special education classes at public schools. All of them were diagnosed as autistic in public hospitals not associated with this research. Administration of the Check List for the Autistic Child (CLAC-II; Umezu, 1980) showed that all of them displayed the typical behavioral pattern of autism; they had deficiencies in language skills, social interaction, and self-control skills and often showed self-stimulatory and self-injurious behavior. All of them had learned basic self-help skills, such as putting on clothes and eating with a spoon. They could name several objects and follow some simple instructions. IQ scores on the Wechsler Intelligence Scale for Japanese Children (WISC-R) for each student were below 35.

Student 1 (10 years, 7 months old) often engaged in self-injurious behavior (hand-biting) when an adult rejected or ignored his request. His speech was mainly echolalia, but he sometimes requested objects he wanted in one-word sentences when verbally prompted by an adult.

Student 2 (11 years, 2 months old) displayed self-injurious behavior (hand-biting) and echoed questions to which he had not yet learned appropriate responses. He sometimes uttered the name of objects he wanted in one- or two-word sentences when an adult presented verbal or visual cues.

Student 3 (11 years, 11 months old) displayed self-stimulatory behavior (finger-flapping). She often echoed questions and sometimes requested objects in one- or two-word sentences when a verbal cue such as "What do you want?" was presented.

Setting

The experiment was conducted in the respective homes of each student. During training sessions,

the student sat facing the "supplier" (an adult who supplied objects requested by the student) across a table, and the "director" (an adult who directed the student to request objects from the supplier) sat on the left side of the student 1 m away. The mother served as director for Student 1, and a female undergraduate student served for Students 2 and 3. A male graduate student served as supplier for all three students.

Unless otherwise specified, all assessment sessions (baseline assessment, generalization, and the other tests) were conducted in the corridor of the house for Student 1 and in another room of the house for Students 2 and 3. The student stood 5 m away from the supplier. The supplier sat behind a box containing various objects used in the experiment, and the director stood next to the student.

General Procedure and Response Definition

Throughout the experiment, the students could not see any objects until an appropriate verbal response was emitted. In the assessment sessions, the "Give me —" response was scored as correct when the student (a) arrived in front of supplier, (b) emitted "Give me —" and specified the correct object, and (c) returned to the director with the object. When the student emitted an incorrect verbal response or failed to complete each step within 30 s, the response was scored as incorrect and the supplier guided the student verbally and/or physically to the director to implement the next trial. In baseline assessment, generalization, and the other tests, neither verbal nor physical prompts were given. The experiment was conducted 2 or 3 days per week with up to three sessions conducted per day.

Known and Unknown Objects

Objects for which the students gave correct responses on both receptive and productive tests were classified as "known" objects. If the student gave incorrect responses on both tests, the object was classified as "unknown." In the receptive test, the student stood in front of a table, on which 10 objects (e.g., a pencil, a cup) were arranged in a row. In response to an adult's "Take a—" instruc-

tion, the student delivered an object to the adult and the location of objects was rearranged before the next trial. Trials continued in this manner until each object was requested. The productive test required students to name a presented object when asked "What's this?" Each correct response in these two tests was followed by an edible.

Pretraining

Pretraining was conducted to establish the following social behavior chain: when instructed by the director, the student walked to the supplier and asked for an object with a sentence "Give me —" and took the object back to the director. One of the previously selected known objects was requested on each trial, and the supplier always delivered the requested object. One session consisted of 12 trials.

The following procedure was used to teach the "Give me —" response for each trial. Initially, the director said to the student "Bring — from that teacher." When the student could not respond correctly, the director modeled the response "Give me —." When the student imitated the modeled response, the supplier handed the object to the student and physically prompted the student to hand the object to the director, at which time the director delivered an edible and said "Good." The supplier's verbal prompt was gradually faded by dropping syllables from the end of the verbal request until the student could give the correct verbal response without being prompted. We used the sentence "Enpitsu kudasai" in Japanese. "Enpitsu" corresponds to "a pencil" and "Kudasai" to "Give me." First, the supplier modeled the whole response "Enpitsu kudasai." Then, the prompt was gradually reduced from "Enpitsu kuda" to "Enpitsu ku" and so forth. When the student failed to respond correctly under one prompt form, the previous prompt form was presented in the next trial. Also, the physical prompt was gradually reduced from physically guiding the student to the director to pointing to director. Pretraining was considered complete when the student showed more than 90% correct responding for two consecutive sessions without verbal and physical prompting.

