

**Conditioning Peers as Reinforcers and the Effects on Mand Training with  
Preschool-Aged Children**

by

Nicole M. Hanney

A dissertation submitted to the Graduate Faculty of  
Auburn University  
in partial fulfillment of the  
requirements for the Degree of  
Doctor of Philosophy

Auburn, Alabama  
December 12, 2015

*Keywords:* social skills, mand training, pairing, conditioned reinforcement

Copyright 2015 by Nicole M. Hanney

Approved by

Sacha T. Pence, Chair, Assistant Professor  
Christopher Newland, Alumni Professor  
John Rapp, Associate Professor of Psychology  
Martha Escobar, Associate Professor of Psychology

## Abstract

Communication and social deficits are two of the core deficits in children diagnosed with Autism Spectrum Disorder (ASD; American Psychiatric Association, 2013). Skill acquisition programs simultaneously targeting communication and social deficits are common in Early Intensive Behavioral Intervention (EIBI) with children with ASD (Lovaas, 2003). Previous literature has taught children to mand (request) for preferred items from peers, targeting both deficits in communication and social skills. As a result of pairings of the peer with reinforcers during mand training, peers may become conditioned reinforcers. Several studies have attempted to use response-stimulus (RS) pairing and stimulus-stimulus (SS) pairing to condition neutral, social stimuli as reinforcers; however, results have been idiosyncratic. *Experiment 1: Conditioning Peers as Reinforcers* compared SS pairing procedures and RS pairing procedures in conditioning preschool-aged peers as reinforcers. Three of six participants had a peer successfully conditioned with RS. One participant had a peer conditioned with SS pairing, suggesting that RS pairing may be more effective than SS pairing. *Experiment 2: Mand Training* evaluated the effects of peers as conditioned reinforcers or peers with a history of pairings on the acquisition of manding to peers. Mand training to conditioned peers was just as effective as to novel peers for 3 of 4 participants.

## Acknowledgments

The completion of this dissertation project would not have been possible without the clinical skills of the following undergraduate and graduate research assistants: Sheridan Chambers, Amanda Frederking, Skyler Guest, Sarah Haygood, Sami Lee, Angelyn Rhames, Chelsea Sullivan, Heatherly Williford, and Faith Woerner. Their dedication to the field of behavior analysis and focus on the progression of clinical practice was exhibited throughout the study. I would like to thank my mentor, Sacha Pence, whose research and clinical expertise shaped this project from the beginning to its final stages. Her knowledge and guidance has been irreplaceable throughout my pursuit of a doctorate degree. I would also like to thank my committee members Christopher Newland, John Rapp, and Martha Escobar for their valuable ideas and suggestions throughout the revision process.

Table of Contents

Abstract..... ii

Acknowledgments..... iii

List of Figures..... v

Chapter 1: Literature Review..... 1

    Mand Training ..... 2

    Peer-Directed Mand Training ..... 8

    Conditioned Reinforcement ..... 10

Chapter 2: Experimental Procedures ..... 26

    Introduction ..... 27

    Experiment 1: Conditioning Peers as Reinforcers ..... 29

        Method ..... 29

        Results and Discussion ..... 43

    Experiment 2: Mand Training ..... 49

        Method ..... 49

        Results and Discussion ..... 56

    General Discussion for Experiment 1 and 2 ..... 60

References ..... 66

## List of Figures

Figure 1 .....	77
Figure 2 .....	78
Figure 3 .....	79
Figure 4 .....	80
Figure 5 .....	81
Figure 6 .....	82

### **Chapter 1: Literature Review**

Children with Autism Spectrum Disorder (ASD) exhibit deficits in the areas of communication and social skills (American Psychiatric Association, 2013). Deficits in these areas can be detrimental to developing appropriate interactions with typically developing peers and prevent placement into an integrated, less restrictive environment. Skill-acquisition programming during early intensive behavioral intervention (EIBI) can target communication and social skills, often simultaneously. Prerequisite skills for social interactions, such as attending to stimuli (e.g., play-related items, peers, adults) and joint attention (Krstovska-Guerrero & Jones, 2013; Wong, 2013) are often targeted in programming for early learners. Both of these skills are basic prerequisites for more complex social interactions, including asking a peer to share a preferred item (e.g., manding to peers) and engaging in cooperative play with peers. These examples simultaneously target deficits in social skills and communication.

Mands (i.e., requests) are often the first verbal operant acquired by typically developing children (Sundberg & Michael, 2001). As a consequence, mands are frequently among the first verbal operants targeted in an EIBI curriculum (Sundberg & Michael, 2001; Sundberg & Partington, 1998). A mand is a verbal operant evoked by a motivating operation (MO; e.g., deprivation, satiation; Michael, 1982) and maintained by access to the reinforcer specific to that MO (Lechago, Howell, Caccavale, & Peterson, 2013; Skinner, 1957; Sundberg, Loeb, Hale, & Eigenheer, 2002). For example, if a child is hungry (i.e., food deprivation as an MO), he may emit a mand (e.g., “May I have chips, please?”) to a caregiver to receive access to food (e.g., chips as the reinforcer).

An MO is a variable in an individual's environment that increases or decreases the value (i.e., value-altering effect) of a stimulus as a reinforcer or punisher and either increases or decreases the likelihood of a response occurring in the future (i.e., behavior-altering effect; Michael, 1982). In the previous example of the child asking for chips, the MO is a state of deprivation (e.g., being hungry). The MO increases the value of food as a reinforcer (i.e., value-altering) and increases the likelihood that the child will mand for food (i.e., behavior-altering). Sundberg and Michael (2001) note that mands are the only verbal operant that directly benefit the speaker, allowing an individual with a skilled manding repertoire to have more control over his or her environment. Overall, mand training is a crucial component of an EIBI curriculum and essential to establishing an individual's communicative repertoire.

### **Mand Training**

When teaching a mand, a clinician must (a) create an effective MO, (b) prompt a response using an appropriate modality (e.g., vocal, sign, picture exchange, or augmentative device) and (c) immediately deliver access to the specific reinforcer (Chaabane, Alber-Morgan, & DeBar, 2009; Ingvarsson, 2011; Nigro-Bruzzi & Sturmey, 2010; Sundberg & Michael, 2001).

### **Motivating Operation**

A clinician contrives the MO by altering an aspect of the learner's environment or using naturally occurring opportunities. For example, Bowen, Shillingsburg, and Carr (2012) taught mands for preferred edible items during naturally occurring opportunities (e.g., learner reaches for juice or fruit during lunch time; a learner earns a Skittle contingent on completion of a task during skill-acquisition sessions). The clinician can contrive the MO by restricting access to a high-preferred item (i.e., creating a state of deprivation; Barlow, Tiger,

Slocum, & Miller, 2013; Chaabane et al., 2009). For example, Nigro-Bruzzi and Sturmey (2010) taught staff to contrive an MO by removing access to a preferred leisure item, holding it 3 cm in front of the individual, and waiting for an independent mand for 3 s before prompting. For some learners, brief periods of restricted access can be sufficient to create an MO. For example, Hartman and Klatt (2005) compared mand acquisition with two children with ASD when preferred items were restricted for 23 hr to when items were freely available for 5 min prior to the training session. One participant acquired mands faster when items were restricted. However, the other participant acquired the mand at similar rates in both conditions.

The clinician can also arrange an MO by using an interrupted chains procedure (Hall & Sundberg, 1987). During an interrupted chains procedure, an individual completes the steps of a behavioral chain that often involves a preferred activity or terminal product (e.g., painting a picture, making a sandwich). However, the individual does not have access to an item necessary to complete the chain, thus, contriving an MO for the missing item. The individual must mand for the missing item to complete the chain and gain access to the terminal reinforcer. For example, Lechago, Carr, Grow, Love, and Almason (2010) taught mands to three children with ASD using an interrupted chains procedure. The experimenters used different preferred leisure activities as behavior chains (e.g., making a volcano, making flavored milk) to contrive MOs for the same target mand (e.g., “spoon”). For example, a spoon was missing at the onset of the activity, but was needed to complete the behavior chain of mixing materials. By asking for the spoon and mixing the materials together, participants could observe the eruption of a volcano or drink the flavored milk. Mands for “Where is the spoon?” and “Who has the spoon?” were taught for the learner to retrieve the spoon and complete the behavior chain to earn access to the naturally occurring reinforcer.



## **Target Response and Prompting**

The response topography of a mand is typically selected based on the prerequisite skills of the learner. The most common response modalities include: vocal, sign, picture exchange, and augmentative devices. Gregory, DeLeon, and Richman (2009) conducted an assessment of matching and motor-imitation skills with six children with developmental disabilities prior to mand training using manual signs and a picture exchange system. Overall, those participants who performed with the greatest accuracy during the matching and motor-imitation assessments acquired the mands (sign and picture exchange) more rapidly than the participants who did not possess these skills prior to mand training. Two participants with impaired matching and motor-imitation skills did not acquire mands in either response topography. The authors concluded that the presence of motor-imitation skills and matching had similar correspondence with acquiring signs and exchange-based communication systems, meaning that a learner possessing both of these skills may more quickly acquire either response topography. In general, assessments of prerequisite skills should be conducted prior to beginning mand training. Since the results of Gregory et al. indicate that possessing these prerequisite skills (i.e., motor imitation, matching) may increase the rate of acquisition, it may be beneficial for clinicians to consider teaching these skills prior to or simultaneously with mand training.

Clinicians may decide to conduct a choice assessment with potential mand response topographies to inform the target response to use during training. A topography with a lower response effort may be exhibited more frequently than a topography with a higher response effort. For example, Winborn, Wacker, Richman, Asmus, and Geier (2002) compared existing mands (e.g., saying “all done”) and trained, novel mands (e.g., exchanging a “break, please” card)

during functional communication training for two participants with developmental disabilities and problem behavior. The researchers examined the two mand topographies using a concurrent-schedules design in which either response would produce the same reinforcer (i.e., break from a task). Two participants preferred to use an existing mand as opposed to the trained novel mand; however, increases in problem behavior were also associated with the use of the existing mand. The researchers hypothesized that the preference for the existing mand could be that this mand was a lower response effort than the novel mand. However, using an existing mand could lead to increases in problem behavior due to a past history of reinforcement of problem behavior associated with the existing mand. Similarly, Buckley and Newchok (2005) investigated the effects of response effort during functional communication training using a picture exchange card and concluded that the participant engaged in the low-effort response (i.e., picking up the card from the table and placing it in the hands of the experimenter) to mand rather than the high-effort response (i.e., leaving the table, walking to a felt board, selecting the card, walking back to the table, and placing the card in the hands of the experimenter).

Once the response topography is selected, the clinician can identify prompting strategies to evoke the target response. Clinicians may implement varying prompting strategies (e.g., vocal, physical) at different levels of intrusiveness (e.g., full vocal, partial vocal, hand-over-hand manual guidance, partial-manual guidance) to prompt the target response. The types of prompts used will depend on the topography of the mand (Bourret, Vollmer, & Rapp 2004; Gutierrez et al., 2007). For example, vocal responses would require vocal prompts (e.g., clinician says “ball” to prompt the learner to say “ball;” Taylor et al., 2005). Sign, picture exchange, and communication devices would require model or physical prompts and could involve vocal

prompts as a supplement. The clinician could use a model prompt or manual guidance while saying “ball” to prompt the learner to engage in the sign for “ball” (Groskreutz, Groskreutz, Bloom, & Slocum, 2014), to exchange a picture card that has a “ball” on it (Kodak, Paden, & Dickes, 2012), or to select a “ball” icon on the communication device (Taylor et al., 2005).

Regardless of the specific prompts used, the clinician will need to decide what prompting hierarchy to use during training: least-to-most or most-to-least prompting. Least-to-most prompting begins with the least intrusive prompt and the intrusiveness of the prompt increases (e.g., gesture, model, manual guidance) until the learner engages in the target response. Barlow et al. (2013) used least-to-most prompting to teach participants to mand for edible and tangible items using either a sign (i.e., vocal prompt, model, manual guidance) or a picture exchange response (i.e., vocal prompt, model plus vocal prompt, manual guidance). On the other hand, most-to-least prompting begins with the most intrusive prompt necessary to prompt the learner to engage in the target response. Prompts gradually become less intrusive as the learner engages in correct prompted responses. Ziomek and Rehfeldt (2008) used most-to-least prompting (i.e., hand-over-hand manual guidance, light guidance on the learner’s elbow) to teach three adults with intellectual disabilities to use a picture exchange communication system (PECS) to mand for preferred tangible and edible items.

If using most-to-least prompting procedures, the clinician will implement a systematic prompt-fading procedure (e.g., within or across training sessions) to eliminate any prompting from the clinician, facilitate independent mands, and transfer control of the mand to the appropriate MO. Prompt fading is often used in combination with a time delay (Davis, Kahng, & Coryat, 2012). A clinician may initially deliver prompts immediately (e.g., 0-s delay)

and then gradually increase the delay durations (e.g., 0-s delay, 1-s delay, 2-s delay, 3-s delay) to facilitate independent mands. The delay to the prompt allows for an opportunity for the individual to emit an independent mand. For example, Shillingsburg and Valentino (2011) taught participants to mand for information using “How?” by initially implementing an immediate vocal prompt of the response. A subsequent trial was then conducted by increasing the time delay to 5 s prior to the vocal prompt to allow an opportunity to engage in an independent response.

A clinician may also decide to include a discriminative stimulus ( $S^D$ ) prior to prompting the mand depending on a learner’s characteristics (e.g., prior mand training, history of repeating  $S^D$ s during other verbal-operant training, type of specific reinforcer being delivered; Bowen et al., 2012). For example, the phrase, “What do you want?” may be used during mand training (Jennett, Harris, & Dehnolino, 2008; Nigro-Bruzzi & Sturmey, 2010). However, if an  $S^D$  is included during initial mand training, the presentation of the  $S^D$  should be systematically faded throughout training, so that the target mand only occurs under the control of the MO and not under the control of the  $S^D$  (i.e., faulty stimulus control). For example, a learner should mand for a preferred snack when the MO (i.e., hunger) for that preferred snack is present, not exclusively when an adult presents an  $S^D$  (i.e., “What do you want for a snack?”).

### **Reinforcer Delivery**

Once the response is emitted, the clinician delivers access to the specific reinforcer. Preferred edible items (Bowen et al., 2012; Kooistra, Buchmeier, & Klatt, 2012), tangible items and leisure activities (Falcomata, Wacker, Ringdahl, Vinqvist, & Dutt, 2013; Shillingsburg, Powell, & Bowen, 2013), missing items and information (Betz, Higbee, & Pollard, 2010; Lechago et al., 2010; Marion et al., 2012; Roy-Wsiaki, Marion, Martin, & Yu, 2010; Shillingsburg & Valentino, 2011), attention (Falcomata et al., 2013), a break from demands

(Harding, Wacker, Berg, Winborn-Kemmerer, & Lee, 2009), and removal of an aversive stimulus (Groskreutz et al., 2014; Shillingsburg et al., 2013; Yi, Christian, Vittimberga, & Lowenkron, 2006) have all been used as specific reinforcers during mand training. All of the aforementioned studies have trained individuals to mand to adults; however, several studies (Kodak et al., 2012; Paden, Kodak, Fisher, Gawley-Bullington, & Bouxsein, 2012; Taylor et al., 2005) have also evaluated teaching children with ASD to mand to peers with similar characteristics (i.e., age, diagnosis) for preferred tangible and edible items.

To ensure the contiguity between the mand and the delivery of the reinforcer (i.e., reinforcing the target response and not an arbitrary response occurring between the target response and reinforcer delivery) during mand training, a clinician should immediately deliver the reinforcer following the mand. However, following training, an individual may engage in high rates of manding that are difficult or impractical to maintain in the natural environment. Therefore, it may be necessary for clinicians to teach a learner to mand for the reinforcer only when it is available and to cease manding for the reinforcer when it is not available using multiple schedules of reinforcement (Sidener, Shabani, Carr, & Roland, 2006).

### **Peer-Directed Mand Training**

Typically developing children may mand to peers for preferred items, actions, and attention. For example, a typically developing child may say “Play with me” to a peer to gain access to the peer’s attention and the preferred tangible items he accesses by playing with the peer. Typically developing children spontaneously mand to peers and adults more frequently than their peers with ASD (Forde, Holloway, Healy, & Brosnan, 2011). Children with ASD often require direct training to acquire manding to their peers, despite being able to mand for similar items from adults (Taylor et al., 2005). Teaching children with ASD to mand to typically

## CONDITIONING PEERS

developing children and other children with ASD not only targets deficits in communication, but also targets social interactions. Manding to peers facilitates social interactions during naturally occurring situations (e.g., recess, group activities), and creates opportunities for clinicians to prompt social behavior, such as sharing an activity and engaging in pretend play. Children with ASD who are able to appropriately mand to peers may even exhibit less problem behavior when peers are engaging with a preferred item, because the child would be more likely to mand to gain access to the preferred item instead of engaging in problem behavior (Kodak et al., 2012).

Several studies have evaluated manding to peers (Kodak et al., 2012; Paden et al., 2012; Taylor et al., 2005). Taylor et al. taught three males with ASD to mand for preferred edibles from their same-age peers with ASD when the respective MO was present and absent. Prior to inclusion in the study, all of the participants reliably manded for preferred items from adults; however, none of the participants manded for similar items from peers. During MO-absent conditions, the participant and peer had free access to preferred edibles. During MO-present conditions, only the peer had access to the participant's preferred edibles (i.e., contriving the MO through restricted access). The clinician used prompting and prompt-fading to evoke the target response and then prompted the peer to deliver the edible item to the participant contingent on responding. Mands only occurred during MO-present conditions and not during MO-absent conditions, suggesting that contriving the MO through restricted access to the preferred edible items was responsible for evoking mands to peers. During follow-up probes, participants were able to mand to peers for novel items and to novel peers.

In a more recent study, Paden et al. (2012) extended Taylor et al. (2005) by teaching two males with ASD to use PECS to mand to peers for preferred tangible and edible items. Each participant served as the peer (i.e., "communication partner") for the other participant. An

## CONDITIONING PEERS

independent mand was recorded when a participant handed a PECS card of a preferred tangible or edible item to the peer. The experimenters used differential reinforcement plus manual guidance prompting to teach participants the target mands. Mands to the adult experimenters were on extinction. If the participant attempted to exchange a PECS card with the experimenter instead of the available peer, the experimenter used manual guidance prompts to redirect the participant to exchange the PECS card with the peer. Contingent on an appropriate mand, the experimenter prompted the peer to deliver the edible or tangible item to the participant. Despite engaging in some mands to the adult experimenters during training, by the conclusion of the study participants were primarily allocating responding to peers.

