*TEACHING CHILDREN WITH AUTISM TO ENGAGE IN
PEER-DIRECTED MANDS USING A PICTURE EXCHANGE
COMMUNICATION SYSTEM*

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We evaluated differential reinforcement of alternative behavior (DRA) plus prompting to increase peer-directed mands for preferred items using a picture exchange communication system (PECS). Two nonvocal individuals with autism participated. Independent mands with a peer increased with the implementation of DRA plus prompting for both participants. In addition, peers engaged in brief social interactions following the majority of mands for leisure items. These results suggest that teaching children to use PECS with peers may be one way to increase manding and social interactions in individuals with limited or no vocal repertoire.

Key words: autism, differential reinforcement of alternative behavior, mand, picture exchange communication system, social interactions

Children with autism often display impairments in social interaction and language. Therefore, a common target of intervention for these individuals is an appropriate communicative response, such as a mand (Kelley, Shillingsburg, Castro, Addison, & LaRue, 2007). A *mand* is a verbal response that is maintained by a characteristic reinforcer and is sensitive to motivating operations for that reinforcer (Skinner, 1957). During mand training, a therapist typically prompts children with autism to emit a vocal response for preferred items with adults (e.g., Krantz & McClannahan, 1998) or typically developing children (e.g., Petursdottir, McComas, McMaster, & Horner, 2007).

Although mand training with adults or typically developing peers as recipients may ensure the delivery of appropriate consequences, it also may limit generalization. Because children with autism often are in close contact

with peers with autism, mand training between these individuals may occasion additional social initiations and reciprocal play. Training peer-directed mands between individuals with autism also may promote generalization of the response to novel individuals, potentially increasing social interaction. However, most experimenters have evaluated the effects of teaching children with autism to direct mands towards typically developing individuals.

In a notable exception, Taylor et al. (2005) evaluated the relation between motivating operations and levels of peer-directed vocal mands. Although the participants readily exhibited vocal mands for preferred items using either vocalizations (two participants) or a voice-output device (one participant) with adults, they did not exhibit mands toward their peers. Results showed that manipulating motivating operations (i.e., restricting participants' access to preferred edible items while a nearby peer had access to the items) was not sufficient for the emergence of peer-directed mands; thus, participants required direct teaching (i.e., prompting).

A noteworthy feature of Taylor et al. (2005) was that the authors included a participant who communicated via a voice-output device. Due

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to the limited vocal repertoire of many children with autism, it is important to extend the literature on mand training to children who use alternative modes of communication (e.g., a voice-output device or picture exchange communication system [PECS]; Bondy & Frost, 2001). Although prior studies have evaluated mand training with PECS during which typically developing individuals were the recipients (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002), they have not evaluated peer-directed mand training using PECS in which children with autism were the recipients. Therefore, the purpose of this study was to extend Taylor *et al.* by evaluating the effects of mand training using PECS for promoting peer-directed mands between two nonvocal children with autism.

METHOD

Participants, Setting, and Materials

Two children (Bill and Tom), aged 7 and 9 years, respectively, with a diagnosis of autism participated in the study. Both participants had a limited vocal repertoire and used PECS as their primary method of communication. Prior to the initiation of the study, participants completed the following phases of PECS training: (a) physical exchange, (b) expanding spontaneity, and (c) picture discrimination (Bondy & Frost, 2001). Tom and Bill served as communication partners for each other, and they had the opportunity to interact with each other outside the sessions. We conducted all of the sessions in a classroom in a university-based early intervention program. Items present during the session included a table and chairs, leisure items (e.g., a piggy bank with plastic coins, ball, and trampoline), edible items (e.g., jelly beans, cheese puffs, and juice box), PECS cards (depicting preferred leisure and edible items), and distracter PECS cards (depicting nonpreferred items, e.g., a plate, paper, and pen) used during PECS training.

Dependent Variables and Interobserver Agreement

Observers scored independent mands with an adult or peer and prompted mands with a peer during all sessions. In addition, observers collected data on social interactions following peer-directed mands during a portion of sessions. Independent mands with an adult were defined as selecting and handing a PECS card to any adult in the classroom without any prompts. Independent mands with a peer were defined as selecting and handing a PECS card to the peer without any prompts. The peer was not required to take the card independently, and the therapist provided assistance to the peer to take the card if necessary. Prompted mands with a peer were defined as any PECS exchange that required prompting from the adult at any point during the exchange. Observers scored the number of independent and prompted mands per session, which were converted to a rate measure by dividing the frequency of mands by the number of minutes in each session (i.e., 5 min). Observers also scored the frequency of social interactions, defined as both peers simultaneously engaging appropriately with a leisure item during 37% and 35% of Bill's and Tom's sessions, respectively.

A second observer independently collected data on independent and prompted mands during 63% and 64% of Bill's and Tom's sessions, respectively. We calculated interobserver agreement using the point-by-point method by dividing the number of agreements by the number of agreements plus disagreements and converting this number to a percentage. Overall agreement for independent and prompted mands averaged 99% (range, 89% to 100%) for Bill and 97% (range, 80% to 100%) for Tom. Overall agreement for social interactions was 100% for Bill and averaged 92% (range, 75% to 100%) for Tom.

