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MANIPULATION OF MOTIVATING OPERATIONS AND USE OF A SCRIPT-FADING PROCEDURE TO TEACH MANDS FOR LOCATION TO CHILDREN WITH LANGUAGE DELAYS

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The effects of contriving motivating operations (MOs) and script fading on the acquisition of the mand "Where's [object]?" were evaluated in 2 boys with language delays. During each session, trials were alternated in which high-preference items were present (abolishing operation [AO] trials) or missing (establishing operation [EO] trials) from their typical locations. Both participants learned to mand during EO trials and not to mand during AO trials during training. Generalization of manding was demonstrated across novel instructors, stimuli, and settings and maintained 3 to 4 weeks following the intervention.

Key words: motivating operations, mand, script fading

Children with developmental disabilities frequently exhibit deficits in question asking (Charlop & Milstein, 1989; Koegel & Koegel, 1995) and, in particular, tend to have difficulty learning to ask questions for information (e.g., where, why, how) (Calloway, Myles, & Earles, 1999). This skill deficit may occur because responses to these questions have not been established as conditioned reinforcers (Sundberg, Loeb, Hale, & Eigenheer, 2002). One strategy to address this difficulty is mand training, in which establishing operations (EOs) are captured or contrived to increase the value of the information (Sundberg & Michael, 2001). Procedures that attempt to teach manding for information when that information does not function as a reinforcer must rely on other types of reinforcers (e.g., tangible items, tokens). This can be problematic because behavior is more likely to generalize and be maintained when training is arranged using consequences that occur naturally in the environment (Cowan & Allen, 2007).

Sundberg et al. (2002) manipulated EOs and used in vivo prompts to teach mands for information about the location of missing items to two boys with autism. Trials were alternated in which a high- or low-preference item was placed in a container out of reach. Manding "Where's [toy]?" resulted in information about the location of the toy (and subsequent access to the toy). Endicott and Higbee (2007) conducted a systematic replication of Sundberg et al. with three boys with autism. Procedures were similar, with the addition of a stimulus preference assessment to determine high- and low-preference items. In both studies, all participants learned to mand for the location of high-preference items. However, because mands also occurred when low-preference items were hidden, the controlling variable for these responses is unclear.

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The purpose of the current study was to extend the literature on contriving EOs to evoke mands for location. Instead of using high- and low-preference items to demonstrate EO control of the mand, an item was missing (i.e., contrived EO) during some trials, but was not missing (i.e., contrived abolishing operation; AO) during other trials. Audiotaped scripts were used rather than in vivo vocal prompts, because it has been suggested that the former may be easier to fade (Green, 2001; Krantz & McClannahan, 1993, 1998). Although scripts are commonly used to teach conversation skills to individuals with autism (e.g., Brown, Krantz, McClannahan, & Poulson, 2008), no previous studies have used script fading to teach mands for the location of missing items. In addition, during the current study, recordings of scripts were activated by the teacher on a multifile voice recorder, out of view of participants, to further facilitate fading.

METHOD

Participants and Setting

Participants were two boys, Billy (3 years 7 months old), who had been diagnosed with a severe expressive language delay, and Nick (3 years 8 months old), who had been diagnosed with autism and an expressive language delay. They demonstrated similar language skills, as determined via the Preschool Language Scale (Zimmerman, Steiner, & Pond, 2002). Although both boys had learned to mand for a variety of items (i.e., "I want [object]"), neither had learned to mand for information.

Procedure

Sessions were 30 to 45 min long and were conducted three to four times per week in a room at the participants' school. Ten high-preference toys (unavailable outside the sessions) were identified via classroom observation and parent questionnaires. Prior to the study, both participants demonstrated the ability to tact photographs of all toys, select a photograph of a toy from an array of 10 photographs affixed with hook-and-loop tape to a choice board, obtain the corresponding toy container, go to 15 different locations in the school when instructed (e.g., closet), and repeat brief audiotaped phrases from a digital voice recorder.

A multiple-probe design across participants was employed to evaluate the effects of the intervention package. Prior to each session, the experimenter randomly assigned five toys to each condition and placed pictures of the 10 items on the choice board. Each session consisted of five AO trials (toy was present) and five EO trials (toy was missing). Toys for EO trials were hidden from the participant's view. The order of trials was determined by the child and was dependent on the order in which photographs were selected from the choice board. In addition, photographs were not replaced once selected. Trial-by-trial data were collected and summarized as the percentage of trials with the mand "Where's [object]?" during EO trials (prompted with a script), EO trials (unprompted), and AO trials. During AO trials, the instructor presented a choice board (50.8 cm by 76.2 cm) that contained photographs of high-preference toys. The child then made a choice by removing the photograph from the choice board, walking to the toy shelf, locating the toy container with the corresponding photograph on the outside, and playing with the toy for 2 min to 3 min. During EO trials, the same procedures were in place, with one exception: When the child located the matching toy container, the toy was missing.