Finally, Kodak et al. (2012) taught two male children with ASD to use PECS to mand to peers for preferred tangible and edible items and evaluated generalization to a novel peer and the natural environment. Each participant served as the peer for the other participant; however, a novel peer was included during generalization evaluations. Both participants engaged in increased mands to peers. Furthermore, mands to peers generalized with no additional training to a novel peer and to a more naturalistic environment (i.e., occurring during a naturalistic play setting instead of a typical table and chairs type of teaching session).

In summary, the aforementioned studies (Kodak et al., 2012; Paden et al., 2012; Taylor et al., 2005) were successful in teaching children with ASD to mand to peers using several topographies of target mands. Results also generalized to novel peers, novel items, and naturalistic teaching environments.

### **Conditioned Reinforcement**

#### **Basic Principles**

## CONDITIONING PEERS

In general, the principle of conditioned reinforcement is defined by the idea that a neutral stimulus can acquire the properties of other reinforcing stimuli through a series of associations (Catania, 1998). Two procedures to contrive these associations or “pairings” are stimulus-stimulus pairing and response-stimulus pairing. During stimulus-stimulus pairing, a primary reinforcer (e.g., food pellets) or an established secondary (conditioned) reinforcer is paired with a neutral stimulus (e.g., audible click) and delivered to the individual contingent on a time-based schedule (e.g., every 30 s) regardless of the individual’s responding (e.g., delivery every 30 s regardless of the number of lever presses). Skinner (1938) described a study in which rats received response-independent delivery of food pellets (i.e., primary reinforcer) paired with the sound of the food dispenser (i.e., the neutral stimulus). After a series of pairings, a lever was introduced to the operant chamber and only the sound of the food dispenser was presented contingent on lever pressing. Although contingent delivery of the sound of the food dispenser initially increased lever pressing, responding did not maintain after several sessions.

During response-stimulus pairing, a primary reinforcer (e.g., food pellets) or an established secondary (conditioned) reinforcer is paired with a neutral stimulus (e.g., audible click) and delivered contingent on a new target response (e.g., nose pokes). After a number of pairings, only the previously neutral stimulus (e.g., audible click) is delivered contingent on the original target response (e.g., lever presses). If responding maintains or increases under the new contingencies, then the previously neutral stimulus has been established as a conditioned reinforcer. Di Ciano and Everitt (2004) used response-stimulus pairing during rats’ self-administration of cocaine, heroin, and sucrose. For example, rats engaged in nose pokes to administer cocaine (i.e., primary reinforcer) with a simultaneous presentation of a red light (i.e.,



## CONDITIONING PEERS

neutral stimulus). After eight 90-min sessions of pairings, the rats engaged in lever presses to receive access to the red light (i.e., conditioned reinforcer) and no cocaine.

### **Applied Literature: Token Economies**

Several applications of the basic principles of conditioned reinforcement have been developed and are commonly used in clinical practice. In these applications, preference assessments and reinforcer assessments can be conducted to identify current reinforcers that are necessary to effectively establish neutral stimuli as conditioned reinforcers. First, the therapist conducts preference assessments to determine preferred items that are potential primary (e.g., edible items) and secondary (e.g., tangible items) reinforcers (DeLeon & Iwata, 1996; Fisher et al., 1992; Roane, Vollmer, Ringdahl, & Marcus, 1998). Once the preference assessment identifies high-preferred stimuli, the therapist conducts reinforcer assessments with those items to determine if they function as reinforcers and have the ability to increase and maintain responding (Piazza, Fisher, Hagopian, Bowman, & Toole, 1996; Roane, Lerman, & Vorndran, 2001). The items used during the conditioning procedures must be reinforcers to transfer the reinforcing properties to neutral stimuli. Next, the therapist selects a neutral stimulus. A reinforcer assessment should be conducted with the neutral stimulus to ensure that the stimulus does not have reinforcing properties. Following the initial reinforcer assessments, pairing sessions involving the primary and secondary reinforcers with the neutral stimulus occur (LeBlanc, Hagopian, & Maglieri, 2000).

A token economy is a behavior intervention package that can target individualized skills and be incorporated into acquisition and behavior-reduction programs. Token economies have been highly effective in changing behavior across several populations, including individuals with ASD and developmental disabilities (Carnett et al., 2014; LeBlanc et al., 2000; Matson &

## CONDITIONING PEERS

Boisjoli, 2009), emotional and behavioral disorders (Moss & Rick, 1981; Wolfe, Dattilo, & Gast, 2003) and typically developing individuals in a classroom setting (Filcheck, McNeil, Greco, & Bernard, 2004; Maggin, Chafouleas, Goddard, & Johnson, 2011). During a token economy, a neutral stimulus, often an arbitrary item such as a plastic “token,” is paired with primary (e.g., preferred edibles) and secondary (e.g., access to a break from demands, preferred tangible items, praise) reinforcers. Once the token acquires the reinforcing properties of the backup reinforcers (i.e., primary and secondary reinforcers), the tokens are delivered contingent on a specified target behavior and later exchanged for backup reinforcers.

Because tokens are exchangeable and associated with a variety of backup reinforcers, the token is said to be a generalized conditioned reinforcer (DeFulio, Yankelevitz, Bullock, & Hackenberg, 2014; Kazdin & Bootzin, 1972). Because tokens have a history of pairings with primary and secondary reinforcers and are associated with a range of backup reinforcers, the tokens can maintain responding across a variety of MOs. For example, Ruskin and Maley (1972) arranged a token economy where individuals diagnosed with schizophrenia could exchange tokens for backup reinforcers, such as edibles, tobacco, clothing, personal accessories, grooming aids, cosmetics, and other miscellaneous items. The variety of backup reinforcers allowed the tokens to maintain responding under several MOs. For example, if the MO of food deprivation (i.e., hunger) was present, the individual could exchange tokens for a backup reinforcer of an edible item. On the other hand, if the MO for personal hygiene was present (e.g., running out of soap), the individual could exchange tokens for a backup reinforcer of grooming aids.

For the token to be established as a conditioned reinforcer, pairing procedures must occur using several backup reinforcers. When using response-stimulus pairing, the therapist would prompt the learner to engage in a specific response and then deliver the token and praise

## CONDITIONING PEERS

contingent on the response. The therapist would provide an opportunity to exchange the token for a backup reinforcer. When using stimulus-stimulus pairing, the delivery of the tokens would be based on time. The therapist would determine a schedule of delivery and then deliver the token and praise contingent on the passage of time. Similar to response-stimulus pairing, the therapist would then provide an opportunity to exchange the token for a backup reinforcer.

LeBlanc et al. (2000) used a version of response-stimulus pairing during token training for an adult with an intellectual disability who was engaging in inappropriate sexual behavior. During token training, the therapist prompted the participant to engage in a target behavior (e.g., shaking hands) and then delivered a token (laminated dollars) contingent on the response. The therapist allowed the participant to exchange the token for a variety of backup reinforcers (i.e., items and activities) with different prices. The therapist also asked several questions (e.g., “What can you do with the tokens?”) about the token system to probe for the participant’s comprehension of the contingencies.

### **Applied Literature: Social Stimuli**

Stimulus-stimulus pairing has been used to increase vocalizations with individuals who engage in little vocal variability. During early infant vocal production, caregivers often consistently pair caregiver vocalizations with reinforcing events, such as meal time. These pairings can condition auditory stimuli, or more specifically vocalizations, as automatically reinforcing. Hearing the vocalizations becomes a reinforcing event. Once the infant begins producing vocalizations, the act of producing and hearing the vocalizations can be automatically reinforcing (Vaughn & Michael, 1982). For individuals with delays in speech production and little vocal variability, vocalizations may not be automatically reinforcing. A line of research has developed using stimulus-stimulus pairing procedures in which primary reinforcers (e.g.,

## CONDITIONING PEERS

edibles) are paired with vocalizations to increase vocalizations and vocalization variability with individuals with delayed speech production (Esch, Carr, & Grow, 2009; Miguel, Carr, & Michael, 2002; Petursdottir, Carp, Matthies, & Esch, 2011).

Several other applied studies have used stimulus-stimulus pairing and response-stimulus pairing in an attempt to condition stimuli to target certain skill deficits. Greer, Pistoljevic, Cahill, and Du (2011) used stimulus-stimulus pairing to condition adult voices as reinforcers to increase the amount of story-listening behavior exhibited by several children with ASD. The pairing procedure was effective and the duration of story-listening increased while problem behavior decreased.

In a recent study, Dozier et al. (2012) compared stimulus-stimulus pairing and response-stimulus pairing procedures in an attempt to condition praise as a reinforcer for adults with ASD and intellectual disabilities. Prior to inclusion in the study, the researchers conducted brief probes delivering praise contingent on engaging in a simple response. If the individuals did not engage in the response (i.e., praise did not increase responding), the individuals were included as participants in the study. During stimulus-stimulus pairing (SS pairing), researchers delivered access to the preferred item (i.e., primary reinforcer) simultaneously with a praise statement (i.e., neutral stimulus) on a fixed-time (FT) schedule. During response-stimulus pairing (RS pairing), researchers delivered the preferred item and praise contingent on the participant engaging in an arbitrary motor task. Tests for conditioned reinforcement (i.e., reinforcer assessments) for praise were also intermittently conducted during the pairing process. SS pairing was not effective in conditioning praise as a reinforcer; whereas, RS pairing was effective in conditioning praise as a reinforcer for half of the participants (4 of 8).

## CONDITIONING PEERS

Due to the relatively limited applied research on applications of conditioning procedures and the idiosyncratic results of the applied literature in using pairing procedures to establish conditioned reinforcers (Dozier et al., 2012), future studies should assess how to effectively condition neutral stimuli, other than arbitrary tangible items (i.e., tokens) to further develop this therapeutic technology. Both Taylor et al. (2005) and Kodak et al. (2012) comment that a collateral benefit of teaching children with ASD to mand to peers may be that the target peer becomes a conditioned reinforcer since a mand-training trial with a peer resembles a RS or SS pairing trial. During a mand-training trial, a peer is delivering a preferred item that could be a primary or secondary reinforcer, to the participant. The delivery of the item is similar to pairing-trial procedures during the conditioning process. Due to the similarity to pairing trials, the peer may become a conditioned reinforcer through a series of mand-training trials. If the peer was established as a conditioned reinforcer through mand training, the likelihood that the participant would initiate or engage with the peer in the future may increase. In addition, if the participant is more likely to initiate with a peer, a clinician would have increased opportunities to prompt appropriate play and social skills after these initiations.

Despite the hypothesis of peer conditioning described by Taylor et al. (2005), no current studies have directly assessed the procedures by which peers become potential conditioned reinforcers. If clinicians could condition peers as reinforcers for specific learners, this conditioning procedure could be used in different facets throughout other play and social skill interventions. If successful, conditioning peers as reinforcers could have significant clinical implications for interventions targeting communication and social-interaction deficits, particularly in EIBI settings.

**References**

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Barlow, K. E., Tiger, J. H., Slocum, S. K., & Miller, S. J. (2013). Comparing acquisition of exchange-based and signed mands with children with autism. *Analysis of Verbal Behavior, 29*(1), 59-69.
- Betz, A. M., Higbee, T. S., & Pollard, J. S. (2010). Promoting generalization of mands for information used by young children with autism. *Research in Autism Spectrum Disorders, 4*, 501-508. doi:10.1016/j.rasd.2009.11.007
- Bourret, J., Vollmer, T., & Rapp, J. (2004). Evaluation of a vocal mand assessment and vocal mand training procedures. *Journal of Applied Behavior Analysis, 37*, 129-144. doi: 10.1901/jaba.2004.37-129
- Bowen, C. N., Shillingsburg, M. A., & Carr, J. E. (2012). The effects of the question “what do you want?” on the mand training outcomes of children with autism. *Journal of Applied Behavior Analysis, 45*, 833-838. doi: 10.1901/jaba.2012.45-833
- Buckley, S. D., & Newchok, D. K. (2005). Differential impact of response effort within a response chain on use of mands in a student with autism. *Research in Developmental Disabilities, 26*, 77-85. doi:10.1016/j.ridd.2004.07.004
- Catania, A. C. (1998). *Learning*. Upper Saddle River, NJ: Prentice Hall.
- Carnett, A., Raulston, T., Lang, R., Tostanoski, A., Lee, A., Sigafos, J., & Machalicek, W. (2014). Effects of a perseverative interest-based token economy on challenging and on task behavior in a child with autism. *Journal of Behavioral Education, 23*, 368-377. doi: 10.1007/s10864-014-9195-7

## CONDITIONING PEERS

- Chaabane, D.B., Alber-Morgan, S. R., & DeBar, R. M. (2009). The effects of parent implemented PECS training on improvisation of mands by children with autism. *Journal of Applied Behavior Analysis, 42*, 671-677. doi: 10.1901/jaba.2009.42-671
- Davis, B. J., Kahng, S. W., & Coryat, K. (2012). Manipulating motivating operations to facilitate the emergence of mands for a child with autism. *Analysis of Verbal Behavior, 28*(1), 145–150.
- DeFulio, A., Yankelevitz, R., Bullock, C., & Hackenberg, T. D. (2014). Generalized conditioned reinforcement with pigeons in a token economy. *Journal of the Experimental Analysis of Behavior, 102*, 26-46. doi: 10.1002/jeab.94
- DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis, 29*, 519-533. doi:10.1901/jaba.1996.29-519
- DiCiano, P., & Everitt, B. J. (2004). Conditioned reinforcing properties of stimuli paired with self-administered cocaine, heroin or sucrose: Implications for the persistence of addictive behaviour. *Neuropharmacology, 47*, 202-213. doi: 10.1016/j.neuropharm.2004.06.005
- Dozier, C. L., Iwata, B. A., Thomason-Sassi, J., Worsdell, A. S., & Wilson, D. M. (2012). A comparison of two pairing procedures to establish praise as a reinforcer. *Journal of Applied Behavior Analysis, 45*, 721-735. doi: 10.1901/jaba.2012.45-721
- Esch, B. E., Carr, J. E., & Grow, L. L. (2009). Evaluation of an enhanced stimulus-stimulus pairing procedure to increase early vocalizations of children with autism. *Journal of Applied Behavior Analysis, 42*, 225-241. doi: 10.1901/jaba.2009.42-225
- Falcomata, T. S., Wacker, D. P., Ringdahl, J. E., Vinqvist, K., & Dutt, A. (2013). An evaluation of generalization of mands during functional communication training. *Journal of Applied*

## CONDITIONING PEERS

*Behavior Analysis*, 46, 444-454. doi: 10.1002/jaba.37

Filcheck, H. A., McNeil, C. B., Greco, L. A., & Bernard, R. S. (2004). Using a whole-class token economy and coaching of teacher skills in a preschool classroom to manage disruptive behavior. *Psychology in the Schools*, 41, 351-361. doi: 10.1002/pits.10168

Fisher, W. W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis*, 25, 491-498.  
doi:10.1901/jaba.1992.25-491

Forde, I., Holloway, J., Healy, O., & Brosnan, J. (2011). A dyadic analysis of the effects of setting and communication partner on elicited and spontaneous communication of children with autism spectrum disorder and typically developing children. *Research in Autism Spectrum Disorders*, 5, 1471-1478. doi:10.1016/j.rasd.2011.02.008

Greer, R. D., Pistoljevic, N., Cahill, C., & Du, L. (2011). Effects of conditioning voices as reinforcers for listener responses on rate of learning, awareness, and preferences for listening to stories in preschoolers with autism. *Analysis of Verbal Behavior*, 27(1), 103-124.

Gregory, M. K., DeLeon, I. G., & Richman, D. M. (2009). The influence of matching and motor-imitation abilities on rapid acquisition of manual signs and exchange-based communicative response. *Journal of Applied Behavior Analysis*, 42, 399-404. doi: 10.1901/jaba.2009.42-399

Groskreutz, N. C., Groskreutz, M. P., Bloom, S. E., & Slocum, T. A. (2014). Generalization of negatively reinforced mands in children with autism. *Journal of Applied Behavior Analysis*, 47, 560-579. doi: 10.1002/jaba.151



## CONDITIONING PEERS

- Gutierrez, A., Vollmer, T. R., Dozier, C. L., Borrero, J. C., Rapp, J. T., Bourret, J. C., & Gadaire, D. (2007). Manipulating establishing operations to verify and establish stimulus control during mand training. *Journal of Applied Behavior Analysis, 40*, 645-658. doi: 10.1901/jaba.2007.645-658
- Hall, G. A., & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *Analysis of Verbal Behavior, 5*(1), 41–53.
- Harding, J. W., Wacker, D. P., Berg, W. K., Winborn-Kemmerer, L., & Lee, J. F. (2009). Evaluation of choice allocation between positive and negative reinforcement during functional communication training with young children. *Journal of Developmental and Physical Disabilities, 21*, 443-456. doi: 10.1007/s10882-009-9155-7
- Hartman, E. C., & Klatt, K. P. (2005). The effects of deprivation, pre-session exposure, and preferences on teaching manding to children with autism. *Analysis of Verbal Behavior, 21*(1), 135–144.
- Ingvarsson, E. T. (2011). Parent-implemented mand-training: Acquisition of framed manding in a young boy with partial hemispherectomy. *Journal of Applied Behavior Analysis, 44*, 205-209. doi: 10.1901/jaba.2011.44-205
- Jennett, H. K., Harris, S. L., & Dehnolino, L. (2008). Discrete trial instruction vs. mand training for teaching children with autism to make requests. *Analysis of Verbal Behavior, 24*(1), 69-85.
- Kazdin, A. E., & Bootzin, R. R. (1972). The token economy: An evaluative review. *Journal of Applied Behavior Analysis, 5*, 343-372. doi: 10.1901/jaba.1972.5-343
- Kodak, T., Paden, A., & Dickes, N. (2012). Training and generalization of peer-directed mands with non-vocal children with autism. *Analysis of Verbal Behavior, 28*(1), 119-124.

