*TEACHING CHILDREN WITH AUTISM SPECTRUM DISORDER TO
MAND FOR INFORMATION USING “WHICH?”*

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We examined a procedure consisting of a preference assessment, prompting, contrived conditioned establishing operations, and consequences for correct and incorrect responses for teaching children with autism to mand “which?” We used a modified multiple baseline design across 3 participants. All the children learned to mand “which?” Generalization occurred to the natural environment, to a novel activity, and to a novel container; the results were maintained over time.

Key words: mand for information, verbal behavior, verbal operant, which

Contrived motivating operations have been used to teach mands for information to children with autism, including the mands “what?” (e.g., Williams, Donley, & Keller, 2000), “where?” (e.g., Betz, Higbee, & Pollard, 2010; Lechago, Carr, Grow, Love, & Almason, 2010), and “who?” (e.g., Endicott & Higbee, 2007; Sundberg, Loeb, Hale, & Eigenheer, 2002). More recently, researchers have exam-

ined the effects of contriving establishing operations (CEOs) in four different ways to teach children with autism to acquire the mands “what?” (Marion, Martin, Yu, & Buhler, 2011; Roy-Wsiaki, Marion, Martin, & Yu, 2010) and “where?” (Marion, Martin, Yu, Buhler, & Kerr, in press). Like the mands “what?” and “where?” the mand “which?” is a mand for information that gives the speaker the ability to gather specific information regarding an item (e.g., “Which book is mine?”). Given the dearth of research that has examined interventions to teach mands for information using “which?” the purpose of the present study was to extend the work of Marion et al. (2011, in press) by contriving one of four CEOs for teaching the mand “which?” to

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children with autism, and to assess for generalization to the other CEOs, the natural environment, and over time.

METHOD

Participants and Setting

Three children, Zach, Connor, and Kevin, participated. All participants ranged in age from 5 to 6 years and had a diagnosis of autism spectrum disorder. All children participated in an intensive applied behavior analysis program and could use the mand frames "what?" and "where?," tact at least 100 pictures and objects, and answer some personal questions. All teaching and generalization sessions occurred in various rooms of each participant's home or yard.

Response Measurement

The dependent variable was the percentage of correct mands for information using "which?" Correct mands were those that contained the word "which?" (e.g., "which bag?" or "which one?"). Variations in responses were accepted as long as they appropriately contained the mand "which?" The observer and trainer recorded the mands on a trial-by-trial basis. A trial consisted of a contrived CEO, a response by the participant (or no response within 10 to 15 s), a prompt (if the response made by the participant was incorrect or did not mand), and the answer to the child's question. The percentage of correct responses was calculated by dividing the number of correct responses by the total number of trials in the session and converting the result to a percentage. For the natural environment sessions, the observer and trainer collected data on whether a spontaneous mand was made with and without a statement from the parent and whether a missed opportunity arose with and without a statement from the parent. These data were calculated by dividing the number of correct mands by the number of correct mands plus missed opportunities and converting the result to a percentage. A missed opportunity was scored when a speaker asked the participant to do, get, find, look, or search for something,

two or more options about the item specified by the speaker were available, and the participant had to ask "which?" to select the correct item to comply with the directive. A second observer collected data at the same time as the experimenter during at least 50% of the sessions for each participant; interobserver agreement was calculated by dividing the number of agreements between the experimenter and observer by the sum of agreements plus disagreements and converting the result to a percentage. Across all participants and sessions, interobserver agreement averaged 98% (range, 96% to 100%). The observer also measured whether the experimenter followed or did not follow each procedural step during 50% to 100% of sessions across participants; procedural integrity was 100%. Procedural integrity reliability was determined by comparing the trainer's and the observer's scores on whether the procedure was followed; reliability averaged 99% (range, 96% to 100%).

Design and Procedure

A modified concurrent multiple baseline design across participants was used to evaluate the teaching package. The design was modified in that baselines were not conducted continuously. Baseline sessions across all CEOs and generalization activities and the natural environment were conducted at the beginning of the study for Zach and Kevin. CEO 1 was chosen randomly as the condition to introduce the training procedure, which allowed us to evaluate the effectiveness of the training procedure across participants.

General procedure. Each parent selected three preferred activities to be used in the study to create CEOs for his or her child. Sessions were conducted three to four times per week. For each CEO, the experimenter began a session by setting up the three preferred activities in front of the participant and asking him if he wanted to play. After acceptance, the experimenter asked the participant to choose one of the three activities. After he chose an activity, the experimenter conducted the first two trials of the session with that activity. After the second

trial, the participant was given a choice of the two remaining activities, and the selected activity was used for the last two trials. If the participant requested to change activities at any time, the experimenter honored his request. Twelve trials were administered in baseline sessions (three for each CEO), and four trials were administered during training and generalization sessions.

During sessions, four to six containers (e.g., two bags and two boxes) were placed near the participant and experimenter. For all CEOs, opportunities were created for a participant to first mand “where?” After the participant mandated “where?,” the experimenter provided a general description (e.g., “in the box”), and the trial began. A prompt was given if the participant did not mand “where?” within 10 to 15 s, but this rarely happened. When a participant emitted the correct mand (e.g., “which box?”), he was told the specific location (e.g., “red box”) to find the item, and was permitted to retrieve it and continue the activity.