Table 1
Correct Verbal Behavior Chain

Unmatched trials

- DR: "Bring — from that teacher." (Points to the supplier.)
 ST: (Comes and stands in front of the supplier.) "Give me —."
 SP: (Offers an object other than the one requested.)
 ST: "That's not it. Give me —."
 SP: (Offers the requested object.)
 ST: (Receives the requested object from supplier and delivers it to the director.)

Unmatched trials in the modified unmatched test

- DR: "Bring — from that teacher." (Points to the supplier.)
 ST: (Comes and stands in front of the supplier.) "Give me —."
 SP: (Offers an object other than the one requested.)
 ST: "That's not it. Give me —."
 SP: (Offers an object other than the one requested.)
 ST: "That's not it. Give me —."
 SP: (Offers the object that the student requested.)
 ST: (Receives the requested object from the supplier and delivers it to the director.)
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DR, director; ST, student; SP, supplier.

Experimental Conditions

Baseline. Two types of trials were conducted during each baseline session: *matched trials* and *unmatched trials*. In matched trials, the supplier offered the object that the student requested. In unmatched trials, the supplier offered an object other than the one the student requested. This response sequence is depicted in Table 1.

Each session consisted of random presentation of six matched trials and six unmatched trials. In unmatched trials, if the student responded differentially to the nonrequested object (e.g., verbal response such as "That's not it" or nonverbal response such as refusing the object offered by the supplier), the supplier was to withdraw the offered object and give the requested one; this never occurred during baseline because differential responses were not emitted. If the student presented the nonrequested object to the director, it was received but prompts and reinforcers (e.g., edibles and direct verbal praise for each response) were not given. Praise for being on-task was provided after six trials.

Training. Training differed from baseline in the setting, the proximity of the student to the supplier, and the contingencies for correct and incorrect responses. In unmatched trials, if the student accepted the nonrequested object, the supplier modeled "That's not it" ("Chigaimasu" in Japanese). When

the student imitated that verbal response, the supplier withdrew the object and modeled "Give me —." When the student reiterated "Give me —," the supplier offered the requested object. The student received a small edible when the requested object was delivered to the director. Using a fading procedure similar to that used in pretraining, the verbal prompt for "That's not it" was faded until the correct response occurred without the prompt. If the student emitted "That's not it" in matched trials, the director said "No" and prompted the student to hand the requested object to the director. In this case, no reinforcement was given.

Unmatched trials were conducted exclusively until the student scored 90% or better for two consecutive sessions without prompt. After that, matched and unmatched trials were presented randomly. For each student, one session consisted of 12 trials. Training was regarded as complete when the student scored 90% or better in two consecutive sessions.

Stimulus Control Probes

After training, the effect of training was assessed in the following five types of test sessions. In these tests, prompts and reinforcements were not given and praise for being on-task was noncontingently provided after every six trials.

Generalization test. Generalization of training to the assessment setting was evaluated using the same procedure and personnel as were used in baseline. In this setting, the subject and the supplier were separated by 5 m.

Generalization test in the free-play setting. Generalization was tested in a free-play setting in which play materials (e.g., crayons, pieces of paper, pieces of clay) and edibles were out of reach of the student. When the student spontaneously responded "Give me —," the supplier offered an object. Spontaneous "Give me —" responses included ones that occurred after a time delay (Halle, Marshall, & Spradlin, 1979) or verbal cues (e.g., "What?") by the supplier. Attempts to take an object without a verbal request were physically prevented. In approximately half of these student requests, the requested object was offered, with nonrequested objects being offered to the remaining requests. Two 30-min sessions, separated by more than 1 week, were conducted.