## CONDITIONING PEERS

- Kooistra, E. T., Buchmeier, A. L., & Klat, K. P. (2012). The effect of motivating operations on the transfer from tacts to mands for children diagnosed with autism. *Research in Autism Spectrum Disorders, 6*, 109-114. doi:10.1016/j.rasd.2011.03.010
- Krstovska-Guerrero, I., & Jones, E. A. (2013). Join attention autism: Teaching smiling coordinated with gaze to respond to joint attention bids. *Research in Autism Spectrum Disorders, 7*, 93-108. doi: 10.1016/j.rasd.2012.07.007
- LeBlanc, L. A., Hagopian, L. P., & Maglieri, K. A. (2000). Use of a token economy to eliminate excessive inappropriate social behavior in an adult with developmental disabilities. *Behavioral Interventions, 15*, 135-143. doi: 10.1002/(SICI)1099-078X(200004/06)15:2<135::AID-BIN51>3.0.CO;2-3
- Lechago, S. A., Carr, J. E., Grow, L. L., Love, J. R., & Almason, S. M. (2010). Mands for information generalize across establishing operations. *Journal of Applied Behavior Analysis, 43*, 381-395. doi: 10.1901/jaba.2010.43-381
- Lechago, S. A., Howell, A., Caccavale, M. N., & Peterson, C. W. (2013). Teaching 'how?' mand-for-information frames to children with autism. *Journal of Applied Behavior Analysis, 46*, 781-791. doi: 10.1002/jaba.71
- Maggin, D. M., Chafouleas, S. M., Goddard, K. M., & Johnson, A. H. (2011). A systematic evaluation of token economies as a classroom management tool for students with challenging behavior. *Journal of School Psychology, 49*, 529-554. doi: 10.1016/j.jsp.2011.05.001
- Marion, C., Martin, G. L., Yu, C. T., Buhler, C., Kerr, D., & Claeys, A. (2012). Teaching children with autism spectrum disorder to mand for information using 'which?'. *Journal of Applied Behavior Analysis, 45*, 865-870. doi: 10.1901/jaba.2012.45-865

## CONDITIONING PEERS

- Matson, J. L., & Boisjoli, J. A. (2009). The token economy for children with intellectual disability and/or autism: A review. *Research in Developmental Disabilities, 30*, 240, 248. doi:10.1016/j.ridd.2008.04.001
- Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior, 37*, 149-155. doi:10.1901/jeab.1982.37-149
- Miguel, C. F., Carr, J. E., & Michael, J. (2002). The effects of a stimulus-stimulus pairing procedure on the vocal behavior of children diagnosed with autism. *Analysis of Verbal Behavior, 18*(1), 3–13.
- Moss, G. R., & Rick, G. R. (1981). Application of a token economy for adolescents in a private psychiatric hospital. *Behavior Therapy, 12*, 585-590. doi: 10.1016/S0005-7894(81)80099-8
- Nigro-Bruzzi, D., & Sturmey, P. (2010). The effects of behavioral skills training on mand training by staff and unprompted vocal mands by children. *Journal of Applied Behavior Analysis, 43*, 757-761. doi: 10.1901/jaba.2010.43-757
- Paden, A. R., Kodak, T., Fisher, W. W., Gawley-Bullington, E. M., & Bouxsein, K. (2012). Teaching children with autism to engage in peer-directed mands using a picture exchange communication system. *Journal of Applied Behavior Analysis, 45*, 425-429. doi: 10.1901/jaba.2012.45-425
- Petursdottir, A. E., Carp, C. L., Matthies, D. W., & Esch, B. E. (2011). Analyzing stimulus-stimulus pairing effects on preferences for speech sounds. *Analysis of Verbal Behavior, 27*(1), 45-60.

## CONDITIONING PEERS

- Piazza, C. C., Fisher, W. W., Hagopian, L. P., Bowman, L. G., & Toole, L. (1996). Using a choice assessment to predict reinforcer effectiveness. *Journal of Applied Behavior Analysis, 29*, 1-9. doi:10.1901/jaba.1996.29-1
- Roane, H. S., Lerman, D. C., & Vorndran, C. M. (2001). Assessing reinforcers under progressive schedule requirements. *Journal of Applied Behavior Analysis, 34*, 145-167. doi:10.1901/jaba.2001.34-145
- Roane, H. S., Vollmer, T. R., Ringdahl, J. E., & Marcus, B. (1998). Evaluation of a brief stimulus preference assessment. *Journal of Applied Behavior Analysis, 34*, 73-76. doi:10.1901/jaba.1998.31-605
- Roy-Wsiaki, G., Marion, C., Martin, G. L., & Yu, C. T. (2010). Teaching a child with autism to request information by asking 'What?'. *Developmental Disabilities Bulletin, 38*(2), 55-74.
- Ruskin, R. S., & Maley, R. F. (1972). Item preference in a token economy ward store. *Journal of Applied Behavior Analysis, 5*, 373-378. doi: 10.1901/jaba.1972.5-373
- Shillingsburg, A. M., Powell, N. M., & Bowen, C. N. (2013). Teaching children with autism spectrum disorders to mand for the removal of stimuli that prevent access to preferred items. *Analysis of Verbal Behavior, 29*(1), 51-57.
- Shillingsburg, A. M., & Valentino, A. L. (2011). Teaching a child with autism to mand for information using 'how.' *Analysis of Verbal Behavior, 27*(1), 179-184.
- Sidener, T. M., Shabani, D. B., Carr, J. E., & Roland, J. P. (2006). An evaluation of strategies to maintain mands at practical levels. *Research in Developmental Disabilities, 27*, 632-644. doi:10.1016/j.ridd.2005.08.002
- Skinner, B. F., (1938). *The behavior of organisms: An experimental analysis*. Oxford, England: Appleton-Century.

## CONDITIONING PEERS

Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.

Sundberg, M. L., Loeb, M., Hale, L., & Eigenheer, P. (2002). Contriving establishing operations to teach mands for information. *Analysis of Verbal Behavior*, 18(1), 15-29.

Sundberg, M. L., & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification*, 25, 698-724. doi:  
10.1177/0145445501255003

Sundberg, M. L., & Partington, J. W. (1998). *Teaching language to children with autism or other developmental disabilities*. Danville, CA: Behavior Analysts, Inc.

Taylor, B. A., Hoch, H., Potter, B., Rodriguez, A., Spinnato, D., & Kalaigian, M. (2005). Manipulating establishing operations to promote initiations towards peers in children with autism. *Research in Developmental Disabilities*, 26, 385-392.  
doi:10.1016/j.ridd.2004.11.003

Vaughan, M. E., & Michael, J. (1982). Automatic reinforcement: An important but ignored concept. *Behaviorism*, 10(2), 217-227.

Winborn, L., Wacker, D. P., Richman, D. M., Asmus, J., & Geier, D. (2002). Assessment of mand selection for functional communication training packages. *Journal of Applied Behavior Analysis*, 35, 295-298. doi: 10.1901/jaba.2002.35-295

Wolfe, B. D., Dattilo, J., & Gast, D. L. (2003). Effects of a token economy system within the context of cooperative games on social behaviors of adolescents with emotional and behavioral disorders. *Therapeutic Recreation Journal*, 37(1), 124-141.

Wong, C. S. (2013). A play and joint attention intervention for teachers of young children with autism: A randomized controlled pilot study. *Autism*, 17, 340-357. doi:  
10.1177/1362361312474723

## CONDITIONING PEERS

- Yi, J. I., Christian, L., Vittimberga, G., & Lowenkron, B. (2006). Generalized negatively reinforced manding in children with autism. *Analysis of Verbal Behavior*, 22(1), 21-33.
- Ziomek, M. M., & Rehfeldt, R. A. (2008). Investigating the acquisition, generalization, and emergence of untrained verbal operants for mands acquired using the Picture Exchange Communication System in adults with severe developmental disabilities. *Analysis of Verbal Behavior*, 24(1), 15-30.

## Chapter 2: Experimental Procedures

### Abstract

Communication and social deficits are two of the core deficits in children diagnosed with Autism Spectrum Disorder (ASD; American Psychiatric Association, 2013). Skill acquisition programs simultaneously targeting communication and social deficits are common in Early Intensive Behavioral Intervention (EIBI) with children with ASD (Lovaas, 2003). Previous literature has taught children to mand (request) for preferred items from peers, targeting deficits in communication and social skills. The pairing trials that occur during mand training with peers may mimic conditioning procedures and could establish peers as reinforcers. Several studies have attempted to use response-stimulus (RS) pairing and stimulus-stimulus (SS) pairing to condition neutral, social stimuli as reinforcers; however, results have been idiosyncratic. In the current study, *Experiment 1* compared SS pairing procedures and RS pairing procedures in conditioning preschool-aged peers as reinforcers. RS pairing may be more effective and efficient than SS pairing (i.e., 3 of 6 participants had a successfully conditioned peer using RS pairing). *Experiment 2* evaluated the effects of peers as conditioned reinforcers or peers with a history of pairings on the acquisition of manding to peers. Mand training to conditioned peers may be just as effective as to novel peers (i.e., 3 participants).

*Keywords:* social skills, mand training, pairing, conditioned reinforcement

## CONDITIONING PEERS

### Conditioning Peers as Reinforcers and the Effects on Mand Training with Preschool-Aged Children

Skill-acquisition programs simultaneously targeting communication and social deficits are common in Early Intensive Behavioral Intervention (EIBI) with children with Autism Spectrum Disorder (ASD, Lovaas, 2003). For example, teaching children with ASD to mand for a variety of items (e.g., “Can I play with the toy, please?”) to other children targets deficits in communication and social interactions. Previous studies (Kodak, Paden, & Dickes, 2012; Paden, Kodak, Fisher, Gawley-Bullington, & Bouxsein, 2012; Taylor et al., 2005) have evaluated teaching children to mand for preferred items from peers. Taylor et al. (2005) taught three males with ASD to mand for preferred edibles from their same-age peers with ASD when the respective MO was present and absent.

Kodak et al. (2012) taught two male children with ASD to use a picture exchange communication system (PECS) to mand to peers for preferred tangible and edible items. Following mand training, the authors observed generalization to a novel peer and the natural environment. Like Kodak and colleagues, Paden et al. (2012) taught two males with ASD to use PECS to mand to peers for preferred tangible and edible items. Despite engaging in some mands to the adults during training, by the conclusion of the study participants were primarily allocating responding to peers.

Taylor et al. (2005) and Kodak et al. (2012) comment that a collateral benefit of teaching children with ASD to mand to peers may be that the target peer becomes a conditioned reinforcer because a mand-training trial with a peer resembles a pairing trial used in conditioning procedures (i.e., response-stimulus pairing, stimulus-stimulus pairing). During a mand-training trial, a peer is delivering a preferred item that could be a primary or secondary reinforcer, to the



## CONDITIONING PEERS

participant. The delivery of the item is similar to pairing-trial procedures during the conditioning process. Due to the similarity to pairing trials, the peer may become a conditioned reinforcer through a series of mand-training trials.

Conditioning procedures (i.e., response-stimulus pairing, stimulus-stimulus pairing) have been used in the applied literature to establish tokens as reinforcers. Token economies are highly effective in changing behavior across several populations, including individuals with ASD and developmental disabilities (Carnett et al., 2014; LeBlanc et al., 2000; Matson & Boisjoli, 2009), emotional and behavioral disorders (Moss & Rick, 1981; Wolfe, Dattilo, & Gast, 2003) and typically developing individuals in a classroom setting (Filcheck, McNeil, Greco, & Bernard, 2004; Maggin, Chafouleas, Goddard, & Johnson, 2011). During a token economy system, a neutral stimulus (e.g., plastic “token”) is paired with primary (e.g., preferred edibles) and secondary (e.g., access to a break from demands, preferred tangible items, praise) reinforcers.

Conditioning procedures are used to increase vocal variability in individuals with speech delays and establish other social stimuli (e.g., praise, adult voices) as conditioned reinforcers (Dozier et al., 2012; Greer, Pistoljevic, Cahill, & Du, 2011). Specifically, Dozier et al. (2012) evaluated a comparison of stimulus-stimulus (SS) pairing and response-stimulus (RS) pairing procedures in an attempt to condition praise as a reinforcer for adults with ASD and intellectual disabilities. During SS pairing, researchers delivered access to the preferred item (i.e., primary reinforcer) simultaneously with a praise statement (i.e., neutral stimulus) on a fixed-time (FT) schedule. During RS pairing, researchers delivered the preferred item and praise contingent on the participant engaging in an arbitrary motor task. Tests for conditioned reinforcement (i.e., reinforcer assessments) for praise were also intermittently conducted during the pairing process.

## CONDITIONING PEERS

SS pairing was not effective in conditioning praise as a reinforcer; whereas, RS pairing was effective in conditioning praise as a reinforcer for half of the participants (4 of 8).

Despite the hypothesis of peer conditioning described by Taylor et al. (2005), no current studies have directly assessed the procedures by which peers become potential conditioned reinforcers. If the peer were to become a conditioned reinforcer through mand training, the likelihood that the participant would initiate with that peer in the future may increase. In addition, if the participant is more likely to initiate with a peer, a clinician would have increased opportunities to prompt appropriate play and social skills after these initiations. If successful, conditioning peers as reinforcers could have significant clinical implications for interventions targeting communication and social-interaction deficits, particularly in EIBI settings.

Due to the limited research on applications of conditioning procedures, the current study further assessed how to effectively condition social stimuli. The purpose of the current study was to (a) compare SS pairing procedures and RS pairing procedures in conditioning preschool-aged peers as reinforcers and (b) evaluate the effects of peers as conditioned reinforcers or peers with a history of pairings on the acquisition of manding to peers. The comparison of pairing procedures was evaluated in *Experiment 1: Conditioning Peers as Reinforcers*, and corresponding effects on the acquisition of manding to peers was evaluated in *Experiment 2: Mand Training*.

### **Experiment 1: Conditioning Peers as Reinforcers**

#### **Method**

**Participants.** Eight preschool-aged children participated in Experiment 1. Six children served as participants (i.e., Joel, Luke, Jeb, Ashley, Cameron, Matt) and two children served as peers (i.e., Peer A, Peer B) during experimental procedures. Table 1 lists the demographic

## CONDITIONING PEERS

information for the six participants and two peers. All participants and peers were recruited from a preschool in the geographic area that served typically developing children and children with developmental disabilities. Peer A and Peer B served as the same peers for all participants for the SS and RS conditions. The participant and peer are referred to as a *dyad* throughout the remainder of the method. All participants and peers met the inclusionary criteria outlined below.

The experimenter used the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008) to assess prerequisite skills. The VB-MAPP is a criterion-referenced (i.e., ages 0-48 months) assessment commonly used, particularly in EIBI settings, to guide skill acquisition programming (e.g., verbal behavior, play skills, social skills, and pre-academic skills) for children with ASD and developmental disabilities. Participants received a minimum VB-MAPP manding score of 6 out of 15 (Level 2 of 3; i.e., mands for at least 20 different missing items without prompts) and engaged in some spontaneous mands (i.e., at least two mands during a 1-hr observation). Participants also received a VB-MAPP social behavior score of 5 out of 15 (Level 1 of 3; i.e., spontaneously engages in parallel play near other children for a total of 2 min and spontaneously follows peers or imitates their motor behavior on two occurrences), a VB-MAPP play score of 5 out of 15 (Level 1 of 3; i.e., independently engages in cause-and-effect play for 2 min), and a VB-MAPP echoics score of 6 out of 10 (Level 2; i.e., can repeat two-syllable combinations).

The peer in the *dyad* was also able to follow at least five simple directions (e.g., “Sit down,” “Hand me the toy”) and engage in sustained cooperative play with similar-age peers for at least 5 min during a 30-min observation. These behavioral skills were necessary for the peer to participate in the training procedures of Experiment 1. The peers’ skills were assessed through direct observation of the peers and caregiver and teacher report.

## CONDITIONING PEERS

Children who engaged in frequent problem behavior, including noncompliance and aggression, were not recruited. Problem behavior was assessed through direct observation of the children and verbal reports from the case manager and teacher. Children who were unable to engage in a selection response (i.e., using one or both hands to grasp an item) due to a physical impairment, or who had a significant visual or hearing impairment (e.g., unable to discriminate colors or hear instructions) were not included in the study.

**Setting and session duration.** All sessions in Experiment 1 occurred in a small, 223.5 cm x 280.6 cm room or a partitioned area if a separate room was unavailable either at the participant's school or at a university clinic. The room was void of any potentially distracting, extraneous visual (e.g., brightly colored posters, tangible items within sight) and auditory stimuli (e.g., loud noises, music). The session area included a table and at least three chairs (i.e., one for the participant, peer, and experimenter); a partition divider was also present during probes for conditioned reinforcement. The arrangement of the seating depended on the type of session (i.e., peer seated across from the participant for pairing sessions, peer seated adjacent to the participant for probes for conditioned reinforcement sessions). At least one trained undergraduate or graduate research assistant was also present during some sessions to collect data for interobserver agreement (IOA) measures and procedural integrity.

The sequence of the procedures in Experiment 1 are displayed in Figure 1. Reinforcer assessments had a maximum duration of 5 min. Probes for conditioned reinforcement sessions had a maximum duration of 10 min. SS pairing sessions and RS pairing sessions had a maximum duration of approximately 30 min. A visit lasted no more than 1 hr during which the experimenter conducted multiple sessions. The type of session depended on the progression of

## CONDITIONING PEERS

the participant through Experiment 1 procedures. No more than two visits were conducted per day. Visits occurred 2 to 5 days per week depending on the availability of the participant.

**Materials.** At least seven edible items were selected based on parent, teacher, and therapist report (i.e., previous preference assessments used for clinical services) and direct observations in the natural environment for use in the preference assessment. At least two edible items were identified as high-preferred by the preference assessment and were used during the reinforcer assessment (i.e., edible items identified as reinforcers were used during pairing procedures). A small stepstool was used for the arbitrary task in the reinforcer assessment. A table, chairs, datasheets, pens, timers, and a video camera were also present during all sessions.

During SS and RS pairings, those high-preferred edible items that functioned as reinforcers during the reinforcer assessment were delivered to the participant. A laminated 21.6 cm x 27.9 cm piece of red construction paper was present during SS pairings and a similar piece of green construction paper was present during RS pairings. During probes for conditioned reinforcement, the experimenter used the same red and green construction paper, as well as a piece of blue construction paper. A partition divider or masking tape was also used during probes for conditioned reinforcement sessions.

**Measurement and interobserver agreement (IOA).** Paper and pen data collection was used during all sessions. The dependent variable for the preference assessment was a *selection response*, defined as the participant using one or both hands to indicate a specific tangible or edible item in the array of items. The *percentage of selection* for each item was calculated to determine high, moderate, and low-preferred tangible and edible items.

**Reinforcer assessment.** The target response for the reinforcer assessment was engaging in the arbitrary task of stepping up onto and then back down a small stepstool. *Stepping* was

## CONDITIONING PEERS

defined as the participant placing both feet on top of the stepstool and then both feet back to the floor. The dependent variable was the *rate of responses* for each condition. The *rate of responses* was calculated by the total number of responses divided by the total session duration.

