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BRIEF REPORT

Teaching an Infant to Request Help

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Abstract

Teaching an infant manual signs is beneficial as it promotes early communication, improves socialization, and can functionally replace behaviors such as crying and whining. Improving early communication also may reduce the probability of an infant engaging in dangerous behavior, like unsafe climbing. The purpose of this study was to extend Thompson et al. (Journal of Applied Behavior Analysis 40:15–23, 2007) by teaching an 8-month-old infant, who was noted to display developmental delays, to sign for "help" when preferred items were inaccessible. Similar to Thompson et al., delayed prompting and differential reinforcement was efficacious in teaching the infant to sign for "help," and the skill generalized to situations that were previously associated with unsafe climbing. However, undesirable generalization of signs for "help" when the infant could independently access the items was observed. Additional teaching was necessary to ensure signing for "help" occurred under appropriate antecedent control.

Keywords Communication training · Infants · Requesting assistance · Sign training

Unlike traditional developmental research that focuses on age as a dependent variable, behavior analysts focus on behavior change given the necessary environmental supports, particularly when the behavior change is socially valid. One impactful area of early behavior-analytic intervention is infant sign training. Using delayed prompting and differential reinforcement (DR), infants have learned signs to access preferred items or interactions (Thompson et al., 2004; 2007). Thompson et al. (2007) also demonstrated reductions in crying when sign training was implemented. Teaching early communication skills that reduce infant crying may serve as a protective factor against abuse and neglect (Thompson et al., 2011). Normand et al. (2011) extended Thompson et al. (2004; 2007) by confirming via a functional analysis that the sign

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was under control of the establishing operation (EO; i.e., it was a mand) rather than the item (i.e., a tact) or the model (i.e., an echoic/mimetic). This analysis further confirmed that early sign training serves as effective functional communication training (FCT), and infants as young as 6 months old can develop a mand repertoire[1].

According to the Centers for Disease Control and Prevention (CDC, 2012), falls are the leading cause of nonfatal injury for young children, accounting for about 8000 emergency room visits daily. Infant safety training has been exclusively considered under a parent training paradigm (e.g.., teaching caregivers environmental arrangements to promote safety; Mathews et al., 1987). It may be advantageous to teach infants to request "help" as a mand if it reduces or eliminates unsafe climbing and prevents injury. However, when teaching mands for "help," it is important to be sure the mand is under appropriate stimulus control. Yet, asking for "help" when the individual can complete the task independently is commonly observed when teaching children to request "help" (Rodriguez et al., 2017). This typically occurs when behavior is under the control of the presence of the difficult task (i.e., the discriminative stimulus) rather than the difficult task itself (i.e., the EO). Therefore, the purpose of this study was two-fold: (a) to extend Thompson et al. (2007) by teaching an infant, who displayed developmental delays, to request "help" when preferred items were inaccessible, and (b) to extend procedures used by Rodriguez et al. (2017) to ensure that signs for "help" were under appropriate antecedent control.

Method

Participant, Setting, and Materials

Zain, an 8-month-old (at the outset of the study) Asian male, participated. Presenting concerns at intake included delays in babbling, minimal eye contact, and disinterest in social interaction. In addition, the caregiver reported Zain displayed rigidity surrounding feeding after he was hospitalized due to a milk allergy. At the time of the study, Zain was enrolled in occupational and physical therapy due to motor delays. A brief assessment of the CDC Developmental Milestones (CDC n.d.) conducted at the beginning of the study suggested Zain would reliably engage in a social smile, follow moving items with his eyes, and reach for preferred items with one hand. He did not engage in any vocal or motor imitation and rarely babbled (no more than one sound per min). At the beginning of the study, he crawled. He learned to walk across his 4-month participation.

The evaluation took place in a university research room on a large mat (1.6m x 3.1m) that could fit Zain, his mother, and six clear, plastic bins (34.3 cm x 20.6 cm x 11.7 cm). See Supplemental Information 1 for more information.