During EO trials in baseline, if the participant did not mand within 5 s after looking in the container, a simple, mastered instruction was presented and the next trial was conducted (i.e., the choice board was presented again). During EO trials in the intervention phase, procedures were the same as in baseline, except the experimenter played an audiotaped script to teach the mand, "Where's [object]?" After

selecting a photograph, the child walked to the toy shelf, located the matching toy container, and was given the opportunity to ask "Where's [object]?" when he saw that the item was missing. If the participant did not emit the desired mand within 5 s of looking in the container, the experimenter remained at the choice board and played the scripts out of view approximately 1 m from the participant. When the participant emitted the entire question while looking at the experimenter (following or prior to listening to the script), he was told the location of the toy so he could find it and play with it.

Scripts were faded across sessions, beginning with the full script ("Where's [object]?"), then partial script ("Where's"), then no script. The recording device stored the full script and partial script for each toy. Script fading began after a participant emitted a correct response within 5 s of the full script during all EO trials across two consecutive sessions. A baseline probe was conducted prior to introducing script fading to assess the participant's ability to ask "Where's [object]?" without a script to determine the necessity of gradual fading. Mastery criterion at each fading step was two consecutive sessions with the participant asking "Where's [object]?" with or without the voice recorder at 100% accuracy.

If a participant did not repeat a full script, the experimenter prompted him to return to his seat, placed the selected item back on the choice board, gave a distracter task, and allowed him to select from the choice board again. If he did not repeat a faded script, the experimenter played the full script immediately. If he then repeated the full script, he was told the location of the item so he could find and play with the item, but the trial was marked as incorrect.

If a participant manded for the location when the item was present in its container (AO trial), the experimenter placed the toy back in the container, returned the photograph of the toy to the choice board, presented a distracter task, and manually prompted the child to return to the choice board to begin the selection process again. This trial was repeated up to three times. If, after the third trial, an incorrect response occurred, the experimenter placed the card back on the choice board, prompted the child to select again, and used a model prompt of the experimenter's closed lips while looking at the participant to help the child to obtain the toy without asking, "Where?" This was necessary only for Nick during Sessions 16, 17, and 18.

Pre- and postintervention generalization probes were conducted under baseline conditions to assess manding with novel teachers and toys, in five different natural situations throughout the school day (e.g., glove missing when it was time to go home), and with toys arranged naturally on the floor (rather than the shelf) and the desired toy missing. Sessions were conducted 3 to 4 weeks following the intervention to assess maintenance of manding. Six special education teachers and speech pathologists also responded to a survey with five questions regarding the likelihood that they would use different aspects of the intervention for students with language delays or autism (1 = *strongly disagree*; 5 = *strongly agree*).

Interobserver agreement data were collected during at least 50% of randomly selected sessions across all conditions for each participant, and data were calculated using the point-by-point agreement method. Mean interobserver agreement across participants was 97% (range, 81% to 100% across sessions). Treatment integrity data (percentage of trials per session in which all procedures were implemented correctly) were collected during a minimum of 40% of randomly selected sessions across all conditions for each participant. Mean treatment integrity across participants was 96% (range, 80% to 100%, across sessions).

RESULTS AND DISCUSSION

The percentage of correct mands for location during each session for Billy and Nick is depicted in Figure 1. Neither participant