***Probes for conditioned reinforcement.*** The dependent variable for the probes for conditioned reinforcement was the *percent duration of the session* that the participant allocated to each condition. Duration data were only scored once the participant had both feet within one side of the room (i.e., each side of the room was a condition). If the participant had one foot on either side of the dividing line (i.e., separating Peer vs. Alone) or stood on top of the line, the data collector ceased collecting duration data and resumed once the participant placed both feet on one side. If the participant was sitting or lying on the floor, the duration of time in seconds that the upper body (torso, shoulders, and head) was on one side of the room was recorded. If the participant's upper body was across both sides of the room, the data collector ceased collecting duration data and resumed once the upper body was on one side. The dependent measure was calculated as a *percent of session* for each condition by dividing the duration of time in seconds allocated to each side of the room (i.e., Peer vs. Alone) by the total duration of the session (i.e., 600 s) and then multiplied by 100.

***Conditioned reinforcement criterion.*** Once a probe (i.e., RS, SS) was equal to or greater than 70% duration of a session with a peer, a second probe was conducted. If the second probe was equal to or greater than 70% duration of session with a peer, a third probe was conducted. Once a participant had three consecutive sessions at 70% duration of session with a peer, that peer was considered a conditioned reinforcer.

Trained graduate and undergraduate students served as primary and secondary data collectors. Prior to Experiment 1, the experimenter trained graduate and undergraduate students

## CONDITIONING PEERS

to collect data. The experimenter created several training videos of each type of assessment that included various responses by a confederate participant. Once the students received at least 90% accuracy across three consecutive sessions of each type of assessment, they were considered reliable data collectors and were allowed to collect IOA for the current study.

The primary data collector (experimenter) recorded data during the actual session. The secondary data collector recorded data during the session or at a later time from a video recording of the session. The experimenter calculated IOA using the point-by-point agreement formula for the preference assessment. The total number of agreements was divided by agreements plus disagreements and then the proportion was multiplied by 100. An agreement was defined as both data collectors independently indicating the same selection response. The experimenter calculated IOA using the mean count-per-interval formula for the reinforcer assessment and the probes for conditioned reinforcement. Each of the sessions were divided into 10-s intervals. For each 10-s interval, the smaller number or duration was divided by the larger number or duration to obtain a proportion for each interval. IOA was calculated by summing these proportions, dividing the total by the number of 10-s intervals, and then multiplying by 100. IOA was obtained on 35% of all sessions across each assessment and participant. Mean percentage agreement across participants was 100% for preference assessments and reinforcer assessments. Mean percentage agreement across participants was 91% (range, 83%-100%) for probes for conditioned reinforcement.

### **Procedural Integrity**

The experimenter recorded all sessions using a video camera. Graduate or undergraduate students were trained to be reliable data collectors for procedural integrity data. The data collector assessed the accuracy of the experimenter's implementation of the preference

## CONDITIONING PEERS

assessment, reinforcer assessment, SS and RS pairing conditions, and probes for conditioned reinforcement. The experimenter created several training videos of each type of assessment that included various correct and incorrect responses of experimenter implementation of the procedures. Once the trainees received at least 90% accuracy on procedural integrity data across three consecutive sessions of each type of assessment, they were considered reliable data collectors and were allowed to collect procedural integrity data for the current study.

Each condition or assessment had a number of responses that were either scored as correct or incorrect. The procedural integrity score was calculated as the percentage of correct responses made by the experimenter during each session. Procedural integrity was assessed on 35% of all preference assessment, reinforcer assessment, SS and RS conditioning probes, and SS and RS pairings across all participants. Point-by-point IOA was also assessed for 35% of the procedural integrity data (see Interobserver Agreement).

**Preference assessment.** The data collectors scored the accuracy of the following experimenter responses: (1) experimenter delivered access to selected items, (2) removed the items after the access interval, (3) removed selected items from the array and rotated the array after a selection, and (4) blocked attempts to select more than one item. Mean percentage procedural integrity was 100% across participants. Mean percentage agreement on procedural integrity was 100% across participants.

**Reinforcer assessment.** The data collectors scored the accuracy of the following experimenter responses: (1) completed the forced exposure trials, (2) delivered the  $S^D$ , (3) delivered the consequence contingent on the fixed-ratio schedule target response criterion, and (4) blocked the stepstool during access to consequences. Mean percentage procedural integrity



## CONDITIONING PEERS

was 100% across participants. Mean percentage agreement on procedural integrity was 100% across participants.

**Probes for SS and RS conditioned reinforcement.** The data collectors scored the accuracy of the following experimenter responses: (1) completed the exposure trials, (2) prompted the participant back to the starting position before each session, (3) and delivered the appropriate S<sup>D</sup>. Mean percentage procedural integrity was 100% across participants. Mean percentage agreement on procedural integrity was 100% across participants.

**SS pairings.** The data collectors scored the accuracy of the following experimenter response: prompted peer to deliver the high-preferred item to the participant according to the time schedule. Mean percentage procedural integrity was 99% across participants. Mean percentage agreement on procedural integrity was 100% across participants.

**RS pairings.** The data collectors scored the accuracy of the following experimenter responses: (1) delivered the receptive instruction, (2) provided least-to-most prompting as necessary, and (3) delivered neutral praise for compliance with the receptive instruction. Mean percentage procedural integrity was 98% across participants. Mean percentage agreement on procedural integrity was 100% across participants.

### **Experimental Design**

Depending on the participant, reinforcer assessments were either conducted as an alternating-treatments design or a reversal design in which the conditions were quasi-randomly presented. The two conditions were a high-preferred edible condition and a control condition.

An alternating treatments embedded within a multiple-baseline-across-participants probe design was used to evaluate the effects of SS pairing and RS pairing. Probes for conditioned reinforcement were conducted prior to SS and RS pairings and throughout pairing sessions.

## CONDITIONING PEERS

### Procedures

**Preference assessment.** The experimenter conducted a multiple-stimulus-without-replacement (MSWO) preference assessment (DeLeon & Iwata, 1996) with at least seven edible items. The items were presented in seven separate blocks, (i.e., the experimenter presented the items a total of seven times to the participant) that included the seven edible items. Prior to the assessment, the participant was able to consume each of the edible items. At the beginning of the assessment, the experimenter placed the edible items in an array equidistant to each other and the participant. The experimenter instructed the participant to “pick one” and allowed 30 s to make a selection from the array. Following a selection, the participant was allowed to consume the edibles. The remaining items were rotated and the participant was instructed to “pick one.” The experimenter continued the process until the participant had selected all of the items in the array.

If the participant did not select an item within 30 s of the array presentation, the experimenter redelivered the prompt to “pick one.” If the participant still did not make a selection, the experimenter ended the block, recorded all remaining items as unselected, and initiated the next block at the following visit. The experimenter physically prevented any attempts to select more than one item. The same trial was presented with the instruction to “pick just one.” If the participant still attempted to select more than one item, the experimenter ended the block, recorded all remaining items as unselected, and initiated the next block.

The percentage of selection for each item was calculated by dividing the number of times an item was selected by the total number of presentations. Items were identified as high-preferred items with a percentage score of 100-61%, moderate-preferred with a percentage score of 60-31%, and low-preferred with a percentage score of 30-0%.

## CONDITIONING PEERS

If a preference hierarchy was not established by the MSWO preference assessment (i.e., at least two items within each percentage category), a paired-stimulus preference assessment was conducted (Fisher et al., 1992). The same edible items were included in the paired-stimulus preference assessment. Two items were presented to the participant. The experimenter instructed the participant to “pick one.” Upon the selection of an item, the participant was allowed to consume the item. The presentation of the items was counterbalanced so that each of the items was presented one time with every other item. The items were also presented an equal number of times on both sides (i.e., right, left) of the participant. If the participant did not select an item or attempted to select both items, the experimenter removed the items and presented the items again with the prompt “pick one.” If the participant did not select an item or attempted to select both items again, the experimenter removed the items, recorded the items as unselected, and then presented the next trial. A preference hierarchy (i.e., high, moderate, low-preferred items) was determined by calculating the percentage of selections for each item by dividing the number of selections for the item by the number of total presentations.

**Reinforcer assessment.** A fixed-ratio (FR) reinforcer assessment (Lerman et al., 1997) was conducted to determine if the high-preferred edible items identified by the preference assessment functioned as reinforcers. Each item was evaluated separately. During all conditions, the target response was stepping onto and then back down a small stepstool. The rate of responses (s) were compared across conditions (i.e., high preferred vs. control).

Prior to beginning the FR schedule, the experimenter conducted two forced-exposure trials. At the beginning of the forced exposure trial, the experimenter stated to the participant, “Do this” and provided a model of the target response. If the participant did not independently engage in the target response within 3-5 s, the experimenter used manual guidance (i.e., hand-

## CONDITIONING PEERS

over-hand) to prompt the participant to engage in the target response. Once the participant engaged in the target response, the experimenter delivered contingent access to a high-preferred edible item (modeling the FR 1 schedule) or no programmed consequences (control condition).

After the forced-exposure trials for the present condition, the experimenter began implementing a FR 1 schedule for that condition. For each condition, the experimenter stated to the participant, “You can step on the stepstool as many times as you want. You can stop at any time” with the stepstool placed in front of the participant. During the high-preferred condition, the experimenter held the high-preferred item in the participant’s line of sight. The experimenter delivered either the high-preferred edible item (high-preferred item condition), or no programmed consequences (control condition) contingent on each response. During the high-preferred item condition, the experimenter blocked the stepstool (i.e., to prevent the occurrence of additional responses) during the delivery of and access to the item. Once the high-preferred item was delivered, the experimenter paused the session timer. Once the participant consumed the edible item, the experimenter discontinued blocking the stepstool, placed it in front of the participant, and resumed the session timer.

**Stimulus-stimulus (SS) conditioning probes.** SS conditioning probes were conducted prior to SS pairing and periodically throughout SS pairing (see SS Pairing) to test for the effects of pairing on the reinforcing value of the peer. A concurrent-operant reinforcer assessment (Piazza et al., 1996) was used to test for conditioned reinforcement during SS conditioning probes. During each 10-min SS conditioning probe, the therapy room was divided in half either using a partition divider or masking tape. Two chairs were placed on each side of the therapy room. Both sides of the room contained the exact same leisure items. Two or three items that could potentially facilitate cooperative play between two preschool-aged children were present

## CONDITIONING PEERS

during the probes. The items varied across participants, but included Legos<sup>®</sup>, plastic play food and cooking items, and a Mr. Potato Head<sup>®</sup>. A laminated 21.6 cm x 27.9 cm piece of red construction paper was placed on the wall of one side of the room and a similar piece of blue construction paper was placed on the wall of the other side of the room. The red card was associated with access to *Peer A* and the blue card was the control condition with no access to *Peer A*. The side of the room associated with the peer was alternated quasi-randomly across sessions to prevent any potential participant side biases.

Prior to each SS conditioning probe, the experimenter conducted a four-trial block of forced-exposure trials with two trials under each reinforcement condition (i.e., two *Peer A* and two *No Peer*). The experimenter quasi-randomly alternated the order of trials during the blocks across probes (e.g., *Peer A* then *No Peer* for the first block, *No Peer* then *Peer A* for the second block, etc.).

At the beginning of each exposure trial, the experimenter neutrally manually guided the participant to the starting position in the center of the room. For *Peer A* forced-exposure trials, the experimenter stated, “Sit on the red side to play with (*insert Peer A name*)” and neutrally manually guided the participant to the red card next to *Peer A*. *Peer A* was sitting in the chair next to the wall with the red card. The experimenter neutrally prompted the participant to remain in the area of the room with the red card next to *Peer A* for 30 s.

For the *No Peer* forced-exposure trials, the experimenter stated to the participant, “Sit on the blue side to play by yourself.” *Peer A* was not present during blue card forced-exposure trials. The experimenter neutrally prompted the participant to remain in the area of the room with the blue card for 30 s.

## CONDITIONING PEERS

After each block of forced-exposure trials, the experimenter began the 10-min SS conditioning probe. The experimenter first neutrally manually guided the participant to the starting position in the middle of the room equidistant from chairs on either side. Once the participant was in the starting position, the experimenter began the probe by stating, “Remember, if you want to sit next to (*insert Peer A name*) sit on the red side. If you want to sit by yourself, sit on the blue side” and started a timer for 10 min. The experimenter positioned herself outside of either area behind the participant. On a fixed-time (FT) 1-min schedule, the experimenter stated, “Remember, if you want to sit next to (*insert Peer A name*) sit on the red side. If you want to sit by yourself, sit on the blue side.” The participant had free access to either side of the room during the 10-min probe. The experimenter did not deliver any other prompts (besides the FT 1-min statement) or programmed consequences for the duration of the probe. At the end of the 10-min probe, the experimenter neutrally manually guided the participant back to the starting position.

**Stimulus-stimulus (SS) pairing.** During each approximately 30-min SS pairing session, the experimenter and participant were either seated at a table with chairs or on the floor. Prior to each session, a laminated 21.6 cm x 27.9 cm piece of red construction paper was placed on the table, wall, or on the floor in front of the participant. *Peer A* and the participant were seated facing one another. At the beginning of the pairing trial, the experimenter prompted *Peer A* stating, “Give the (*insert high-preferred item name*) to (*insert participant name*),” to deliver a high-preferred edible item to the participant. Three high-preferred edible reinforcers were used during Cameron and Ashley’s pairings. Two high-preferred edible reinforcers were used with the other participants. The edibles were quasi-randomly delivered to prevent satiation with a specific

## CONDITIONING PEERS

item. The experimenter provided manual guidance if necessary to neutrally prompt *Peer A* to deliver the item to the participant.

One pairing trial began once *Peer A* delivered the high-preferred item to the participant and continued until the participant consumed the edible item. At the end of each pairing trial a 5-s inter-trial interval occurred prior to the beginning of the next pairing trial. Each of the SS pairing sessions contained 40 pairing trials. After five SS pairing sessions (i.e., 200 pairing trials), the experimenter conducted a probe for conditioned reinforcement (see SS Probes for Conditioned Reinforcement). A termination criterion for SS pairing trials was set at 2,000 SS pairing trials or 50 SS pairing sessions (Dozier et al., 2012).

**Response-stimulus (RS) conditioning probes.** RS conditioning probes were conducted prior to RS pairing and periodically throughout RS pairing (see RS Pairing) to test for the effects of pairing on the reinforcing value of the peer. RS conditioning probes were conducted as outlined for SS conditioning probes (see SS conditioning probes) except that a different colored piece of construction paper (i.e., green for *Peer B*, blue for *No Peer*) was used to evaluate the effects of RS conditioning pairing. In addition, *Peer B* participated in the RS conditioning probes and RS pairing.

**Response-stimulus (RS) pairing.** Prior to the first RS pairing session, the experimenter conducted probes (i.e., three of each task) of a variety of gross motor tasks (i.e., at least 10 gross-motor instructions). No programmed consequences were delivered for correct or incorrect responses. The experimenter delivered enthusiastic, verbal praise contingent on other appropriate participant behavior (e.g., “Nice job looking at me!) on a variable-ratio (VR) 3 schedule. The experimenter selected five tasks that the participant independently completed during the three

## CONDITIONING PEERS

probes as the target response for RS pairing. The gross motor tasks selected across all participants were the following: clap hands, rub belly, touch nose, stomp feet, and touch ears.

During each approximately 30-min RS pairing session, the experimenter and participant were seated at a table and chairs or on the floor. Prior to each session, a laminated 21.6 cm x 27.9 cm piece of green construction paper was placed on the table, wall, or on the floor in front of the participant. *Peer B* and the participant were seated facing one another. The experimenter quasi-randomly rotated through the five motor tasks.

At the beginning of each pairing trial, the experimenter instructed the participant to engage in the target response. The experimenter stated the instruction (e.g., “Clap your hands”). If the participant did not engage in the target response within 3-5 s or engaged in an incorrect response, the experimenter repeated the instruction and provided a model of the task (e.g., “Clap your hands like this” while the experimenter clapped her hands). If the participant still did not engage in the target response within 3-5 s after the model or engaged in an incorrect response, the experimenter repeated the instruction and provided manual guidance to prompt the participant to engage in the response (e.g., “Clap your hands like this” while the experimenter manually guided the participant to clap hands).

Contingent upon the participant engaging in the target response, the experimenter delivered neutral praise on a FR 1 schedule (e.g., “That’s right.”) and prompted *Peer B* stating, “Give the (*insert high-preferred item name*) to (*insert participant name*),” to deliver a high-preferred edible item to the participant. These items were quasi-randomly delivered to prevent satiation with a specific item. The experimenter provided manual guidance if necessary to neutrally prompt *Peer B* to deliver the item to the participant.



## CONDITIONING PEERS

One pairing trial occurred once the experimenter delivered the receptive instruction for the target response and ended once the participant consumed the edible item. At the end of each pairing trial a 5-s inter-trial interval occurred prior to the beginning of the next pairing trial.

Each of the RS pairing sessions contained 40 pairing trials. After five RS pairing sessions (i.e., 200 pairing trials), the experimenter conducted a probe for conditioned reinforcement (see RS Probes for Conditioned Reinforcement). A termination criterion for RS pairing trials was set at 2,000 RS pairing trials or 50 RS pairing sessions (Dozier et al., 2012).

### **Results and Discussion**

The results of the MSWO preference assessment indicated the following items for each participant as high preferred: Oreos<sup>®</sup> and Doritos<sup>®</sup> for Matt; Skittles<sup>®</sup> and M&Ms<sup>®</sup> for Luke; caramel popcorn cakes and marshmallows for Joel; Fruit Loops<sup>®</sup>, popcorn, and Cheetos<sup>®</sup> for Cameron; fruit snacks and Oreos<sup>®</sup> for Jeb; and Oreos<sup>®</sup>, Doritos<sup>®</sup>, and popcorn for Ashley. Each of these edible items was evaluated separately using a FR reinforcer assessment with each participant. The rates of stepping (i.e., onto a stepstool) were compared during the edible condition (the edible being evaluated was delivered contingent on responding) and the control condition (no consequences delivered by the therapist following responding). Higher rates of responding in the edible condition compared to the control condition indicated that the edible identified in the MSWO preference assessment functioned as a reinforcer. Across all participants, the high-preferred edibles increased rates of stepping. Based on the results of the reinforcer assessments, the aforementioned edible items were considered primary reinforcers and included in the SS and RS pairings for each participant.