CEO 1 (hide-and-seek). A participant and the experimenter began to play with the activity (e.g., water and water toys) chosen by the participant. The experimenter casually placed a particular toy that the participant used most frequently (e.g., water balloons) behind her back when the child was not looking (other water toys and the water bin were still present). A research assistant then took the toy and hid it in one of the containers (e.g., one of the boxes or bags).

CEO 2 (missing item). This CEO consisted of hiding an item needed to complete a preferred activity, such as hiding the markers for a drawing activity. Before the trial, the needed item was hidden.

CEO 3 (requiring more). This CEO consisted of having all items present that were needed to complete an activity; however, more of an item was required to complete the activity. An example was making a volcano, but not enough vinegar was provided to make it erupt.

CEO 4 (surprise). This CEO consisted of creating an opportunity for a participant to be surprised where an item was hidden. For example, a toy that the participant chose was placed in a box and locked while he watched, and the locked box was given to the participant. Out of sight of the participant, the key was hidden (the surprise) in one of the nearby containers.

Phases

Baseline. Baseline trials were conducted as described in the previous section. If the participant did not mand “which?” within 10 to 15 s, the trial was terminated and that activity was stopped.

Teaching CEO 1. Four teaching trials were conducted per session. On a teaching trial in which a participant was given an opportunity to mand “which?,” the experimenter delivered an echoic prompt if he did not respond within 10 to 15 s of the start of the trial. The first training session always started with full prompts (e.g., “say which?”) until the participant responded correctly across two consecutive trials in one session. After this criterion was met, a partial prompt (e.g., “say whi-?”) was delivered on the next trial. If the participant did not respond to a partial prompt during a trial, a full prompt was delivered on the next trial (considered a new trial). After the participant began to respond correctly within 10 to 15 s of the partial prompt, the prompt was faded by reducing the amount of the response given (e.g., from “whi-” to “w-”). The consequence for correct and prompted responses was the same as described above in the general procedure section. If the participant responded incorrectly during an unprompted trial, the trial was re-presented (this did not count as another session trial), and the prompt was given again. The mastery criterion was a correct, unprompted mand on seven of eight consecutive trials.

Generalization and Follow-Up

Natural environment. We assessed the frequency with which each participant used the

mand “which?” with his parents in the natural environment. None of the toys or activities used to create CEOs in training or generalization sessions (described below) were used by the parents. We observed the parents interact with their child as they typically would. This commonly consisted of playing sports or games, playing with toys, and eating meals. Each parent was asked to contrive opportunities for his or her child to use the mand “which?” in two ways. First, the parent contrived opportunities in which the child had the opportunity to mand “which?” but did not have to mand “where?” For example, a parent could say “Let’s play with puppets; go get them; they are in a drawer.” Second, the parent contrived opportunities for his or her child first to mand “where?” and then to mand “which?” after the type of container was named (similar to training sessions). A natural environment observation continued until the parent provided 10 opportunities to mand “which?” or 1 hr had passed, whichever came first.

Generalization to untrained CEOs, to a novel activity, and to a novel container. Following mastery in CEO 1, generalization was assessed to the other CEOs administered as described above. We also assessed generalization across a novel activity and container. For the latter, four trials were administered, one for each of the CEOs. For Zach and Kevin, the novel activity consisted of baking cookies or other goods; for Connor, it consisted of making pudding. The trials were conducted as in baseline.

Follow-up. Two or three follow-up sessions were administered for CEO 1 at 1, 2, 4, or 5 weeks, depending on participant availability. The follow-up trial was conducted in the same fashion as the baseline for CEO 1.

RESULTS AND DISCUSSION

Figure 1 shows the percentage of correct responses across training and generalization sessions for each participant. None of the

participants used the mand “which?” during baseline. After training in CEO 1, all participants used the mand “which?” Generalization to untrained CEOs, a novel activity or container, and over time occurred for all participants. Generalization to the natural environment occurred for Kevin and Connor but not initially for Zach. Generalization occurred for Zach after he was given an additional discrimination-training procedure to establish appropriate stimulus control over the mands “where did it go?” and “which?” (The procedure and data are available from the first author.)

Several differences in performance were noted among the participants. First, Zach had difficulty learning when to mand “which?” and when not to mand “which?” during training and generalization sessions. Both Connor and Kevin were observed to engage in a common chain of behaviors (i.e., asking “where?,” going to the containers, scanning the containers, and then asking “which?”), which may be a reason why generalization to the natural environment occurred for both of these participants but not initially for Zach. Kevin performed better than Zach and Connor.

One of the limitations of the study was that the participants previously had been taught to mand “what?” and “where?” Future studies might examine if these mands are prerequisites to learning the mand “which?” Second, Zach and Connor had more difficulty using the mand “which?” in the natural environment than using the mands “where?” or “which?” This may have occurred because the mand “where?” was taught first. Future studies might examine procedures for teaching the participants to say “which?” only. Third, future studies might examine teaching the mand “which?” in different contexts (e.g., during a conversation without toys or activities present) or with a different order of CEOs. Fourth, future studies might examine teaching the mand “who?” with this training procedure. Lastly, follow-up in the natural environment as

Figure 1. Percentage of trials with the correct mand “which?” for all participants across baseline, training, generalization, and follow-up. The numbers indicate the 1-, 2-, 4-, and 5-week follow-up sessions for CEO 1. Nat env = natural environment.

well as to the untaught CEOs should be examined in future studies.

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