[1] Considering developmental milestones suggest infants attempt to say three or more words by 15-months-old (CDC, n.d.), developing a mand repertoire this young is the epitome of Baer's philosophy of "Why wait?" (Baer, 1973).

Table 1 Definitions for infant behaviors

Infant's response	Operational definition
Indicating response	The infant reaching for or touching a bins of toys
Sign for help	One of the infant's palms positioned upright while stabilizing the pinky-side of their other hand (without repetition)
Sign for more	The infant's palms touching with repetition
Climbing	The infant pulling himself up using an object while reaching for a preferred toy placed out of reach
Crying	Seemingly distressed vocalizations above conversation level with or without tears

Pre-assessments

Fine Motor Evaluation

The purpose of this assessment was to confirm Zain had the fine motor skills to lift a lid to open a bin. A single five-trial session was conducted wherein every 2 min a bin with a toy was placed in front of Zain, the adult opened the bin to reveal the toy, and then reset the opportunity for Zain. He independently opened the bin on 100% of opportunities.

Motor Imitation Scale

The purpose of this assessment was to evaluate Zain's motor imitation skills before and after he learned to sign "help." Sixteen imitation skills were assessed using the Motor Imitation Scale (Stone et al., 1997). Scores of 0 (Fail), 1 (Emerge), or 2 (Pass) describe no imitation, partial imitation, or complete imitation, respectively. Each action was assessed up to three times if Zain did not engage in complete imitation.

Dependent Measures, Interobserver Agreement, and Procedural Fidelity

Table 1 depicts the definitions of dependent variables. Observers recorded the frequency of climbing, indicating responses, signs for "more," and independent and prompted signs for "help." The frequency was divided by total number of opportunities and converted to a percentage. Observers also recorded the duration of crying. Interobserver agreement (IOA) and procedural fidelity were calculated for at least 33% of sessions in all phases. Observer records were compared using a time-window analysis (Mudford et al., 2009). An agreement was scored if both observers recorded the same response within 5 s of each other's timestamp. IOA was calculated by dividing the number of agreements by the number of agreements plus disagreements and converting the quotient to a percentage. Mean agreement across phases was 99% (range, 83-100%). Procedural fidelity measures were collected on caregiver and the experimenter (see Supplemental Information 2 for more detail). Fidelity measures for all components were 100%.

Design

A reversal design was used to evaluate the effects of the teaching procedures on the development of the sign for "help" and to ensure that requesting "help" was under the appropriate antecedent control.

Generalization Pre-teaching

Pre-teaching was conducted to determine the differential use of climbing compared to signing "help" to access preferred items out of reach. The highest-preferred toy, as determined by a free-operant preference assessment (Roane et al., 1998), was placed out of reach on top of a child-sized table (see Supporting Information 3). Contingent on climbing or signing for "help," the toy was delivered. The session comprised three trials.

Baseline

To simulate a difficult but safe task for Zain to request "help," six preferred toys were locked into six clear, plastic bins with lids, and the bins were spread out across a large mat. Each session comprised six opportunities for Zain to mand for "help." During baseline sessions, independent of infant behavior, the experimenter opened one of the bins every 45 s until all bins were open. There were no programmed consequences for signs or crying.

Teaching

Session set up was identical to baseline. Except, a trial began when Zain engaged in an indicating response (i.e., reaching for a bin). Sessions were approximately 5 min, and one to two sessions were conducted per day, two to three times per week. Zain's caregiver was an active participant in each session and assisted with sign training.

Signs for "help" were taught using a prompt delay (PD; Walker, 2008). Contingent on an indicating response, the caregiver immediately delivered a model prompt. Then, dependent on the specified PD, a physical prompt was delivered by the experimenter (Deshais et al., 2020). Teaching began with a 0 s PD and, like Thompson et al. (2007), the PD increased every five sessions until the mastery criterion was met. One exception to this rule was the increase from a 0 s PD to a 2 s PD, which occurred after two sessions. Contingent on an independent sign for "help," an adult opened the bin. Contingent on an incorrect or no response, an adult physically prompted Zain to sign "help" at the specified PD before opening the bin.

