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Does teaching an omnibus mand preclude the development of specifying mands?

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Does Teaching an Omnibus Mand Preclude the Development of Specifying Mands?

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Abstract

When problem behavior is controlled by a synthesized reinforcement contingency, a simple omnibus mand that yields access to all reinforcers simultaneously has been shown to effectively replace problem behavior. The question arises as to whether teaching an omnibus mand will preclude the acquisition of specifying mands for each of the combined reinforcers. In this study, after three students diagnosed with autism acquired an omnibus mand ("My way, please") that yielded all identified reinforcers simultaneously, we attempted to teach specifying mands (e.g., "All done," "Play with me," and "May I have my toys?") to yield each individual reinforcer (e.g., escape, attention, and tangibles). Problem behavior was immediately eliminated for all children, and the omnibus mand was acquired quickly. Teaching an omnibus mand did not preclude acquisition of specifying mands for any learner and instead allowed for the acquisition of specifying mands once problem behavior had been effectively reduced.

Keywords: functional analysis, functional communication training, generalized mand, omnibus mand, problem behavior, shaping, synthesized contingency

Efficacy of Teaching an Omnibus Mand Prior to Specifying Mands

Individuals diagnosed with autism spectrum disorder (ASD) often engage in problem behavior (Murphy, Healy, & Leader, 2009) and are more likely to engage in problem behavior than children diagnosed with other disabilities (Farmer & Aman, 2011). When treating problem behavior, better initial effects are obtained when a functional analysis informs behavioral intervention (Austin, Groves, Reynish, & Francis, 2015; Campbell, 2003; Herzinger & Campbell, 2007; Iwata, Pace, Cowdery, & Miltenberger, 1994). From functional analyses, problem behavior has been demonstrated to be controlled by single reinforcement contingencies such as escape from demands (Lalli, Casey, & Kates, 1995; Volkert, Lerman, Call, & Trosclair-Lasserre, 2009), access to tangible items (e.g., Betz, Fisher, Roane, Mintz, & Owen, 2013), and access to social attention (e.g., Betz et al., 2013). Problem behavior has also been demonstrated to be controlled by multiple reinforcement contingencies (e.g., escape from demands and access to tangibles, Volkert et al., 2009; escape from demands and access to social attention, Asmus et al., 2004; access to attention, escape, and tangibles, Lalli & Casey, 1996). Additionally, problem behavior has been shown to be controlled by combined or synthesized reinforcement contingencies (e.g., access to tangibles *and* attention, Hanley, Jin, Vanselow, & Hanratty, 2014; Rose & Beaulieu, 2018; escape *from* demands *to* tangibles and attention, Fisher, Greer, Romani, Zangrillo, & Owen, 2016; Ghaemmaghami, Hanley, Jin, & Vanselow, 2016; escape from prompts *to* engage in incompatible behavior *and* access to preferred activities, Hagopian, Bruzek, Bowman, & Jennett, 2007; escape from demands *to* tangibles, Taylor, Phillips, & Gertzog, 2018; escape from instruction *to* interactive play, Jessel, Ingvarsson, Metras, Kirk, & Whipple, 2018).

In fact, published demonstrations of control by multiple and synthesized reinforcement contingencies have increased in recent years. For instance, the proportion of analyses showing multiple control of problem behavior rose across two comprehensive reviews of the functional analysis literature. Hanley, Iwata, and McCord (2003) reported 15% of analyses showing multiple control, whereas Beavers, Iwata, and Lerman (2013) reported 24% of analyses showing multiple control. A more recent review of the functional assessment and treatment literature by Slaton and Hanley (2018) revealed that control by synthesized contingencies has been repeatedly shown in the literature since 1997, but the trend in published analyses showing sensitivity to synthesized reinforcement contingencies sharply increased in 2014, and this sharp trend continued through 2017. Control by synthesized reinforcement contingencies was evident and tacted by the authors of at least 120 published functional analyses (Slaton & Hanley, 2018), with more analyses showing control by synthesized reinforcement evident from the described methods, although not tacted by the authors. The extent to which the contingency influencing problem behavior consists of synthesized reinforcers has important implications for treatment.