Figure 2 displays the results of conditioning for Joel, Luke, and Jeb. The top panel in Figure 2 displays Joel's results. For Joel, during SS baseline the mean percent duration of session allocated to the Peer side was 1.3% (range, 0%-4%) and 96.7% (range, 90%-100%) to the Alone

## CONDITIONING PEERS

side. For the RS baseline, Joel allocated 0.7% (range, 0%-2%) of the session on the Peer side, and 99% (range, 97%-100%) on the Alone side. Following SS and RS pairings, the percent duration to the Peer side increased and remained variable during the post-200, 400, and 600-pairing probes. After 800 pairing trials, the mean percent duration for Joel was 87% (range, 77%-100%) for the RS Peer side and 9% (range, 0%-18%) for the RS Alone side. After 800 pairing trials, the percent duration of session was at or above 70% (range, 77%-100%) for three consecutive sessions. Thus, the RS Peer met the criterion for a conditioned reinforcer after 800 pairings. After 1,000 SS-pairing trials, Joel allocated 64% of session to the SS Peer side and 32% to the SS Alone side. Thus, the SS Peer did not reach the conditioned reinforcer criterion after 1,000 pairing trials. Joel was unable to participate in the study following 1,000 pairings due to school enrollment; therefore, additional pairing trials were not conducted after 1,000 SS-pairing trials.

The middle panel in Figure 2 displays Luke's results. During baseline, the mean percent duration of session on the SS Peer side was 19% (range, 0%-100%) and 79% (range, 0%-100%) on the Alone side. For the RS condition, Luke allocated 35% (range, 0%-100%) of the session on the Peer side, and 65% (range, 0%-100%) on the Alone side. After 200 pairing trials, the mean percent duration for Luke was 98% (range, 96%-100%) for the RS Peer side and 1% (range, 0%-2%) for the RS Alone side. The RS Peer met the criterion for a conditioned reinforcer after 200 pairings. After 400 SS-pairing trials, the mean percent duration was 91% (range, 72%-100%) for the SS Peer side and 0% for the SS Alone side. The SS Peer met the criterion for a conditioned reinforcer after 400 pairings.

The bottom panel in Figure 2 displays Jeb's results. During SS baseline, the mean percent duration of session on the SS Peer side was 38% (range, 5%-77%) and 58% (range, 6%-94%) on

## CONDITIONING PEERS

the Alone side. For the RS baseline, Jeb allocated 36% (range, 0%-84%) of the session on the Peer side, and 61% (range, 11%-100%) on the Alone side. The percentage of session allocated to the peer side remained variable for RS and SS probes following 200, 400, 600, 800, 1,000, and 1,200 pairings. After 1,400 pairing trials, the mean percent duration for Jeb was 91% (range, 87%-97%) for the RS Peer side and 9% (range, 3%-12%) for the RS Alone side, meeting the criterion for a RS-conditioned reinforcer after 1,400 pairings. SS pairings continued with the other peer. After 2,000 pairing trials, Jeb allocated 0% of session to the SS Peer side and 100% to the SS Alone side. Thus, the SS Peer did not reach the conditioned reinforcer criterion after 2,000 pairing trials.

Figure 3 displays the results of conditioning for Ashley, Cameron, and Matt. The top panel in Figure 3 displays Ashley's results. During baseline, the mean percent duration of session on the SS Peer side was 63% (range, 10%-36%) and 77% (range, 63%-84%) on the Alone side. For the RS condition, Ashley allocated 8% (range, 0%-22%) of the session on the Peer side, and 89% (range, 67%-100%) on the Alone side. After 400 pairing trials, results from both conditions indicated an increase in time allocated to the Peer side. After 800 pairing trials, Ashley allocated at least 70% of the session to the Peer side for both conditions; however, the second probe indicated a decrease in time allocated to the Peer side. Despite the decrease in time on the Peer side, both conditions were still at a higher percent duration than baseline sessions, indicating a potential change in preference. After 1,000 RS-pairing trials, the mean percent duration for Ashley was 88% (range, 75%-100%) for the RS Peer side and 6% (range, 0%-11%) to the RS Alone side. Following 1,000 SS-pairing trials, Ashley allocated 97% of the session to the SS Peer side and 3% to the SS Alone side. After 1,000 pairing trials, the percent duration of session with a peer was at or above 70% for two consecutive RS sessions and for one SS session.

## CONDITIONING PEERS

Throughout Experiment 1, Ashley's problem behavior (e.g., aggression towards peers and therapists) was observed to increase in intensity as the study progressed. Due to her level of problem behavior during probes for conditioned reinforcement, additional sessions were not conducted to evaluate the conditioned reinforcement criterion and Ashley's participation in Experiment 1 was terminated.

The middle panel in Figure 3 displays Cameron's results. During baseline, the mean percent duration of session on the SS Peer side was 53% (range, 37%-83%) and 40% (range, 8%-63%) on the Alone side. For the RS condition, Cameron allocated 38% (range, 11%-59%) of the session on the Peer side, and 51% (range, 14%-85%) on the Alone side. The percent session allocated to the peer side remained variable after 200, 400, 600, and 800 pairings. Across the 1,000 to 1,800 post-pairing probes, a decreasing trend in allocation of time to the Peer side across both SS and RS conditions was observed. After 2,000 RS-pairing trials, Cameron allocated 8% to the RS Peer side and 80% to the RS Alone side. Following 2,000 SS-pairing trials, Cameron allocated 32% to the SS Peer side and 57% to the SS Alone side. Neither the RS Peer nor SS Peer conditions reached the conditioned reinforcer criterion.

The bottom panel in Figure 3 displays Matt's results. During baseline, the mean percent duration of session on the SS Peer side was 22% (range, 2%-66%) and 74% (range, 22%-98%) on the Alone side. For the RS condition, Matt allocated 24% (range, 0%-75%) of the session on the Peer side, and 71% (range, 25%-99%) on the Alone side. Following RS and SS-pairing trials (200-800 trials), Matt continued to allocate more time to the alone side of the room than the peer side. After 1,000 RS-pairing trials, Matt allocated 0% of the session to the RS Peer side and 100% to the RS Alone side. After 1,000 SS-pairing trials, Matt allocated 43% of the session to the SS Peer side and 54% to the SS Alone side. Neither RS Peer nor SS Peer conditions reached

## CONDITIONING PEERS

the conditioned reinforcer criterion after 1,000 pairings. Due to extended travel with his family, additional pairing trials after 1,000 pairing trials were not conducted with Matt.

Overall, three participants had at least one successfully conditioned peer based on the conditioned reinforcer criterion (i.e., three consecutive probes for conditioned reinforcement at or above 70% percent duration of session). Joel and Jeb had a successfully conditioned peer in the RS condition after 800 and 1,400 pairing trials, respectively. Luke had conditioned peers in both the RS and SS conditions; however, the peer in the RS condition reached the conditioned reinforcement criterion more quickly than the peer in the SS condition (i.e., 200 pairing trials for the RS condition compared to 400 pairing trials for the SS condition). Ashley's probes for conditioned reinforcement indicated an increase in preference for peers in both conditions, but neither peer reached the conditioned reinforcement criterion due to her dismissal from the study (after 1,000 pairing trials). Two participants, Cameron and Matt, did not have a successfully conditioned peer in either condition after 2,000 and 1,000 pairing trials, respectively.

Previous literature (Dozier et al., 2012) indicates that RS pairing may be more effective than SS pairing procedures to condition social stimuli (e.g., praise). However, the two procedures (i.e., RS pairing and SS pairing) were not directly compared and the results were idiosyncratic for individual participants. The current study found that one participant (Luke) had successfully conditioned peers in both conditions, two participants (Joel, Jeb) had one successfully conditioned peer in the RS condition, one participant (Ashley) indicated a change in overall preference for peers in both conditions as compared to baseline, and two participants (Cameron, Matt) had no successfully conditioned peers. Similar to the results of Dozier et al. (2012), RS pairings were more effective in conditioning a social stimulus (i.e., peer). In addition, the current study's comparison of RS and SS pairings indicate that RS pairings may be more effective (i.e.,

## CONDITIONING PEERS

Joel, Luke, Jeb) and more efficient (i.e., Luke) when directly compared to SS pairings. However, results are still idiosyncratic for some participants where neither RS nor SS pairings were successful in conditioning peers or even shifting a consistent preference.

During baseline sessions, three patterns of responding were observed across all participants: (a) strong preference for Alone side, (b) variability in preference across sessions (i.e., several sessions with majority of session allocated to Peer side, several sessions with majority of session allocated to Alone side), or (c) indifference for either Alone or Peer sides. The patterns of responding during baseline did not predict whether or not a peer would become a conditioned reinforcer as a result of the conditioning process. For participants with at least one successfully conditioned peer (i.e., Joel, Luke, Jeb), baseline percent duration levels either indicated a strong preference being alone (Joel) or variability in preference sessions (Luke, Jeb). As for those participants with no successfully conditioned peers (see Figure 3), baseline percent duration levels indicated all three patterns of responding. Ashley's baseline sessions indicated a preference for alone, Cameron's baseline sessions indicated an indifference between the Peer or Alone side, and, finally, Matt's baseline sessions indicated a variability in preference across sessions.

A limitation of the current study was that Joel, Matt, and Ashley were not exposed to the termination criterion of 2,000 pairing trials. However, Joel had a successfully conditioned peer in the RS condition after 800 pairing trials, but no conditioned peer in the SS condition after 1,000 pairing trials. On the other hand, Ashley was exposed to 1,000 pairing trials for both conditions and an increase in preference for both peers was observed, but she was unable to continue additional pairing trials due to her aggression towards peers. Based on the trend of Ashley's post-pairing probes for conditioned reinforcement, it is hypothesized that Ashley could have had a

## CONDITIONING PEERS

successfully conditioned peer in at least one condition. Although Joel and Matt hypothetically could have started to allocate additional time to the Peer side following additional pairings (i.e., up to 2,000), no increasing trends across post-pairing probes to 1,000 pairings were observed. In fact, Matt's results indicate a decreasing trend in time allocated to the Peer side across both SS and RS conditions as additional pairing trials were conducted.

### **Experiment 2: Mand Training**

#### **Method**

**Participants.** Four participants, Cameron, Joel, Luke, Jeb, from Experiment 1 were included in Experiment 2. The conditioned peers for Joel, Luke, and Jeb from the RS condition were included in Experiment 2. Cameron did not have a peer established as a conditioned reinforcer. Cameron's RS-pairing peer (history of 2,000 pairings) was included in Experiment 2. A novel peer was also selected for all four participants. The participants may have had exposure to the novel peers prior to Experiment 2 because two of the three novel peers also participated in Experiment 1 and attended the same preschool as the participants in both Experiment 1 and 2; however, none of the novel peers had a history of direct pairings with any of the participants within the classroom. Similar to Experiment 1 peers, novel peers in Experiment 2 were able to follow simple instructions, engage in parallel play, and exhibited minimal problem behavior, particularly when denied access to preferred items. Overall, each participant was paired with either a conditioned peer (i.e., Joel, Luke, Jeb) or a peer with a history of pairings (i.e., Cameron) and a novel peer.

**Setting and session duration.** The Experiment 2 sequence of procedures is displayed in Figure 4. All sessions occurred in a small, 223.5 cm x 280.6 cm room either at the participant's school or at a university clinic. The room was void of any potentially distracting, extraneous, visual

## CONDITIONING PEERS

(e.g., brightly colored posters, tangible items within sight) and auditory stimuli (e.g., loud noises, tangible items that play music). The session area included three chairs (one for the participant, peer, and experimenter) and a table, except for Cameron where the participant, peer, and experimenter sat on the floor.

Each mand-training session included 10 trials. Each trial was 60 s in duration. A visit lasted no more than 1 hr during which the experimenter conducted multiple sessions. No more than two visits were conducted per day. Visits occurred 2-5 days per week depending on the availability of the participant.

**Materials.** An MSWO preference assessment (refer to Experiment 1) was conducted to identify two high-preferred tangible items for each participant to be used as the target items during mand training. The items included were tangibles that were unfamiliar to each participant and had not been used in any prior assessment. Other items needed for mand training were a datasheet, pen, timer, and video camera.

**Measurement and interobserver agreement.** The dependent variable was the participants' vocal response and was defined as an *independent mand*, a *prompted mand*, an *incorrect mand*, or a *nonresponse*. All target mands were vocal responses and selected based on each participant's high-preferred tangible items. Since each participant manded in the natural environment by using full sentences, target mands for all participants included a sentence frame (e.g., "I want the [name of item], please."). However, depending on the tangible item for each participant, the syllables per target mand varied across participants (e.g., "I want the flashlight, please" vs. "I want the piano, please").

An *independent mand* was recorded when the participant engaged in the target mand using the sentence frame (e.g., "I want the flashlight, please") in the absence of any vocal



## CONDITIONING PEERS

prompts from the experimenter. The dependent measure was the percentage of independent mands out of 10 trials for each session. A *prompted mand* was recorded when the participant used the target mand within 3-5 s after the experimenter delivered a vocal prompt. An *incorrect mand* was recorded when the participant emitted a vocal response other than the target mand response. For example, if the participant engaged in the vocal response “I want...” after the experimenter delivered a vocal prompt “I want...” instead of the target mand response “I want the flashlight, please,” the experimenter recorded this response as an incorrect mand. A *nonresponse* was recorded when the participant engaged in no vocal response within 5 s after the vocal prompt.

*Acquisition criterion* was defined as the participant emitting an independent target mand with 90% accuracy across three consecutive sessions and two visits. *Failure criterion* was defined as 10 consecutive sessions below 90% accuracy with no increasing trend. If a participant would have reached the failure criterion, mand training would have been discontinued. However, this did not occur.

The experimenter served as the primary data collector for Experiment 2. Prior to Experiment 2, graduate and undergraduate students were trained using similar procedures and reliability criteria as Experiment 1. The secondary data collector recorded data in vivo or from video recordings. The data collectors recorded data on independent mands, prompted mands, incorrect mands, and nonresponses. The experimenter calculated IOA using the point-by-point agreement formula:  $\text{agreements} / (\text{agreements} + \text{disagreements}) * 100\%$ . An agreement was defined as both data collectors independently indicating a trial as an independent mand, prompted mand, incorrect mand, or nonresponse. IOA was assessed for 35% of sessions for each

## CONDITIONING PEERS

participant. Mean percentage agreement for Joel was 100%, Jeb was 100%, Cameron was 98% (range, 90%-100%), and Luke was 94% (range, 90%-100%).

**Procedural integrity.** The experimenter trained graduate and undergraduate students to proficiency to assess the accuracy of the experimenter's implementation of the mand-training procedures. The experimenter used similar procedures and reliability criteria as outlined in Experiment 1 to train the students. The procedural integrity score was calculated as the percentage of correct responses made by the experimenter during each mand-training session. The data collectors scored the accuracy of the experimenter (1) contriving the MO, (2) delivering the prescribed vocal prompt according to the prompt level, (3) providing the appropriate time delay according to the prompt level, and (4) delivering the appropriate consequence for independent mands (i.e., enthusiastic behavior-specific praise and 30-s access to the item). Procedural integrity was assessed for 35% of all mand-training sessions. Mean percentage of procedural integrity was 100% across participants. Point-by-point IOA was assessed for 35% of the procedural integrity data (refer Interobserver Agreement for formula). Mean percentage agreement for Joel was 100%, Jeb was 100%, Cameron was 98% (range, 95%-100%), and Luke was 98% (range, 95%-100%).

**Experimental design.** Experiment 2 was conducted as an alternating-treatments design embedded within a multiple-baseline-across-participants design. Conditions for Joel, Luke, and Jeb alternated between mand training with the conditioned peer and mand training with a novel peer. Conditions for Cameron alternated between mand training with a peer with a history of pairings and mand training with a novel peer. Each condition was associated with a different target mand (i.e., two high-preferred tangible items were identified, one item corresponding to each condition). Table 2 lists the target items and target mands for each participant.

## CONDITIONING PEERS

### **Procedures.**

**Preference assessment.** An MSWO preference assessment with tangible items was conducted. The preference assessment was conducted in the same manner outlined in Experiment 1. Two items were identified as high-preferred for each participant and were used as target items during mand training. Table 2 lists the high-preferred tangible items with the corresponding target mand.

**Baseline.** During each 10-trial mand-training session, the experimenter, participant, and peer were all seated in chairs or on the floor. The experimenter was seated between the participant and peer and both children were positioned to be facing one another. The experimenter began each trial by stating “You and (*insert peer’s name*) can play with this.” The experimenter gave the participant 30-s access to a high-preferred tangible item. If the participant ceased to engage with the item for 10 s during the 30-s access period, the experimenter modeled appropriate play for 3-5 s while saying, “You can play with it like this.” The experimenter provided a model of appropriate play once per trial, when applicable. If the participant attempted to move away from the peer or tangible item, the experimenter provided manual guidance to neutrally prompt the participant back to the original area.

After 30-s access, the experimenter stated, “It’s (*insert peer’s name*) turn to play.” The experimenter prompted the peer to say, “It’s my turn to play,” and removed the item from the participant. To ensure an immediate removal of the item and to minimize potential problem behavior by the participant, the experimenter provided manual guidance to aid the peer in neutrally removing the item. After the peer engaged with the item for 30 s, the experimenter prompted the peer to give her the item and ended the trial. The experimenter then began the next trial with the aforementioned procedures until the 10-trial session was completed.

## CONDITIONING PEERS

During each 10-trial session, the experimenter did not deliver any programmed consequences besides prompting the removal and delivery of the item based on 30-s access intervals. The experimenter ignored any problem behavior (e.g., screaming, crying, aggression) and continued with the current procedures. The experimenter also neutrally blocked any attempts of aggression between participant and peer.

If the participant emitted an independent mand, incorrect mand, or no response during the peer's 30-s access intervals, the experimenter ignored the response and recorded it on the data sheet. If an independent mand would have occurred at an average of 30% of trials during baseline, the experimenter would have discontinued the use of this item and would have selected another high-preferred tangible item for that participant. Additional baseline sessions would have been conducted using the novel item. None of the participants met this criterion.

***Mand training.*** During each 10-trial mand-training session, the experimenter, participant, and peer were seated in chairs or on the floor. The experimenter was seated between the participant and peer and both children were positioned to be facing one another. At the beginning of each trial, the experimenter allowed the participant free access to the high-preferred tangible item corresponding to that condition for 30 s. After the 30-s access, the experimenter stated, "It's (*insert peer's name*) turn to play." The experimenter prompted the peer to say, "It's my turn to play," and removed the item from the participant. To ensure an immediate removal of the item and to minimize potential problem behavior by the participant, the experimenter provided manual guidance to aid the peer in neutrally removing the item. The peer was prompted to keep the item within the participant's sight and to engage with the item for the entire 30-s access interval.