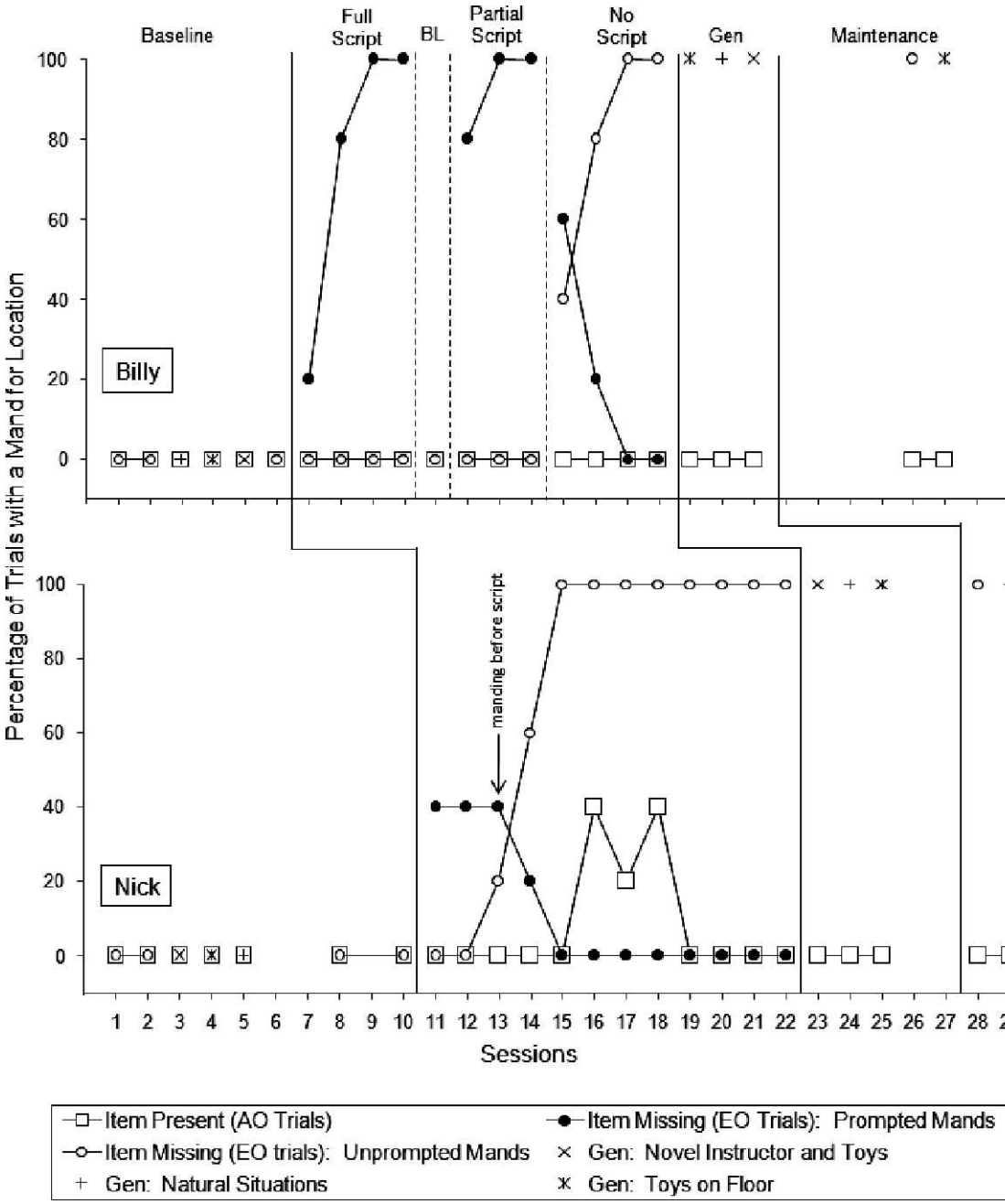

Figure 1. Percentage of trials with prompted and unprompted mands per session during AO trials, EO trials, generalization (Gen), and maintenance for Billy and Nick.

manded for the location of toys during baseline. Following teaching, both participants manded for location using the question, "Where's [object]?," consistent with results reported by Sundberg et al. (2002) and Endicott and Higbee (2007). Billy quickly learned to respond differentially during EO and AO trials and never emitted a mand for location during AO

trials. However, script fading was necessary to teach him to emit the mand during EO trials. Nick did not require script fading because he began to emit the mand during the full-script condition before the experimenter played the script. However, the error-correction procedure was necessary to teach him to respond differentially during EO and AO trials. Sessions conducted 3 to 4 weeks after the study demonstrated maintenance of manding. Results of the social validity assessment indicated that the special education teachers and speech pathologists found the procedures highly acceptable (M = 4.4, range, 3.5 to 5.0). The lowest scores were reported for the question about willingness to hide toys and record their locations prior to the student's arrival at school.

EOs were made evident via participant selection of photographs on the choice board. Instead of using low-preference (weak EO) and high-preference (strong EO) items, we alternated contrived AO and EO trials. It is possible, however, that the error-correction procedures used for Nick may have brought requesting for location under discriminative control of an empty container. However, Nick's correct responding during both EO and AO trials during generalization probes suggests that his responding was evoked by EOs. Future research on contriving EOs and AOs to teach various types of mands is needed. In future studies, it initially may be important to teach students how to imitate questions on the voice recorder, because our participants initially attempted to answer the voice recorder instead of imitating it. Future research also might investigate potential advantages of prerecorded scripts over in vivo vocal prompts. A final limitation of the current study was the inclusion of only two participants, and they required somewhat different procedures to learn to mand for information. Therefore, further replication is needed.

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