Modified unmatched test. In an effort to assess whether the student's acceptance and delivery of a requested object was actually controlled by that object during unmatched trials, modified unmatched trials were interspersed among the ordinary unmatched trials. In these trials the supplier offered nonrequested objects twice rather than once. The response sequence for these trials is depicted in Table 1. In this test, one session consisted of three ordinary unmatched trials, three modified unmatched trials, and six matched trials. Otherwise, procedures were identical to those used in baseline.

Unknown object test. To examine whether the student could respond "That's not it" when unknown objects were presented, three types of trials were conducted: (a) trials in which the director requested a known object and the supplier offered an unknown object (known-unknown trials), (b) trials in which the director requested an unknown object and the supplier offered a known object (unknown-known trials), and (c) trials in which an unknown object was requested and another unknown object was offered (unknown-unknown trials). When the student said "That's not it. Give me —" in response to the supplier's presentation

of a nonrequested object, the supplier offered the requested object. When the student accepted a nonrequested object, the supplier did not give any prompts and the director accepted the delivered object as in matched trials. No reinforcement was given as in the other tests. One session consisted of six known-unknown trials (or six unknown-known trials), three unknown-unknown trials, and six ordinary matched trials presented in unpredictable order.

Follow-up test. Two months after the experiment terminated, a follow-up assessment was conducted under conditions identical to baseline sessions.

Experimental Design

A multiple baseline design across students (Barlow & Hersen, 1984) was used to assess the effects of training. Generalization across situations and stimuli was also assessed.

Data Collection and Reliability

During all assessment sessions, the student's "Give me —" and "That's not it" responses were scored as correct or incorrect by the director and were audiotape-recorded for later transcription. In the free-play setting, an observer recorded the names of offered objects, as well as the student's "Give me —" and "That's not it" responses. For approximately half of the sessions, the "Give me —" and "That's not it" responses of each student were transcribed from the tapes and categorized as correct or incorrect by a second observer. Interobserver agreement was calculated by comparing the director's score with the score of the second observer for each trial, then totaling the number of agreements and dividing that total by the number of agreements plus disagreements. The percentage agreement was 100% for each student.

RESULTS

Baseline. Figure 1 shows the percentage of correct "That's not it" responses in unmatched trials for each student. During baseline, differential responding was not observed. Every student accepted