Functional communication training (FCT) is a regularly used treatment following analyses showing control by social reinforcement (Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998; Heath, Ganz, Parker, Burke, & Ninci, 2015; Horner & Day, 1991; Kurtz, Boelter, Jarmolowicz, Chin, & Hagopian, 2011; Wacker et al., 2017; for comprehensive reviews see Durand & Moskowitz, 2015; Hagopian, Boelter, & Jarmolowicz, 2011; Tiger, Hanley, & Bruzek, 2008). Ghaemmaghami and Hanley (in press) most recently reported 601 applications of FCT being published between 1985 and 2017. FCT involves teaching a socially acceptable response referred to often as a functional communication response (FCR), an alternative response, or mand that results in the reinforcer that was shown to influence problem behavior

from a pre-treatment functional analysis. Problem behavior is usually placed on extinction while an FCR is being taught (Hagopian et al., 1998; Kurtz et al., 2011; Tiger et al. 2008).

When a functional analysis suggests problem behavior maintained by a single reinforcer, a single response is taught to access that particular reinforcer (or a proxy of that reinforcer, such as a different type of attention or a different edible reinforcer). This response commonly specifies the reinforcer, presumably to increase the odds of reinforcement from others (Durand, 1999; Durand & Carr, 1991; Durand & Carr, 1992). For example, Volkert et al. (2009) showed that problem behavior was sensitive to escape from demands for three participants diagnosed with ASD or another developmental disability. Two participants were taught the American Sign language manual sign "break," and another was taught to pull and present a card on a retractable string attached to his waist; emission of the FCR resulted in removal of the demands. Hagopian, Contrucci Kuhn, Long, and Rush (2005) taught two participants diagnosed with varying disabilities a single FCR to yield specific positive reinforcers shown to influence problem behavior. The authors taught one participant to access interaction with the therapist with the response "I need your attention" and another participant to exchange a picture of video games to access video games. However, as noted above, problem behavior may be controlled by more than one reinforcer (Falcomata, Muething, Gainey, Hoffman, & Fragale, 2013; Lalli & Casey, 1996) or to a combination of reinforcers (Ghaemmaghami, Hanley, & Jessel, 2016; Santiago, Hanley, Moore, & Jin, 2016; Slaton, Hanley, & Raftery, 2017). Outcomes of studies showing control by multiple or synthesized contingencies present different ways to implement FCT, somewhat complicating an otherwise straightforward process of differential reinforcement.

When problem behavior is shown to be under multiple control, it is often unclear how FCT is implemented (e.g., Asmus et al., 2004; Volkert et al., 2009). For instance, in a review of

138 cases receiving a functional analysis in a short-term inpatient facility, Asmus et al. reported that problem behavior was sensitive to both positive and negative social reinforcement in 40% of cases. Participants were then taught FCRs while problem behavior was placed on extinction. Additional treatment components (e.g., punishment) were included in some cases. The authors did not provide details specifying whether both or all FCRs were taught simultaneously in a single session or if communicative responses were taught in separate sessions. In other studies describing FCT for multiply determined problem behavior, it appears that different FCRs were taught for each reinforcer in separate sessions. For instance, Austin and Tiger (2015) taught a 13-year-old boy to say, "Excuse me" in *attention sessions* and "May I have the Xbox?" in *tangible sessions* but steps to integrate the FCRs for implementation in a single context, an inevitable circumstance under which FCT will need to be implemented (i.e., the ecology in which problem behavior was learned), were not described[1].

When problem behavior is shown to be sensitive to a synthesized reinforcement contingency (SRC), authors have described two different ways to implement FCT, and there is, as yet, no guidance for considering which way to teach FCRs when multiple reinforcers are needed to fulfill the reinforcement contingency maintaining problem behavior. One way involves teaching what Hanley et al. (2014) termed an omnibus mand, and this is the more common way to proceed from analyses showing control by an SRC (Falcomata, Muething, et al., 2013; Ghaemmaghami, Hanley, & Jessel, 2016; Ghaemmaghami, Hanley, Jessel, & Landa., 2018; Hanley et al., 2014; Jessel et al., 2018; Santiago et al., 2016; Slaton et al., 2017; Taylor et al.,

[1] Treatments for multiply-determined problem behavior, in general, lack demonstration of satisfactory effects in ecologically relevant settings (Landa & Hanley, unpublished manuscript). In a review of functional analyses indicating problem behavior maintained by multiple reinforcers, Landa and Hanley found that treatment effects were extended to relevant settings, *with* relevant caregivers and under lean schedules of reinforcement, for only nine of 101 participants. Further, effects were extended to relevant settings, *with* demonstration of generality and social validation from stakeholders, for only five participants.