## CONDITIONING PEERS

The experimenter used most-to-least prompting with a time delay to teach the target mand by delivering vocal prompts (i.e., experimenter said the target mand), increasing the time delay prior to prompt delivery (i.e., experimenter waited a specified duration prior to saying the target mand), and systematically fading out these prompts to facilitate independent mands (e.g., experimenter moved from saying the target mand to only saying the first few letter sounds of the target mand). The delay to the prompt began once the item was removed and delivered to the peer. The prompt fading procedures were: Level 1, 0-s time delay with full-vocal prompt (e.g., experimenter immediately said “I want the flashlight, please”); Level 2, 1-s time delay with full-vocal prompt (e.g., experimenter waited 1 s before saying “I want the flashlight, please”); Level 3, 2-s time delay with full-vocal prompt (e.g., experimenter waited 2 s before saying “I want the flashlight, please”); Level 4, 3-s time delay with partial-vocal prompt (e.g., experimenter waited 3 s before saying “I want...”); Level 5, 4-s time delay with partial-vocal prompt (e.g., experimenter waited 4 s before saying “I want...”); Level 6, independent (e.g., experimenter delivered no vocal prompt).

After the participant emitted the target mand (independently or prompted) with at least 90% accuracy for one session according to the current prompt level, the experimenter increased the prompt level. If the participant had two consecutive sessions below 90% accuracy (independent and prompted responses), the experimenter decreased the prompt level. Prompt fading occurred independently during each condition (i.e., conditioned peer, peer with a history of pairings, novel peer) and based on participant acquisition (i.e., prompting levels changed in each condition based on performance in that condition).

During training, if the participant did not emit the target mand within 5 s after the initial vocal prompt or emitted a vocal response other than the target response, the experimenter

## CONDITIONING PEERS

delivered the vocal prompt again (up to three vocal prompts were delivered). If the participant engaged in the target mand following the second or third vocal prompt, the experimenter followed the procedures for delivery and removal of the item. If participant still did not use the target response after three vocal prompts, the experimenter allowed the peer to engage with the item for the remainder of the 30-s trial and then began a new trial.

If the participant emitted the target mand (e.g., “I want flashlight, please”), the experimenter delivered enthusiastic behavior-specific praise (e.g., “Great job asking (*insert peer’s name*) to play with the flashlight!”) on a FR 1 schedule and immediately prompted the peer to deliver the target item to the participant for the remainder of the 30-s trial.

As in baseline, if the participant attempted to move away from the peer or tangible item at any point during mand-training sessions, the experimenter provided manual guidance to neutrally prompt the participant back to the original area. The experimenter ignored any problem behavior (e.g., screaming, crying, aggression) that occurred during the removal and delivery of the item and continued with the current mand-training procedures. The experimenter also neutrally blocked any attempts of aggression between participant and peer.

### **Results and Discussion**

Figure 5 displays the results of mand training for Luke and Jeb. Luke and Jeb did not engage in any independent target mands during baseline. During mand training, Luke and Joel acquired the target mands similarly with the novel peer and conditioned peer. Luke acquired the target mand with the novel peer in six sessions and with the conditioned peer in seven sessions. Jeb acquired the target mand with the novel peer in five sessions and with the conditioned peer in six sessions.

## CONDITIONING PEERS

Figure 6 displays the results of mand training for Cameron and Joel. During baseline, neither Cameron nor Joel engaged in an independent target mand. Anecdotally, Cameron was the only participant to emit some sort of generalized mand (e.g., “Can I have a turn?”) for a few trials during baseline (i.e., across peers); whereas, none of the other participants emitted any relevant vocalization during baseline sessions (i.e., participants waited to receive access to the item after the peer’s access interval was complete). Once mand training began, Cameron acquired the target mand in the condition with a peer with a history of RS pairings in four sessions. In the condition with a novel peer, Cameron acquired the target mand in 13 sessions. On the other hand, Joel acquired the target mands simultaneously in four sessions with both the conditioned peer and the novel peer.

Prior to Experiment 2, all participants were able to mand for a variety of tangible items from adults in their natural environment. However, prior to the study, they were observed to rarely mand to their peers in their preschool classrooms. After mand training, participants reached the acquisition criterion for target mands with both a conditioned peer (Joel, Luke, Jeb) or a peer with a history of pairings (Cameron) and a novel peer. Cameron was the only participant for whom a target mand was acquired more efficiently with the peer with a history of pairings than the novel peer (i.e., a difference of nine sessions). Anecdotally, Cameron also engaged in several topographies of problem behavior (e.g., screaming, crying, aggression towards the experimenter) during sessions with the novel peer that were typically evoked by contriving the MO for the next mand-training trial (i.e., removing access of the tangible item from the participant). Cameron had a history of problem behavior maintained by access to preferred items. Therefore, the restriction of preferred items at the beginning of each trial may have evoked her problem behavior. On the other hand, Luke and Jeb acquired the target mands

## CONDITIONING PEERS

more efficiently with a novel peer than the conditioned peer; however, the difference of one session between the conditions may not be clinically relevant. Finally, Joel acquired the target mands with both peers (i.e., conditioned, novel) equally as efficiently.

Overall, results of Experiment 2 indicate that manding to a conditioned peer may be acquired just as quickly as manding to a novel peer. These results indicate that conditioning may not be necessary or beneficial for a learner to acquire mands to peers. Since all of the participants exhibited a strong manding repertoire prior to Experiment 2, the results may indicate that the strength of a learner's manding repertoire may be the primary indicator of success when teaching children with ASD to mand to peers. For these learners, the type of peer included during the training may be irrelevant. However, for some participants (Cameron), manding to a peer with a history of pairings may be acquired more quickly than manding to a novel peer. These results indicate that for some participants, conditioning may have a more clinically relevant role in manding to peers, particularly, with learners, such as Cameron, who exhibit problem behavior maintained by access to preferred items.

In summary, learners with a strong manding repertoire (i.e., directed towards adults) can both effectively and efficiently acquire mands to a conditioned peer, a peer with a history of pairings, and a novel peer. Experiment 2 replicates the findings in the current mand-training literature (Kodak et al., 2012; Paden et al., 2012; Taylor et al., 2005) in that learners who can effectively mand to adults in the natural environment can acquire manding to peers after mand training is implemented. The results also extend the literature by comparing the various histories of peers included in mand training (i.e., conditioned peer, peer with a history of pairings, novel peer) to then recommend if a specific history with a peer may increase or decrease the effectiveness of mand training.



## CONDITIONING PEERS

While conditioning peers is not necessary for learners to acquire manding to peers, future research should evaluate the role of conditioning in training other verbal behavior involving peers (i.e., intraverbals, conversational turn-taking) and social and play skills (i.e., turn-taking, cooperative play). For example, during intraverbal training with peers, the MO would not be present as in mand training. This could change the value for the presence of a specific peer and thus alter the role of conditioning during the intraverbal training (e.g., exchanging an intraverbal with a conditioned peer vs. a novel). Evaluating intraverbal training with conditioned and novel peers would also assess potential prerequisites for teaching more complex social skills (i.e., conversational turn-taking).

Second, future research should evaluate if conducting a brief series of pairings with a peer prior to including the peer in the mand training session may be beneficial for some learners. Prior to inclusion in the current study, Cameron had a history of receiving access to preferred items contingent on problem behavior. However, during Experiment 1, Cameron either received access to high-preferred edibles based on time (from the SS Peer) or contingent on compliance with a demand (from the RS Peer). Perhaps, in Experiment 2, Cameron responded to each corresponding peer based on her prior learning history with the RS Peer from Experiment 1 and the lack of direct pairing with the novel peer. Not only did Cameron engage in higher levels of manding with the RS Peer, but this peer was also associated with less problem behavior. Future research study could evaluate if conducting a brief series of pairings prior to mand training could decrease the level of problem behavior during acquisition as compared to a novel peer for learners with a history of problem behavior maintained by access to tangible items.

The results of the study also have several implications for clinicians. In general, for learners with a strong manding repertoire to adults, mand training to peers should be targeted

## CONDITIONING PEERS

during skill acquisition programming across both contrived and naturally occurring opportunities. For clinicians in an applied setting, it may not be feasible to conduct a substantial number of pairings (i.e., 1,000-2,000) prior to mand training. In many cases, a history of pairing may not be necessary (Jeb, Luke, Joel) to assist with mand acquisition to peers. However, for learners like Cameron, it may be beneficial to conduct pairings prior to training to reduce the likelihood of problem behavior occurring during mand training. Overall, if peers are available, particularly in an integrated setting, clinicians should be incorporating them across types of skill-acquisition programming.

### **General Discussion**

Despite the hypothesis that peers can potentially become conditioned reinforcers through mand-training trials (Kodak et al., 2012; Taylor et al., 2005), little research has directly assessed procedures that could establish peers as conditioned reinforcers. Dozier et al. (2012) evaluated RS and SS pairing to condition praise (i.e., social stimulus) as a reinforcer, and found that RS pairing was effective for half of the participants, but SS pairing was not effective with any participants.

Similar to Dozier et al. (2012), the results of Experiment 1 indicate that RS pairing may be more effective in conditioning peers as reinforcers when compared to SS pairing. Joel (with 800 pairings), Luke (with 200 pairings), and Jeb (with 1,400 pairings) all had a successfully conditioned peer using RS-pairing procedures. Luke was the only participant to have a successfully conditioned peer using SS pairing procedures (with 400 pairings). Neither Joel nor Jeb had a successfully conditioned peer after 1,000 and 2,000 SS pairings, respectively. Neither Cameron nor Matt had a successfully conditioned peer using SS or RS pairing after 2,000 and 1,000 pairings, respectively. Ashley also did not have a successfully conditioned peer (based on

## CONDITIONING PEERS

the conditioned reinforcement criterion) in either SS or RS pairing (with 1,000 pairings); however, the overall level of Ashley's post-pairing percent duration of session with peers increased compared to baseline levels, indicating a possible change in preference for peers as a result of pairing procedures.

The current study extends the literature by furthering the applied technology of conditioning social stimuli and evaluating comparisons of peers during mand training. Similar to Dozier et al. (2012), the results of the current study indicate idiosyncratic findings across participants. However, RS pairing was the more effective method of conditioning (i.e., 3 participants with a conditioned peer using RS, 1 participant with SS). It is possible that peers could hypothetically become conditioned peers through a series of mand-training trials. However, the likelihood of conditioning occurring is minimal due to the high number of pairings required to condition peers in comparison to the few number of mand-training trials necessary to acquire a mand during mand training. For example, Joel required 800 RS-pairing trials to establish a peer as a reinforcer, but acquired the mand in 40 trials. In addition, even if the peer becomes a conditioned reinforcer, this may not be essential during future mand training; mand training to conditioned peers may be just as effective as to novel peers.

To determine if a stimulus has become a conditioned reinforcer, the stimulus must maintain responding when delivered contingent on a novel target response. However, the current study measured the duration of time allocated to either a Peer or Alone condition when presented in a concurrent-operant arrangement, meaning the peer itself was not delivered contingent on a novel response. As mentioned in Dozier et al. (2012), the results of Experiment 1 may indicate that due to the history of pairings, peers may actually have functioned as discriminative stimuli as opposed to conditioned reinforcers, since the stimuli undergoing pairings (i.e., peers) could

## CONDITIONING PEERS

not be delivered contingent on a novel response in the absence of primary reinforcers. If peers are functioning as discriminative stimuli, peers would still be signaling the presence of reinforcement due to the history of pairings, which could facilitate future interactions in the natural environment.

Despite the hypothesis that conditioning peers may alter the effectiveness of mand training, the outcomes of Experiment 2 indicate that mand acquisition with a conditioned peer and with a novel peer may be similarly effective and efficient. Joel, Luke, and Jeb acquired the target mand in appropriately the same number of sessions across both conditioned peers and novel peers. However, Cameron acquired the target mand in fewer sessions with a peer with RS-pairing history than the unfamiliar peer. Anecdotally, Cameron was observed to engage in problem behavior during sessions with the novel peer. These results may indicate that if a learner is likely to engage in problem behavior evoked by denied access to a preferred item (i.e., contriving an MO during a mand-training trial), a peer with history (or a conditioned peer) may be more effective than a novel peer. The presence of a conditioned reinforcer or a stimulus with a history of being paired with reinforcement could decrease the aversiveness of denied access to a preferred item; thus, decreasing the likelihood of the learner to engage in problem behavior.

Recommendations for including “pairing” throughout clinical practice are commonplace, particularly within EIBI services. For example, prior to initiating skill-acquisition programming with a novel learner, a practitioner may suggest to therapists to conduct “pairings” in which the therapist provides the learner with time-based access to preferred tangible and edible items and praise. The recommendation is often suggested for the therapist to be “paired” with reinforcers, thus resulting in the therapist becoming more preferred or a conditioned reinforcer. This history

## CONDITIONING PEERS

with the therapist could facilitate the learner's success during skill-acquisition programming. However, little research has directly evaluated this recommendation.

Based on the current study, a primary limitation to the pairing recommendation is that a high number of pairings are likely required to condition social stimuli (peers) as reinforcers, which may be impractical in an applied setting. For example, Luke required the least number of pairings with 200 pairing trials. This is equivalent to approximately 3 hours of pairings. On the other hand, Jeb required 1,400 pairing trials, equating to approximately 18 hours of pairings. The majority of pairings occurring in a clinical environment appear to be SS (time-based delivery). However, the current study and previous literature (Dozier et al., 2012) indicate that RS pairing may be more effective than SS pairing. Not only would the number of pairings require additional time and resources (i.e., edible/tangible items), but practitioners should consider the manner in which the pairings are conducted and prioritize the use of RS pairing instead of SS pairing. Therefore, future studies should evaluate the practicality of conditioning (i.e., time, resources, RS as opposed to SS pairing) within an applied setting. Additionally, if the results of Cameron and Matt are representative of the effects of number of pairings on some participants, it may be that some participants may reach a state of satiation after a certain number of pairings, in which pairings no longer have positive effects on behavior and, in fact, decrease time allocated to peers. Finally, future studies could also evaluate the effects of conditioning on direct-care staff to see if pairing staff with reinforcers results in a decrease in problem behavior or an increase in cumulative mastered skill-acquisition targets. Future research could also evaluate the direct-care staff and learner's engagement to see if pairing has any results on engagement.

Future studies should evaluate if participants would allocate greater duration of time to peers in the natural environment (i.e., generalization) following pairing. For example, researchers

## CONDITIONING PEERS

could observe a participant and peer during free play (free access to tangible items) in a preschool classroom and measure the duration of time allocated to being near the peer or actually playing with the peer as opposed to playing alone or being removed from the peers (e.g., sitting to the side of the room by himself). Future studies could also evaluate if the pairing process should be conducted within a 1:1 type setting or could be conducted within the typical classroom setting and still have similar effects on learner behavior. In addition, researchers should evaluate any collateral increases in verbal behavior (e.g., mands, tacts, intraverbals) and play initiations towards peers as compared to baseline levels. Anecdotally, in the current study, several of the caregivers of the participants with a successfully conditioned peer reported that their children were discussing the conditioned peer in the home environment. In addition, a few of the caregivers scheduled “play dates” with the participant and conditioned peer outside of the current study. If an increase in time with a conditioned peer does generalize to the natural environment, additional studies could then compare the effectiveness and efficiency of prompting other relevant skills (e.g., tacts, intraverbals, play) as compared to novel peers.

In summary, Experiment 1 extends the current literature by attempting to condition a social stimulus (i.e., peers) by comparing RS and SS-pairing procedures. Similar to previous studies (Dozier et al., 2012), the results indicate that RS pairings may be more effective (i.e., 3 of 6 participants) and efficient (i.e., Luke) than SS pairings. In addition, Experiment 2 replicates the current findings that mand training to peers can be successful across multiple participants (Kodak et al., 2012; Paden et al., 2012; Taylor et al., 2005) and extends the literature by comparing types of peers that may or may not promote faster acquisition during mand training. Results indicate that mand training involving conditioned peers may be just as effective as novel peers.

## CONDITIONING PEERS

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Barlow, K. E., Tiger, J. H., Slocum, S. K., & Miller, S. J. (2013). Comparing acquisition of exchange-based and signed mands with children with autism. *Analysis of Verbal Behavior, 29*(1), 59-69.
- Betz, A. M., Higbee, T. S., & Pollard, J. S. (2010). Promoting generalization of mands for information used by young children with autism. *Research in Autism Spectrum Disorders, 4*, 501-508. doi:10.1016/j.rasd.2009.11.007
- Bourret, J., Vollmer, T., & Rapp, J. (2004). Evaluation of a vocal mand assessment and vocal mand training procedures. *Journal of Applied Behavior Analysis, 37*, 129-144. doi: 10.1901/jaba.2004.37-129
- Bowen, C. N., Shillingsburg, M. A., & Carr, J. E. (2012). The effects of the question “what do you want?” on the mand training outcomes of children with autism. *Journal of Applied Behavior Analysis, 45*, 833-838. doi: 10.1901/jaba.2012.45-833
- Buckley, S. D., & Newchok, D. K. (2005). Differential impact of response effort within a response chain on use of mands in a student with autism. *Research in Developmental Disabilities, 26*, 77-85. doi:10.1016/j.ridd.2004.07.004
- Catania, A. C. (1998). *Learning*. Upper Saddle River, NJ: Prentice Hall.
- Carnett, A., Raulston, T., Lang, R., Tostanoski, A., Lee, A., Sigafos, J., & Machalicek, W. (2014). Effects of a perseverative interest-based token economy on challenging and on task behavior in a child with autism. *Journal of Behavioral Education, 23*, 368-377. doi: 10.1007/s10864-014-9195-7



## CONDITIONING PEERS

- Chaabane, D. B., Alber-Morgan, S. R., & DeBar, R. M. (2009). The effects of parent implemented PECS training on improvisation of mands by children with autism. *Journal of Applied Behavior Analysis, 42*, 671-677. doi: 10.1901/jaba.2009.42-671
- Davis, B. J., Kahng, S. W., & Coryat, K. (2012). Manipulating motivating operations to facilitate the emergence of mands for a child with autism. *Analysis of Verbal Behavior, 28*(1), 145–150.
- DeFulio, A., Yankelevitz, R., Bullock, C., & Hackenberg, T. D. (2014). Generalized conditioned reinforcement with pigeons in a token economy. *Journal of the Experimental Analysis of Behavior, 102*, 26-46. doi: 10.1002/jeab.94
- DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis, 29*, 519-533. doi:10.1901/jaba.1996.29-519
- DiCiano, P., & Everitt, B. J. (2004). Conditioned reinforcing properties of stimuli paired with self-administered cocaine, heroin or sucrose: Implications for the persistence of addictive behaviour. *Neuropharmacology, 47*, 202-213. doi: 10.1016/j.neuropharm.2004.06.005
- Dozier, C. L., Iwata, B. A., Thomason-Sassi, J., Worsdell, A. S., & Wilson, D. M. (2012). A comparison of two pairing procedures to establish praise as a reinforcer. *Journal of Applied Behavior Analysis, 45*, 721-735. doi: 10.1901/jaba.2012.45-721
- Esch, B. E., Carr, J. E., & Grow, L. L. (2009). Evaluation of an enhanced stimulus-stimulus pairing procedure to increase early vocalizations of children with autism. *Journal of Applied Behavior Analysis, 42*, 225-241. doi: 10.1901/jaba.2009.42-225
- Falcomata, T. S., Wacker, D. P., Ringdahl, J. E., Vinqvist, K., & Dutt, A. (2013). An evaluation of generalization of mands during functional communication training. *Journal of Applied*

## CONDITIONING PEERS

*Behavior Analysis*, 46, 444-454. doi: 10.1002/jaba.37

Filcheck, H. A., McNeil, C. B., Greco, L. A., & Bernard, R. S. (2004). Using a whole-class token economy and coaching of teacher skills in a preschool classroom to manage disruptive behavior. *Psychology in the Schools*, 41, 351-361. doi: 10.1002/pits.10168

Fisher, W. W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis*, 25, 491-498.  
doi:10.1901/jaba.1992.25-491

Forde, I., Holloway, J., Healy, O., & Brosnan, J. (2011). A dyadic analysis of the effects of setting and communication partner on elicited and spontaneous communication of children with autism spectrum disorder and typically developing children. *Research in Autism Spectrum Disorders*, 5, 1471-1478. doi:10.1016/j.rasd.2011.02.008

Greer, R. D., Pistoljevic, N., Cahill, C., & Du, L. (2011). Effects of conditioning voices as reinforcers for listener responses on rate of learning, awareness, and preferences for listening to stories in preschoolers with autism. *Analysis of Verbal Behavior*, 27(1), 103-124.