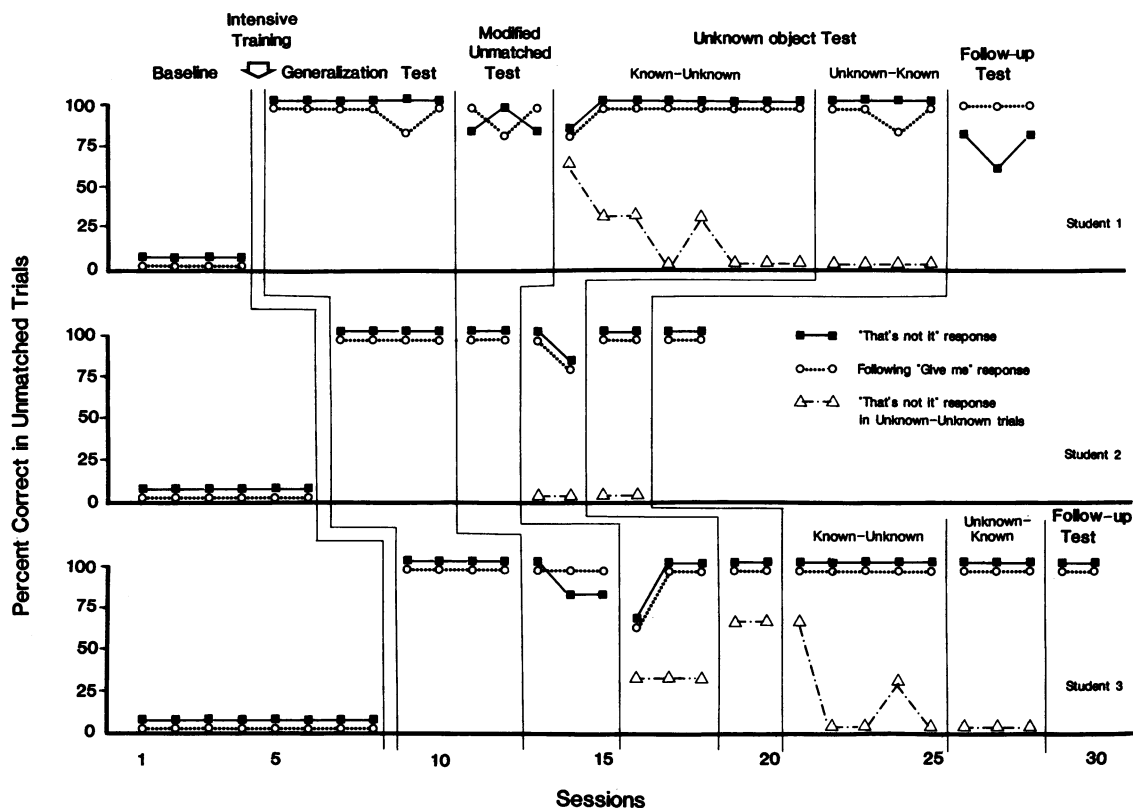


Figure 1. Percentage of correct "That's not it" responses for Students 1, 2, and 3 on unmatched trials. Filled squares represent "That's not it" responses. Open circles represent following "Give me —" responses. Open triangles represent "That's not it" responses in unknown-unknown trials.

and delivered the offered objects in all of the trials, whether or not the object was the one requested.

Training. Training was conducted to establish the verbal response "That's not it. Give me —" to the unmatched object. The number of trials required to reach the criterion for Students 1, 2, and 3 was 198, 48, and 66, respectively.

Generalization test. Correct responses on unmatched trials immediately increased to 100% for the "That's not it" response for each student. The percentage correct of the following "Give me —" responses was 97%, 100%, and 100% for Students 1, 2, and 3, respectively.

Modified unmatched test. Figure 1 shows the percentage of correct "That's not it" and "Give me —" responses in the modified unmatched test. Each student showed a high percentage of correct "That's not it" responding ($M = 89\%$, 100% , and 89%) to the second nonrequested object and

subsequent "Give me —" responding ($M = 94\%$, 100% , and 100%).

Unknown-object tests. In known-unknown sessions, the mean percentage of correct "That's not it" responses was quite high for each student ($M = 98\%$, 92% , and 89%). In unknown-known sessions, the percentage of correct response was 100% for each student. The scores on the second "Give me —" response for each student were also high throughout unknown-object tests ($M = 99\%$, 96% , and 99%).

In unknown-unknown trials interspersed among the known-unknown and unknown-known trials, the mean percentage of correct "That's not it" responses for the first four sessions was 33%, 0%, and 42% for each student and in general declined across trials.

Follow-up test. The mean percentage of correct "That's not it" responses for Students 1, 2, and

3, respectively, was 78%, 100%, and 100%. The percentage of correct second "Give me —" responses was 100% for each student.

Free-play setting mands. Table 2 shows the frequencies of student-initiated "Give me —" and "That's not it" responses. The mean percentage of correct "That's not it" responses per total unmatched opportunities for Students 1, 2, and 3, respectively, was 87%, 93%, and 88%. The mean percentage of the following "Give me —" response was 74%, 86%, and 88%, respectively.

Other results. Across all experimental sessions the percentage of correct first "Give me —" responses was 96% for Student 1 and 99% for Students 2 and 3. The offered object was delivered to the director within 30 s on 98%, 100%, and 100% of trials for Students 1, 2, and 3, respectively. Frequencies of "That's not it" responses in matched trials (incorrect responses) were 1, 0, and 2 for each student.