Generalization Post-teaching

To evaluate the generalization of our teaching, a post-teaching probe was conducted using the same procedures as described in the generalization pre-teaching.

Discrimination Test

The next phase evaluated if signs for "help" were under appropriate antecedent control. To evaluate discrimination between when to request "help" versus independently complete the task, half of the bins were open but closed-over such that they appeared locked (see Supplemental Information 4).

During the discrimination test, signs for "help" were never prompted. DR in the form of providing "help" was delivered when Zain signed for "help" in contexts wherein the EO was in place (i.e., EO-present trials). Extinction was implemented during trials wherein the bins were unlocked but closed over (i.e., EO-absent trials). If Zain requested "help" at any point when interacting with an EO-absent bin, the adult did not provide "help" and the response was scored as incorrect.

EO-Absent Intervention

Given the high rates of requesting "help" when Zain could open the bin, direct teaching of opening the lid under the EO-absent context was initiated. Teaching began with a 0-s PD to the physical prompt to attempt to open the bin. After two sessions, the PD to the attempt was increased to 2 s. Opportunities to sign for "help" under the EO-present context were still available during the EO-absent intervention.

After, Zain demonstrated mastery-level performance (i.e., 100% requests for "help" under EO-present conditions; 0% requests for "help" under EO-absent conditions), we assessed for appropriate antecedent control in the absence of prompting. The consequences were the same as the initial discrimination test except sessions alternated between providing only EO-present or EO-absent trials.

Results

Figure 1 depicts acquisition of the sign for "help" compared to crying and signs for "more." Prior to teaching, Zain climbed to access the toy for 100% (3 of 3) opportunities. Signs for "help" were not emitted. Similar levels of signing "help" were observed during baseline of the simulated, difficult task. Instead, Zain allocated responding to the only other previously learned sign: "more." During sign training, independent signing for "help" emerged at the 10-s PD. Within five sessions of emergence, Zain signed for "help" for nearly 100% of opportunities, and signs for "more" and crying decreased to zero. Experimental control was established during the reversal to baseline, as signs for "help" decreased when access was delivered noncontingently. Generalization of signing "help" was observed when toys were out of reach. During the initial discrimination test, Zain correctly responded to nearly 100% of the EO-present trials. Performance during the EO-absent trials was variable. Quick differentiation between EO-present and -absent trials were obtained after the inclusion of a 2-s PD to the physical prompt was implemented during the EO-absent intervention.