Gregory, M. K., DeLeon, I. G., & Richman, D. M. (2009). The influence of matching and motor-imitation abilities on rapid acquisition of manual signs and exchange-based communicative response. *Journal of Applied Behavior Analysis*, 42, 399-404. doi: 10.1901/jaba.2009.42-399

Groskreutz, N. C., Groskreutz, M. P., Bloom, S. E., & Slocum, T. A. (2014). Generalization of negatively reinforced mands in children with autism. *Journal of Applied Behavior Analysis*, 47, 560-579. doi: 10.1002/jaba.151

## CONDITIONING PEERS

- Gutierrez, A., Vollmer, T. R., Dozier, C. L., Borrero, J. C., Rapp, J. T., Bourret, J. C., & Gadaire, D. (2007). Manipulating establishing operations to verify and establish stimulus control during mand training. *Journal of Applied Behavior Analysis, 40*, 645-658. doi: 10.1901/jaba.2007.645-658
- Hall, G. A., & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *Analysis of Verbal Behavior, 5*(1), 41–53.
- Harding, J. W., Wacker, D. P., Berg, W. K., Winborn-Kemmerer, L., & Lee, J. F. (2009). Evaluation of choice allocation between positive and negative reinforcement during functional communication training with young children. *Journal of Developmental and Physical Disabilities, 21*, 443-456. doi: 10.1007/s10882-009-9155-7
- Hartman, E. C., & Klatt, K. P. (2005). The effects of deprivation, pre-session exposure, and preferences on teaching manding to children with autism. *Analysis of Verbal Behavior, 21*(1), 135–144.
- Ingvarsson, E. T. (2011). Parent-implemented mand-training: Acquisition of framed manding in a young boy with partial hemispherectomy. *Journal of Applied Behavior Analysis, 44*, 205-209. doi: 10.1901/jaba.2011.44-205
- Jennett, H. K., Harris, S. L., & Dehnolino, L. (2008). Discrete trial instruction vs. mand training for teaching children with autism to make requests. *Analysis of Verbal Behavior, 24*(1), 69-85.
- Kazdin, A. E., & Bootzin, R. R. (1972). The token economy: An evaluative review. *Journal of Applied Behavior Analysis, 5*, 343-372. doi: 10.1901/jaba.1972.5-343
- Kodak, T., Paden, A., & Dickes, N. (2012). Training and generalization of peer-directed mands with non-vocal children with autism. *Analysis of Verbal Behavior, 28*(1), 119-124.

## CONDITIONING PEERS

- Kooistra, E. T., Buchmeier, A. L., & Klat, K. P. (2012). The effect of motivating operations on the transfer from tacts to mands for children diagnosed with autism. *Research in Autism Spectrum Disorders, 6*, 109-114. doi:10.1016/j.rasd.2011.03.010
- Krstovska-Guerrero, I., & Jones, E. A. (2013). Join attention autism: Teaching smiling coordinated with gaze to respond to joint attention bids. *Research in Autism Spectrum Disorders, 7*, 93-108. doi: 10.1016/j.rasd.2012.07.007
- LeBlanc, L. A., Hagopian, L. P., & Maglieri, K. A. (2000). Use of a token economy to eliminate excessive inappropriate social behavior in an adult with developmental disabilities. *Behavioral Interventions, 15*, 135-143. doi: 10.1002/(SICI)1099-078X(200004/06)15:2<135::AID-BIN51>3.0.CO;2-3
- Lechago, S. A., Carr, J. E., Grow, L. L., Love, J. R., & Almason, S. M. (2010). Mands for information generalize across establishing operations. *Journal of Applied Behavior Analysis, 43*, 381-395. doi: 10.1901/jaba.2010.43-381
- Lechago, S. A., Howell, A., Caccavale, M. N., & Peterson, C. W. (2013). Teaching 'how?' mand-for-information frames to children with autism. *Journal of Applied Behavior Analysis, 46*, 781-791. doi: 10.1002/jaba.71
- Lerman, D. C., Iwata, B. A., Rainville, B., Adelinis, J. D., Crosland, K., Kogan, J. (1997). Effects of reinforcement choice on task responding in individuals with developmental disabilities. *Journal of Applied Behavior Analysis, 30*, 411-422. doi: 10.1901/jaba.1997.30-411
- Lovaas, O. I. (2003). *Teaching individuals with developmental delays: Basic intervention techniques*. Austin, TX: Pro-Ed.

## CONDITIONING PEERS

- Maggin, D. M., Chafouleas, S. M., Goddard, K. M., & Johnson, A. H. (2011). A systematic evaluation of token economies as a classroom management tool for students with challenging behavior. *Journal of School Psychology, 49*, 529-554. doi: 10.1016/j.jsp.2011.05.001
- Marion, C., Martin, G. L., Yu, C. T., Buhler, C., Kerr, D., & Claeys, A. (2012). Teaching children with autism spectrum disorder to mand for information using 'which?'. *Journal of Applied Behavior Analysis, 45*, 865-870. doi: 10.1901/jaba.2012.45-865
- Matson, J. L., & Boisjoli, J. A. (2009). The token economy for children with intellectual disability and/or autism: A review. *Research in Developmental Disabilities, 30*, 240, 248. doi:10.1016/j.ridd.2008.04.001
- Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior, 37*, 149-155. doi:10.1901/jeab.1982.37-149
- Miguel, C. F., Carr, J. E., & Michael, J. (2002). The effects of a stimulus-stimulus pairing procedure on the vocal behavior of children diagnosed with autism. *Analysis of Verbal Behavior, 18*(1), 3-13.
- Moss, G. R., & Rick, G. R. (1981). Application of a token economy for adolescents in a private psychiatric hospital. *Behavior Therapy, 12*, 585-590. doi: 10.1016/S0005-7894(81)80099-8
- Nigro-Bruzzi, D., & Sturmey, P. (2010). The effects of behavioral skills training on mand training by staff and unprompted vocal mands by children. *Journal of Applied Behavior Analysis, 43*, 757-761. doi: 10.1901/jaba.2010.43-757

## CONDITIONING PEERS

- Paden, A. R., Kodak, T., Fisher, W. W., Gawley-Bullington, E. M., & Bouxsein, K. (2012). Teaching children with autism to engage in peer-directed mands using a picture exchange communication system. *Journal of Applied Behavior Analysis, 45*, 425-429. doi: 10.1901/jaba.2012.45-425
- Petursdottir, A. E., Carp, C. L., Matthies, D. W., & Esch, B. E. (2011). Analyzing stimulus-stimulus pairing effects on preferences for speech sounds. *Analysis of Verbal Behavior, 27*(1), 45-60.
- Piazza, C. C., Fisher, W. W., Hagopian, L. P., Bowman, L. G., & Toole, L. (1996). Using a choice assessment to predict reinforcer effectiveness. *Journal of Applied Behavior Analysis, 29*, 1-9. doi:10.1901/jaba.1996.29-1
- Roane, H. S., Lerman, D. C., & Vorndran, C. M. (2001). Assessing reinforcers under progressive schedule requirements. *Journal of Applied Behavior Analysis, 34*, 145-167. doi:10.1901/jaba.2001.34-145
- Roane, H. S., Vollmer, T. R., Ringdahl, J. E., & Marcus, B. (1998). Evaluation of a brief stimulus preference assessment. *Journal of Applied Behavior Analysis, 34*, 73-76. doi: 10.1901/jaba.1998.31-605
- Roy-Wsiaki, G., Marion, C., Martin, G. L., & Yu, C. T. (2010). Teaching a child with autism to request information by asking 'What?'. *Developmental Disabilities Bulletin, 38*(2), 55-74.
- Ruskin, R. S., & Maley, R. F. (1972). Item preference in a token economy ward store. *Journal of Applied Behavior Analysis, 5*, 373-378. doi: 10.1901/jaba.1972.5-373
- Shillingsburg, A. M., Powell, N. M., & Bowen, C. N. (2013). Teaching children with autism spectrum disorders to mand for the removal of stimuli that prevent access to preferred items. *Analysis of Verbal Behavior, 29*(1), 51-57.

## CONDITIONING PEERS

Shillingsburg, A. M., & Valentino, A. L. (2011). Teaching a child with autism to mand for information using 'how.' *Analysis of Verbal Behavior*, 27(1), 179-184.

Sidener, T. M., Shabani, D. B., Carr, J. E., & Roland, J. P. (2006). An evaluation of strategies to maintain mands at practical levels. *Research in Developmental Disabilities*, 27, 632-644. doi:10.1016/j.ridd.2005.08.002

Skinner, B. F., (1938). *The behavior of organisms: An experimental analysis*. Oxford, England: Appleton-Century.

Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.

Sundberg, M. L., Loeb, M., Hale, L., & Eigenheer, P. (2002). Contriving establishing operations to teach mands for information. *Analysis of Verbal Behavior*, 18(1), 15-29.

Sundberg, M. L., & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification*, 25, 698-724. doi: 10.1177/0145445501255003

Sundberg, M. L., & Partington, J. W. (1998). *Teaching language to children with autism or other developmental disabilities*. Danville, CA: Behavior Analysts, Inc.

Taylor, B. A., Hoch, H., Potter, B., Rodriguez, A., Spinnato, D., & Kalaigian, M. (2005). Manipulating establishing operations to promote initiations towards peers in children with autism. *Research in Developmental Disabilities*, 26, 385-392. doi:10.1016/j.ridd.2004.11.003

Vaughan, M. E., & Michael, J. (1982). Automatic reinforcement: An important but ignored concept. *Behaviorism*, 10(2), 217-227.

Winborn, L., Wacker, D. P., Richman, D. M., Asmus, J., & Geier, D. (2002). Assessment of mand selection for functional communication training packages. *Journal of Applied*

## CONDITIONING PEERS

*Behavior Analysis*, 35, 295-298. doi: 10.1901/jaba.2002.35-295

Wolfe, B. D., Dattilo, J., & Gast, D. L. (2003). Effects of a token economy system within the context of cooperative games on social behaviors of adolescents with emotional and behavioral disorders. *Therapeutic Recreation Journal*, 37(1), 124-141.

Wong, C. S. (2013). A play and joint attention intervention for teachers of young children with autism: A randomized controlled pilot study. *Autism*, 17, 340-357. doi: 10.1177/1362361312474723

Yi, J. I., Christian, L., Vittimberga, G., & Lowenkron, B. (2006). Generalized negatively reinforced manding in children with autism. *Analysis of Verbal Behavior*, 22(1), 21-33.

Ziomek, M. M., & Rehfeldt, R. A. (2008). Investigating the acquisition, generalization, and emergence of untrained verbal operants for mands acquired using the Picture Exchange Communication System in adults with severe developmental disabilities. *Analysis of Verbal Behavior*, 24(1), 15-30.



## CONDITIONING PEERS

Table 1

*Experiment 1: Participant Demographics*

Participant	Age	Gender	Race	Diagnosis
Joel	5 yr 5 mo	Male	Asian	Autism
Luke	4 yr 3 mo	Male	African American	Developmental Disability
Jeb	5 yr 3 mo	Male	Caucasian	Autism
Cameron	5 yr 8 mo	Female	Hispanic	Developmental Disability
Ashley	4 yr 11 mo	Female	Caucasian	Other Health Impairment
Matt	5 yr 10 mo	Male	Middle Eastern	Developmental Disability

## CONDITIONING PEERS

Table 2

*Target Items and Mands*

Participant	Conditioned/Peer with History		Novel Peer	
	Target Item	Target Mand	Target Item	Target Mand
Joel	Massager	“I want the shaky toy, please.”	Sticky blocks	“I want the blocks, please.”
Luke	Light spinner	“I want the light spinner, please.”	Massager	“I want the shaky toy, please.”
Jeb	Musical steering wheel	“I want the driving toy, please.”	Spinning bead maze	“I want the spinning beads, please.”
Cameron	Sticky blocks	“I want the blocks, please.”	Musical safari flashlight	“I want the flashlight, please.”

# CONDITIONING PEERS

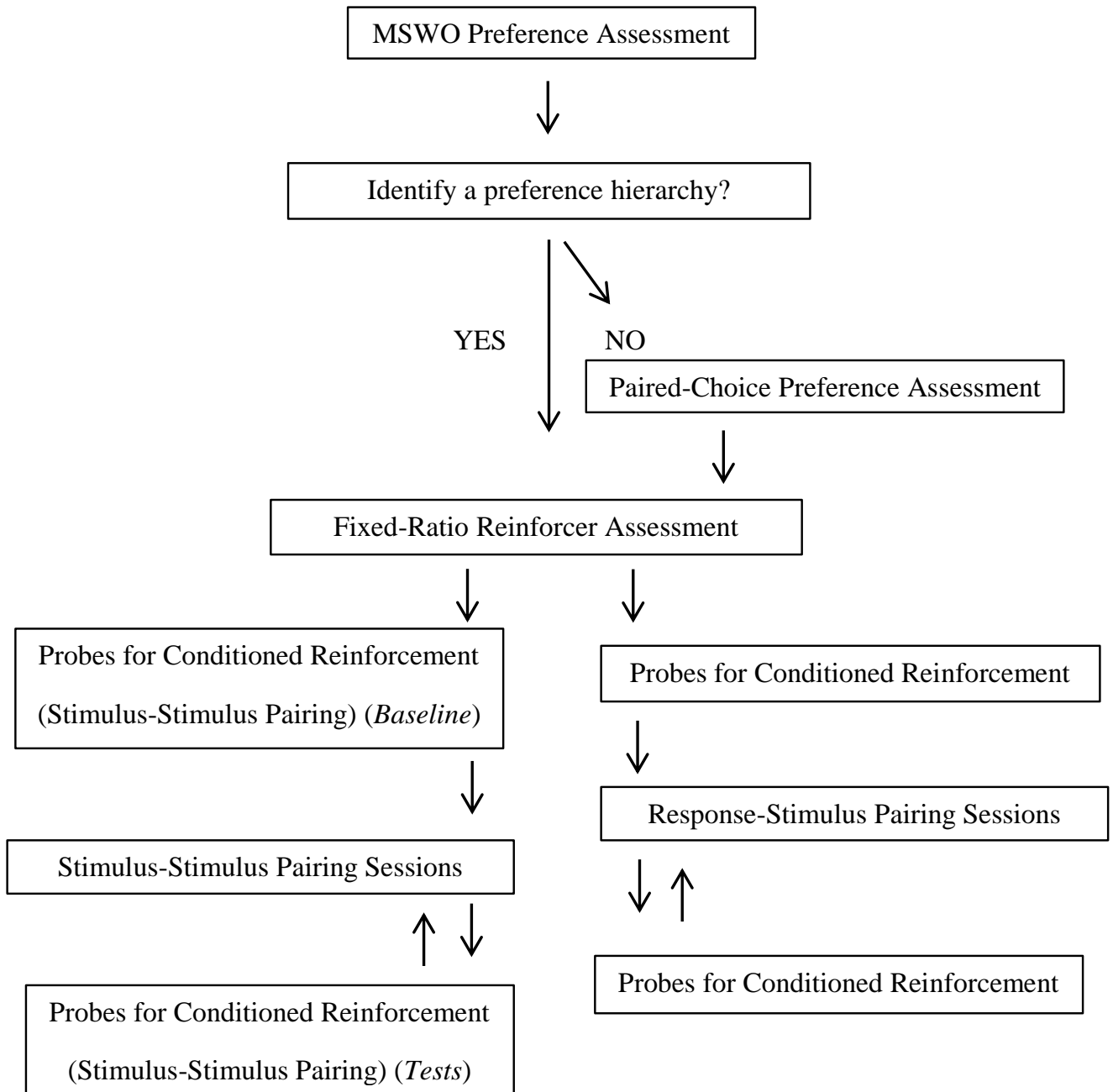


Figure 1. Sequence of procedures for Experiment 1: Conditioning Peers as Reinforcers.