Procedure

We evaluated the effects of mand training using a reversal design embedded within a multiple baseline across participants design. All sessions lasted 5 min and included 10 trials (30 s

each). The participants sat at a table adjacent to one another or stood within 1 m of one another next to a table. For each participant, we used five target PECS (high-preference items that the participants most frequently requested and consumed) and two distracter PECS (non-preferred stimuli that the participants rarely requested or consumed). The therapist placed the items associated with PECS cards for the current trial in view of the participants either on or next to the table. During each 30-s trial, the therapist presented three PECS cards (one target card and the two distracter cards) to one of the participants. The therapist sequentially presented each of the five target PECS cards, in a quasirandom fashion, and each target card was presented across two trials within each session. The therapist did not provide any prompts or guidance to initiate the selection of a PECS card and did not provide vocal prompts at any point in the evaluation. Contingent on a peer-directed mand, the peer delivered a leisure item or a small piece of an edible item (leisure items were removed after 10 s). If the participant exhibited a mand for one of the distracter card items, the peer delivered the corresponding item for 10 s. The therapist removed all PECS cards following a mand, and re-presented the same PECS cards after 10 s until another mand occurred or until the 30-s trial ended. This procedure allowed the possibility of a maximum of three mands per trial for each target item.

Baseline. The therapist did not present prompts to facilitate the participant's selection of a PECS card. Contingent on an independent mand with an adult or peer, the therapist delivered the item associated with the selected card (e.g., a piggy bank). However, the therapist did not prompt the peer to take the PECS card.

Differential reinforcement of alternative behavior (DRA) plus prompting. The therapist conducted the procedures in a manner identical to baseline except that independent mands with adults were placed on extinction. That is, the therapist did not honor an adult-directed mand

for 5 s and provided the least intrusive prompt necessary to occasion a prompted peer-directed mand. The same therapists conducted baseline and treatment sessions, and there was no signal to indicate that therapists would not honor mands. Following the participant's selection of a PECS card, the therapist provided the least amount of guidance necessary to complete the mand with the peer. That is, if the participant selected a PECS card but did not initiate a peer-directed mand within 5 s, the therapist provided the least amount of guidance necessary to complete the peer-directed mand (i.e., partial or full physical guidance). If the peer did not take the PECS card or deliver the target item independently, the therapist provided the least amount of guidance necessary to prompt the peer to complete the exchange.

RESULTS AND DISCUSSION

During baseline, participants did not exhibit peer-directed mands, although they did exhibit independent adult-directed mands (see Figure 1). During DRA plus prompting, participants' independent peer-directed mands increased. We discontinued data collection on adult-directed mands during treatment. If the participant attempted to engage in an adult-directed mand during treatment, the adult provided the least amount of guidance necessary to occasion a prompted peer-directed mand. Thus, many of the prompted peer-directed mands were preceded by an attempt to engage in an adult-directed mand. Participants' independent peer-directed mands decreased to near-zero levels during a return to baseline and immediately increased when treatment was reintroduced. The results of this study indicate that DRA plus prompting was effective in increasing mands for preferred items between two nonvocal individuals with autism. Peer-directed mands for leisure items also resulted in brief social interactions (e.g., playing with a toy together) during 69% of opportunities (data not shown). Thus, a portion of the peer-directed mands produced subsequent social interactions.

Figure 1. The number of mands per minute during Tom’s and Bill’s treatment evaluation. DRA = differential reinforcement of alternative behavior.

Although we observed high rates of adult-directed mands during baseline, the participants rarely directed their mands toward their peers. One potential explanation for this finding may be related to a relatively recent history of reinforcement for mands with adults. Both participants frequently manded with PECS cards throughout their daily clinic appointments. In addition, adults provided relatively immediate access to items contingent on mands. It is possible that peer-directed mands resulted in a slightly longer delay to reinforcement during the evaluation and intermittent reinforcement (or extinction) in the natural environment. Thus, our findings highlight the importance of training children to respond to peer-directed mands.

This investigation replicates and extends previous research on mand training in a number of ways. First, the results suggest that nonvocal children can be taught to exhibit peer-directed mands using PECS. Second, our data show that children with autism can be taught to initiate interactions with peers with

developmental disabilities. Both participants in the study engaged in peer-directed mands and responded to mands from a peer using PECS.

Although the data suggest that teaching children with limited or no vocal repertoire to exchange PECS with peers may be one way to increase peer-directed mands and subsequent social interactions, there were several limitations of this study. First, we did not collect data on the behavior of the recipient of the PECS exchange, limiting conclusions that could be drawn regarding how often the recipient independently responded to peer mands. Anecdotally, the peer did not always take the PECS card and deliver the preferred item independently; thus, the therapist was required to use physical guidance to facilitate the PECS exchange. Therefore, future studies could extend this investigation by collecting data on recipient behavior and evaluating the effects of training peers to conduct PECS exchanges independently. Second, both children exhibited mands for preferred items while sitting at a

table. Because mands in the natural environment may require a child to approach a peer from a distance, researchers could examine the utility of teaching children to travel a distance to engage in a peer-directed mands (i.e., the child has to walk across the room to exchange the PECS card with a peer). Third, we included preferred items that were relatively short in duration (e.g., jumping on a trampoline for 10 s) and did not require reciprocal play. Researchers could extend work in this area by training peer-directed mands for longer duration activities that may occasion extended social interactions (e.g., playing a board game, art projects). Fourth, we did not assess or program for maintenance, response generalization, or stimulus generalization of intervention effects. Future research could assess maintenance of initiations in the absence of adult mediation and generalization across novel peers with and without autism.

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