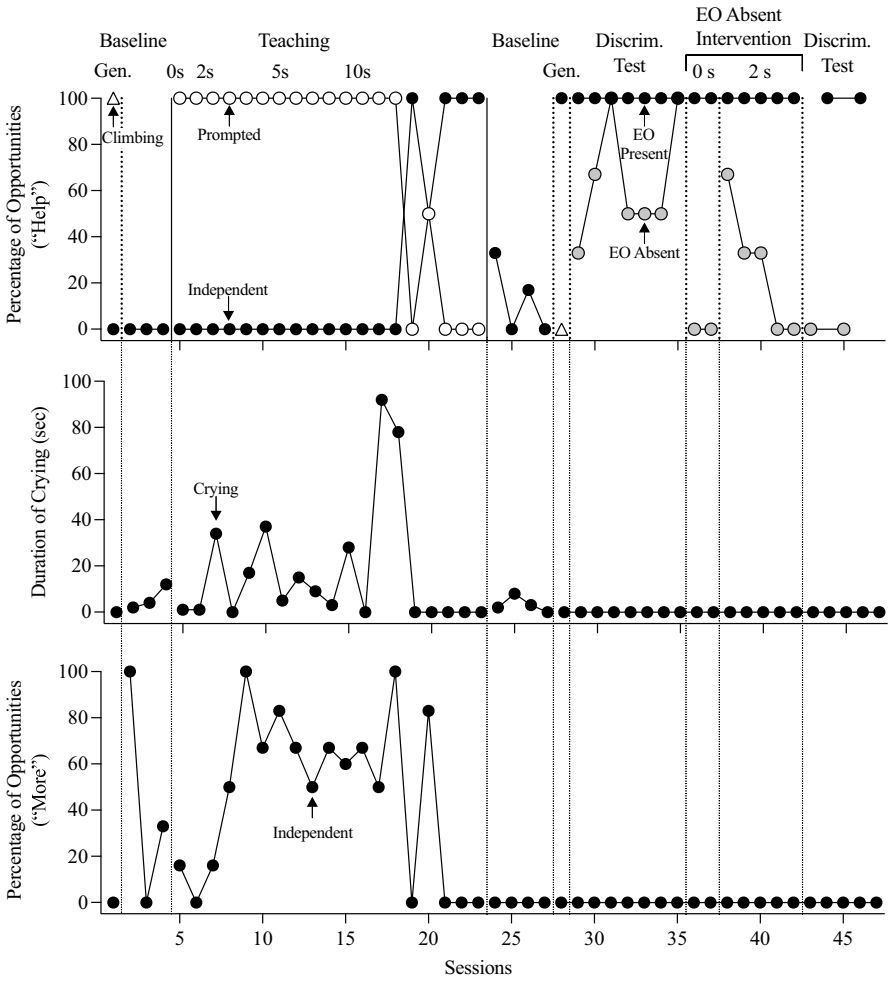

Fig. 1 Acquisition of sign for "help" compared to "more" and crying. *Note.* During the EO-Absent Intervention, the experimenter only intervened on EO-Absent opportunities. That is, there were still EO-Present opportunities wherein Zain's behavior continued to access reinforcement for signs for "help"

Discrimination of the contingencies was verified when physical prompting was removed during the second discrimination test.

Figure 2 depicts performance with the Motor Imitation Scale (Stone et al., 1997) pre- and post-teaching. Partial or complete imitation was never observed prior to sign language teaching. After teaching, complete and partial imitation was observed across eight targets.

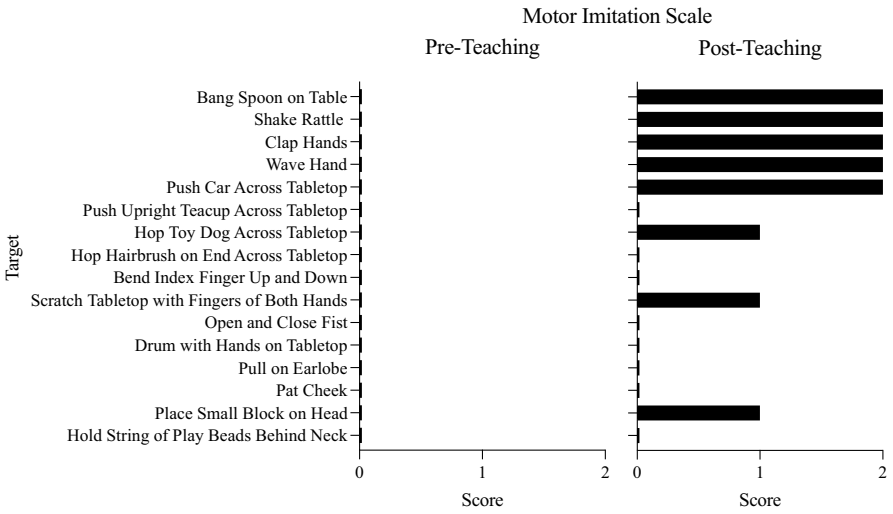

Fig. 2 Motor imitation performance before and after teaching. *Note.* Score of 0 = Fail (no imitation), score of 1 = Emerge (partial imitation), score of 3 = Pass (complete imitation)

Discussion

Prompt delays and DR were efficacious in teaching an infant to sign "help" to request inaccessible items, including in situations that previously evoked unsafe climbing. This is impactful as the efficacy of these procedures has only been demonstrated with neurotypical infants or infants already diagnosed (i.e., Heather diagnosed with Down Syndrome in Thompson et al., 2007). Surprisingly, this infant achieved mastery levels of responding with a 10-s PD compared to longer delays (e.g., 35 s, 120 s) previously necessary to establish independent responding. This difference in time to acquisition is likely attributable to waiting for an indicating response (Shillingsburg et al., 2014) before beginning the prompt delay. That is, instead of waiting upward of 120 s for an EO to develop like Thompson et al., we waited for a response suggesting the presence of an EO before prompting the sign. For some children, waiting for an indicating response is essential for mand development (e.g., Doug in Shillingsburg et al., 2014), and this modification likely improved the efficiency of sign language training. Research comparing these two approaches is encouraged.