DISCUSSION

Results of this study indicated that echolalic autistic students acquired the verbal response set "That's not it. Give me—" under control of requested and nonrequested objects offered by an adult. Many language training programs (e.g., Guess et al., 1974, 1978; Lovaas, 1977) have included procedures to establish the "Give me —" response. However, one cannot regard this verbal response as a mand until the variables that control the response are identified (Simic & Bucher, 1980). In this experiment, students who acquired the "Give me —" response failed to respond "That's not it" to a nonrequested object during baseline, suggesting that the "Give me —" response was not under control of the requested object and thus not appropriately classified as a mand. Therefore, a differential response to an offered object such as the "That's not it" response should be incorporated into the behavior chain to ensure the "Give me —" response functioned as a mand. Our results indicated that the "That's not it" response was established through the prompt-fading procedure and generalized across settings and to trials in which either the requested or the offered object (but not both) were unknown to the subject.

Table 2
Frequencies of "Give me —" and "That's not it"
Responses Occurring in Generalization Test in the
Free-Play Setting

| Student | Ses- sion | Sponta- neous "Give me —" | Total un- matched oppor- tunities | "That's not it" | Follow- ing "Give me —" |
|---------|--------------|------------------------------------|--|--------------------|----------------------------------|
| 1 | 1 | 12 | 9 | 8 | 6 |
| | 2 | 23 | 14 | 12 | 11 |
| 2 | 1 | 10 | 6 | 5 | 5 |
| | 2 | 13 | 8 | 8 | 7 |
| 3 | 1 | 14 | 9 | 8 | 8 |
| | 2 | 12 | 7 | 6 | 6 |

The controlling variables for the "That's not it" response were examined in known-unknown, unknown-known, and unknown-unknown trials. All students responded "That's not it" appropriately in known-unknown and unknown-known trials. The "That's not it" responses in unknown-unknown trials, in contrast, finally decreased to zero for all three students, although the same contingency was used as in known-unknown and unknown-known trials. These results suggest that the "That's not it" response was controlled neither by each stimulus pair used in the training nor by the stimulus property (e.g., an unknown object), but was controlled by the relation of the requested object and the offered one when one or both objects were known.

Further evidence of the generality of the mand trained herein was seen in the unstructured free-play situation, in which students could also respond "Give me —" and "That's not it" appropriately without prior requests from an adult. Of course, data from the free-play situation should be interpreted cautiously because of the lack of baseline assessment.

Several factors may have contributed to the results reported herein. First, the social behavior chain (an establishing operation) provided more teaching opportunities with various objects than could have been provided through an incidental teaching procedure. This kind of intensive "multiple exemplars" training (Garcia, Baer, & Firestone, 1971; Solnick & Baer, 1984; Stokes, Baer, & Jackson,

1974) may have facilitated generalization to the unstructured student-initiated situation (Harris, 1975; Scott, Himadi, & Keane, 1983; Stokes & Baer, 1977). Second, the assessment procedure used in this research, especially on the tests, involved a time delay from the initial instruction by the director to the emission of a verbal response to the supplier. Such a time delay may reduce the immediate and strong control by an antecedent verbal stimulus that might have retarded the emergence of generalization. Third, intensive training of the "That's not it" response may have weakened control exerted by the director's instructions such that the "Give me —" response came under control of the requested object regardless of the setting or the adults present.

In sum, this research demonstrates a training model that holds promise for teaching manding to autistic students who emit few spontaneous verbal responses. In this study, an establishing operation, in which the director instructed the subject to mand a specified object to the supplier, was manipulated to increase learning opportunities, and the control by a requested object was assessed. Training the verbal response set "Give me —" and "That's not it" was useful in determining the degree to which verbal responses that were assumed to be mands were controlled by the reinforcers they specified. The establishing operation and the functional analysis strategies are important in attempts to apply the theoretical analysis of verbal behavior to the formation of functional language for language-deficient children.

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