CONDITIONING PEERS

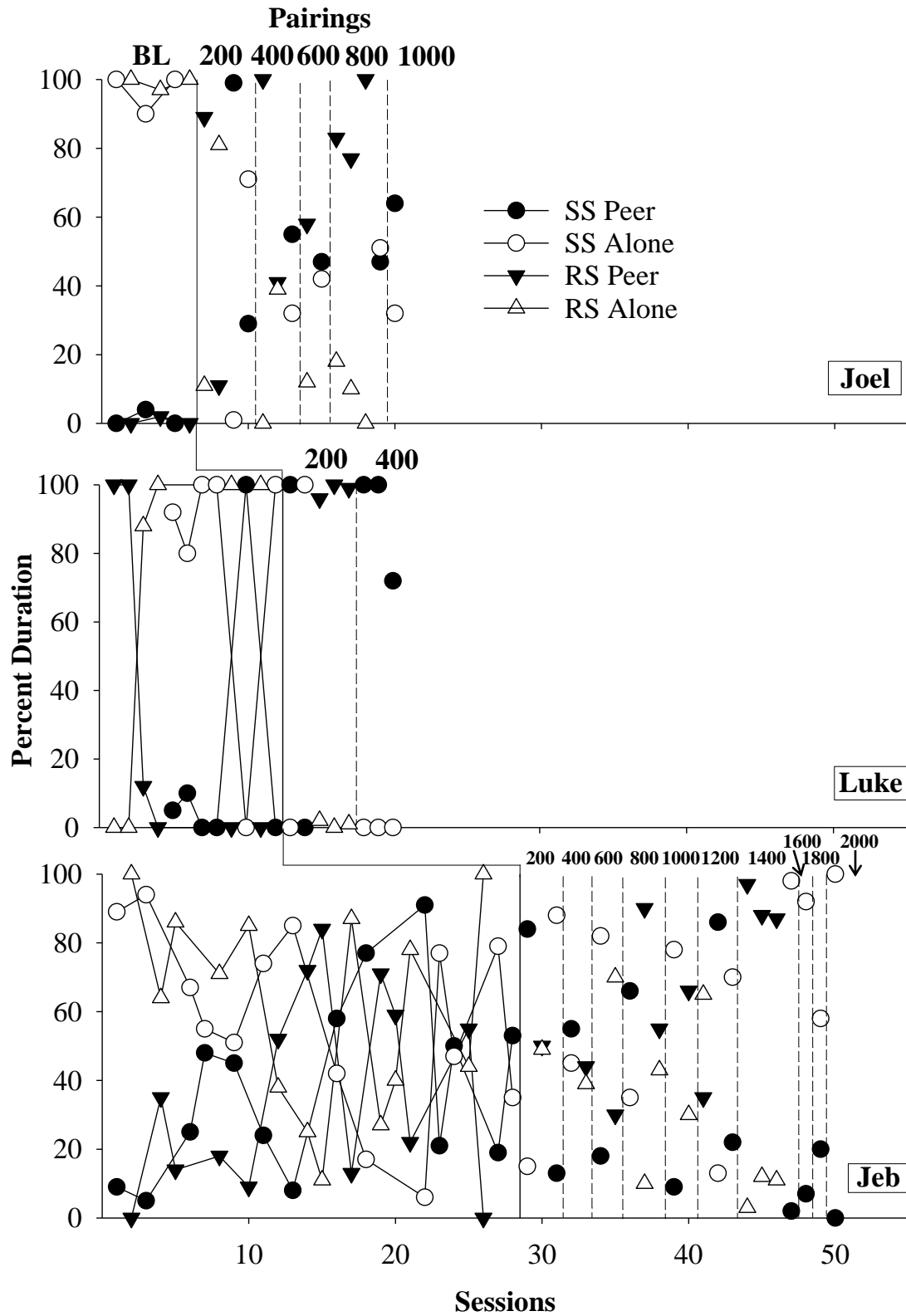


Figure 2. Conditioning Peers as Reinforcers: Probes for conditioned reinforcement for Joel (top panel), Luke (middle panel), and Jeb (bottom panel).

CONDITIONING PEERS

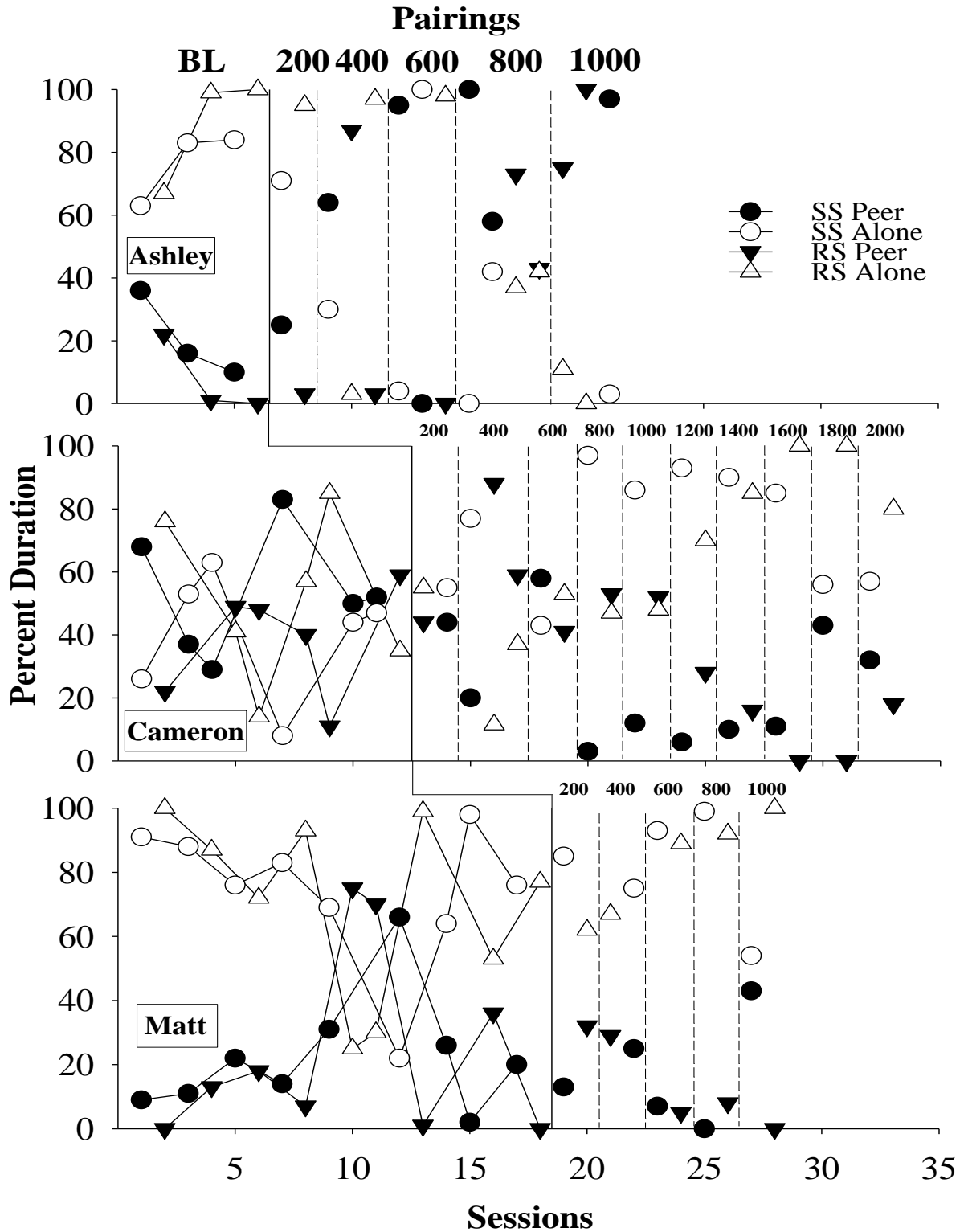


Figure 3. Conditioning Peers as Reinforcers: Probes for conditioned reinforcement for Ashley (top panel), Cameron (middle panel), and Matt (bottom panel).

## CONDITIONING PEERS

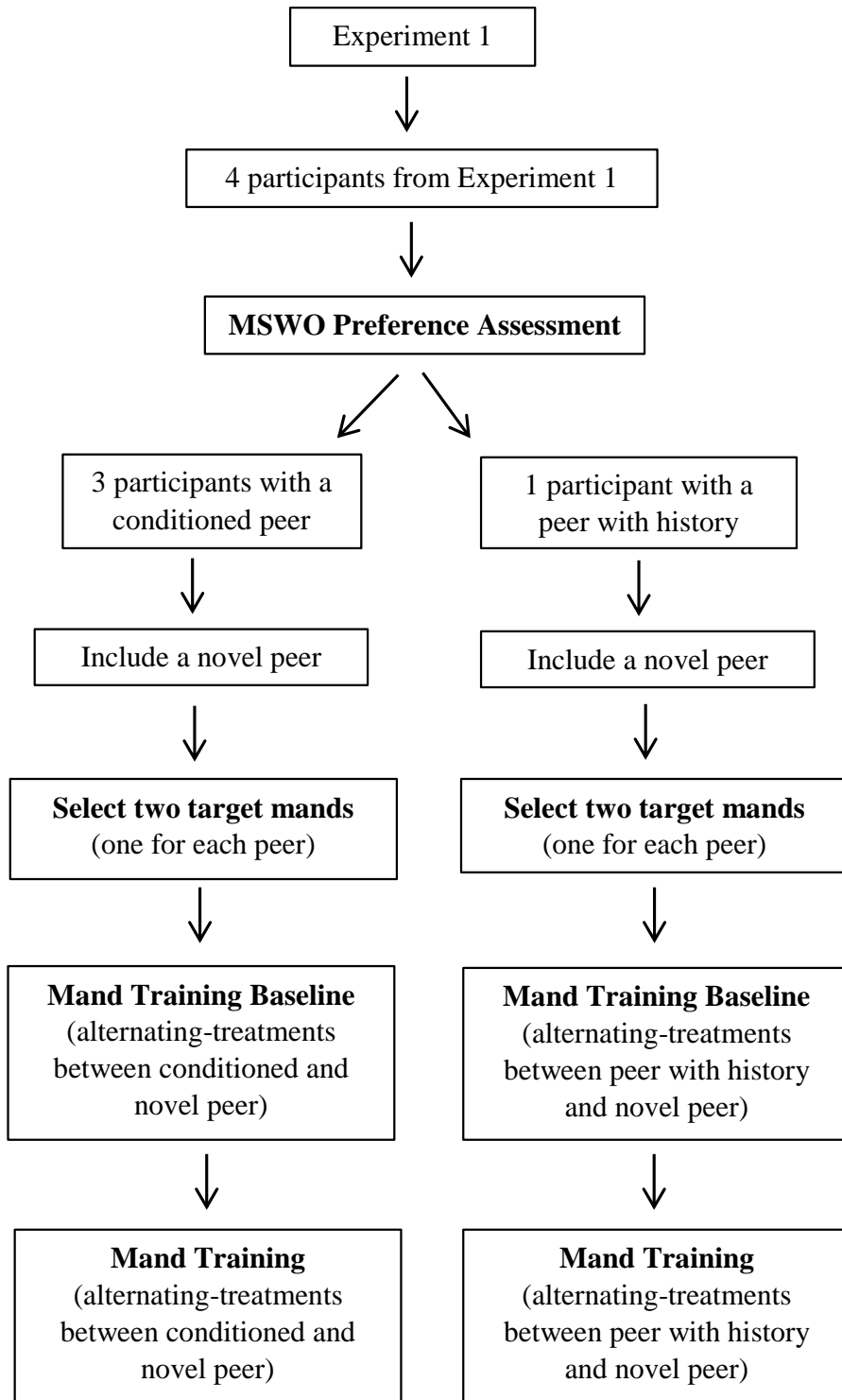


Figure 4. Sequence of procedures for Experiment 2: Mand Training.

CONDITIONING PEERS

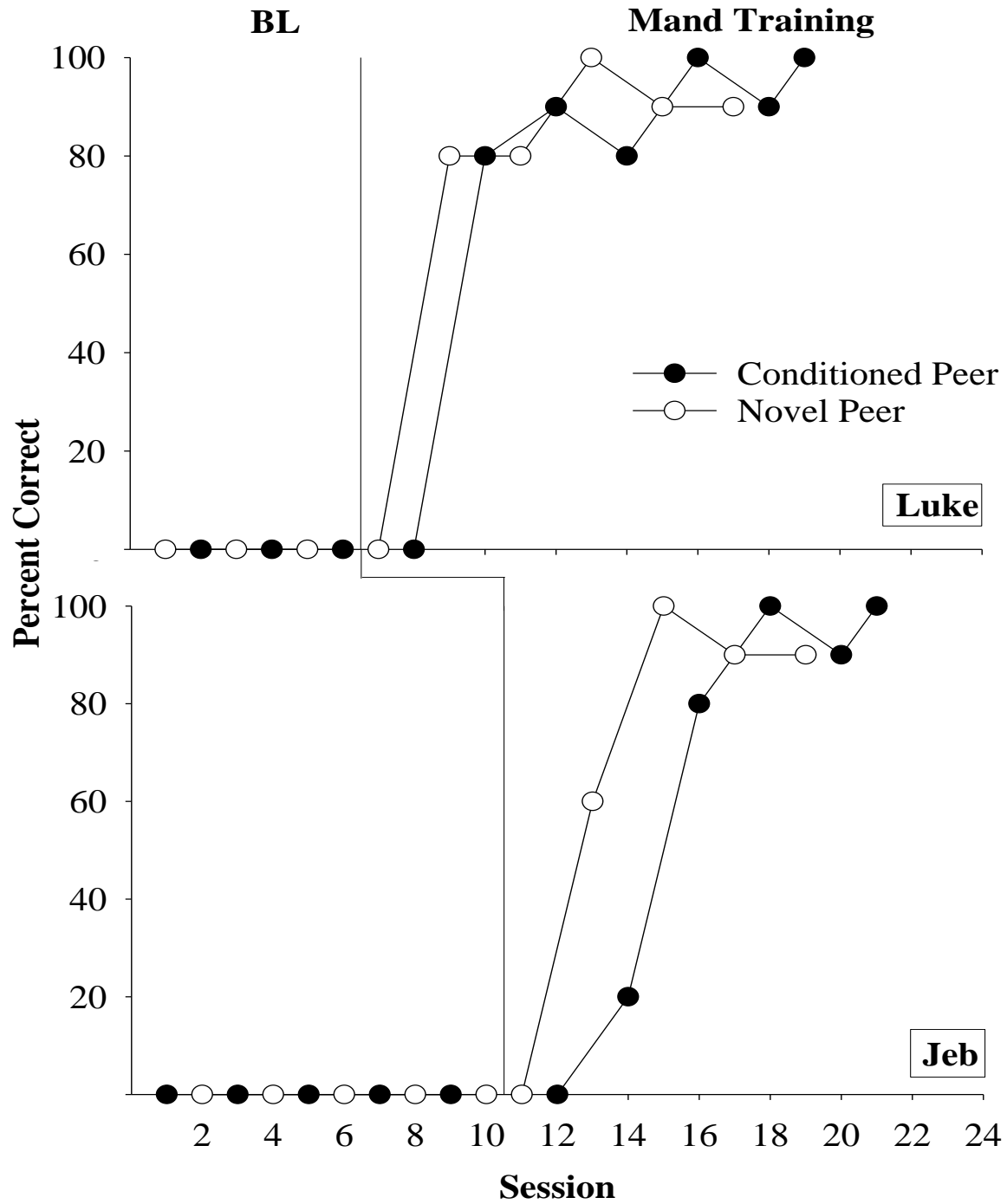


Figure 5. Mand Training: Baseline and acquisition during mand training for Luke (top panel) and Jeb (bottom panel).

CONDITIONING PEERS

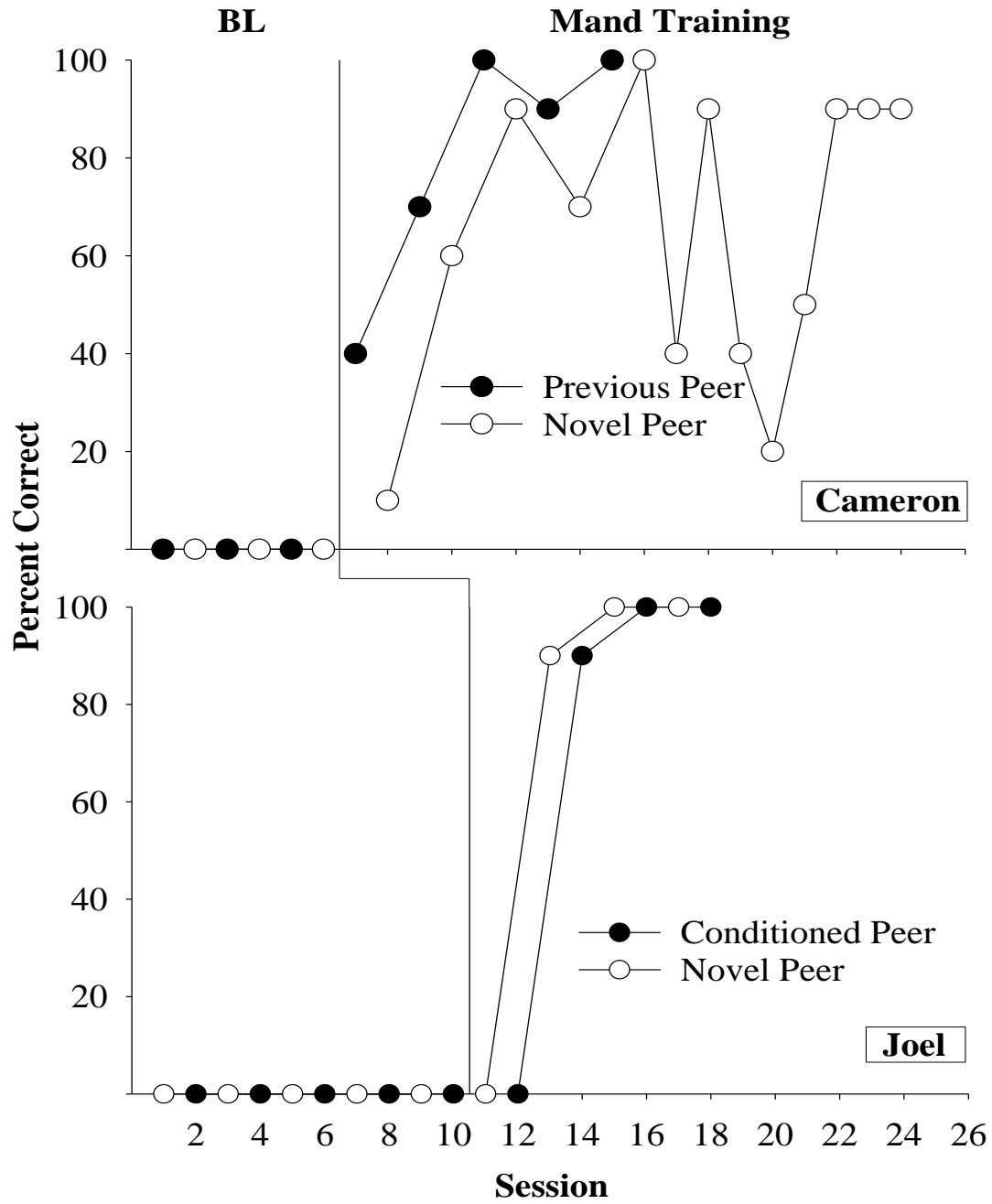


Figure 6. Mand Training: Baseline and acquisition during mand training for Cameron (top panel) and Joel (bottom panel).