Another important outcome was the immediate generalization of signs for "help" in the context that previously evoked unsafe climbing. The caregiver also anecdotally reported multiple instances of signs for "help" at home when preferred toys were inaccessible in his toy bin and when toys were not functioning correctly (e.g., no longer made sounds). These results confirm the efficacy of FCT in teaching children as young as 8-months-old to allocate responding to a communicative response rather than unsafe behavior (e.g., climbing). Similar to Thompson et al. (2007), we observed crying reduce to zero (during sessions) after Zain learned to sign for "help." This is particularly impactful as infant crying functions

as an aversive stimulus in which caregivers may go to significant means to terminate (Thompson et al., 2011). Our results strengthen the utility of infant sign training as a prevention model.

Carr (1979) suggested that teaching sign language to neurodiverse children may have collateral effects and improve general adaptive functioning. Given the similarity in teaching strategies for each skill (i.e., a model proceeded by a physical prompt), motor imitation may conceivably develop as a byproduct of sign training. As suspected by Thompson et al. (2007), we observed increases in motor imitation following acquisition of the sign for "help." Although we observed a clear difference in responding before and after sign training, it is important to exercise caution in emphasizing the effect of sign training on motor imitation development as there were approximately 6 weeks between the measures. Of course, other developmental and learning factors could have contributed to this change. Nonetheless, the difference in motor imitation over such a short timeframe is noteworthy and could be of general interest to behavior analysts. Future studies may consider embedding additional probes throughout teaching to better control for external variables that may affect motor imitation acquisition.

Additional teaching strategies were necessary to ensure that discriminated mands for "help" were developed. During the last discrimination test, perfect allocation to signs for "help" was observed in the EO-present versus EO-absent trials, which suggested that the signs were under the control of the EO rather than the presence of the difficult task. Perhaps this test was akin to Normand et al. (2011)'s functional analysis of infant sign training; we, too, determined that the stimulus context occasioned neither a tact nor an echoic (mimetic), as responding during the EO-present context remained high even though model prompts were no longer programmed. Nonetheless, undesirable generalization of requests for "help" may occur (Rodriguez et al., 2017) and manipulation of EOs is necessary to develop and confirm discriminated mands (Gutierrez et al., 2007).

Language delays are considered a risk factor for the development of problem behavior (Luczynski & Fahmie, 2017) and a diagnosis of a neurodevelopmental disorder (Veness et al., 2014). Our results are consistent with previous reports (Thompson et al., 2004; Thompson et al., 2007; Normand et al., 2011) that infants and toddlers can acquire manual signs that generalizes across people and settings. Infant sign training not only provides an opportunity to prevent the development of problem behavior (Thompson et al., 2007) but perhaps can optimize outcomes for individuals who are neurodiverse (Fein et al., 2013). For example, current CDC milestones suggest that a child should be able to point at objects to request "help" by the time they are 15 months old. In the spirit of "why wait?" (Baer, 1973), the current study established a discriminated mand for "help" in an infant half the age of the suggested milestone age further confirming the efficacy of a behavior-analytic and verbal-behavior approach.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s40616-023-00198-9.

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Data availability All data generated or analyzed during this study are included in this published article.

Declarations

Conflicts of interest The authors have no potential conflicts of interests to disclose.

Informed consent Informed consent was obtained from legal guardians, and participant assent was obtained before and throughout each session. Participant assent was measured through an approach response, willingness to stay on the mat, and consistent engagement with the toys. If 1 min of crying occurred consecutively, sessions were terminated for the day.

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