2018). An omnibus mand is a response that is under control of two or more specific evocative events and is simultaneously reinforced by two or more reinforcers functionally linked to the evocative events. Whereas a mand is evoked by a particular establishing operation, specifies an action to be taken by the listener, and is satisfied when a particular reinforcer is delivered, an omnibus mand is strengthened by interacting establishing operations, more vaguely implies actions to be taken by the listener, and is satisfied when particular reinforcers are delivered together. For instance, Hanley et al. (2014) taught participant Dale to say "My way, please" when an adult interrupted his preferred activities, denied his requests, and instructed him to do homework tasks; emission of the omnibus mand resulted in termination of the homework task and access to preferred activities and compliance with Dale's requests. More recently, Saini, Sullivan, Baxter, DeRosa, and Roane (2018) taught participants Zack and Sarah to touch a picture card that resulted in escape from parental demands and access to tangibles; Sarah's caregivers also watched the iPad with her during the reinforcement interval.

Teaching an omnibus mand is consistent with the more general practice in FCT of relying on a low-effort response, especially in the beginning of FCT (Tiger et al., 2008). Low-effort FCRs are often taught because they have been found to be associated with sooner and greater reductions in problem behavior compared to high-effort FCRs (Buckley & Newchok, 2005; Horner & Day, 1991; Richman, Wacker, & Winborn, 2001). An omnibus mand, therefore, is a low-effort response that results in multiple reinforcers and stands in contrast to an approach that would require emission of multiple mands in order for all reinforcers to be delivered.

Potential shortcomings of teaching an omnibus mand are that novel listeners may not be able to deliver the reinforcers following an omnibus mand due to its formal lack of specificity (e.g., "My way") and that teaching an omnibus mand initially may preclude the development of

mands for individual reinforcers (Barbera, 2007; Sundberg & Partington, 1998), henceforth referred to as specifying mands. If an omnibus mand is taught at the beginning of treatment, attempts to teach specifying mands may be unsuccessful because the relevant establishing operations for evoking new communication responses have been obviated (in a manner similar to rich schedules of noncontingent reinforcement precluding the development of communication responses, Fritz, Jackson, Stiefler, Wimberly, & Richardson, 2017; Goh, Iwata, & DeLeon, 2000; Marcus & Vollmer, 1996). Furthermore, the reimposition of the specific establishing operations to teach specifying mands after an omnibus mand has been acquired may still evoke undesirable levels of problem behavior, the issue teaching an omnibus mand is supposed to address.

Researchers have occasionally reported forgoing the omnibus mand training and teaching specifying mands initially (e.g., Falcomata, Wacker, Ringdahl, Vinquist, & Dutt, 2013; Ghaemmaghami, Hanley, Jin, et al., 2016). Ghaemmaghami, Hanley, Jin, et al. (2016) taught three specifying mands, sequentially, to a young boy following a synthesized functional analysis. The authors taught a mand for each suspected reinforcer in succession—a mand for escape was taught first, then a mand for tangibles, and last, attention. Acquisition of specifying mands may be advantageous for communicating to naïve listeners (Durand, 1999) and for requesting reinforcers under particular states of deprivation or other establishing operations. Establishing events are likely to fluctuate, especially when function-based treatments are implemented over extended periods of time, and specifying mands allow a speaker to access particular reinforcers at times they are most valuable (Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997). It is also possible that specifying mands may be considered more socially acceptable than an omnibus mand, especially for individuals with advanced vocal-verbal repertoires. However, in efforts to

teach specifying mands, problem behavior may persist (Falcomata, Wacker, et al., 2013; Ghaemmaghami, Hanley, Jin, et al., 2016). For example, when Ghaemmaghami, Hanley, Jin, et al. sequentially taught specifying mands, problem behavior did not cease until all three specifying mands were acquired, requiring over thirty, 5-min sessions. Similar results were reported by Falcomata, Wacker, et al. in which problem behavior persisted for over 80 sessions each, for all three participants. Although specifying mands may be a desired outcome, reducing problem behavior immediately may be paramount.

When an individual has a history of dangerous problem behavior, practitioners may prefer to teach skills in a manner that will not evoke high rates, or high intensities, of problem behavior. Researchers have used shaping to teach a variety of skills (e.g., Athens, Vollmer, & St. Peter Pipken, 2007; Bourret, Vollmer, & Rapp, 2004; Fleece et al., 1981; Harrison & Pyles, 2013), and it is no surprise that shaping procedures have been used in treatments for problem behavior (Ghaemmaghami et al., 2018; Hagopian & Thompson, 1999; Hanley et al., 2014). Shaping involves reinforcement of successive approximations towards a desired outcome (Cooper, Heron, & Heward, 2007) and may be useful in FCT when complex communication skills are desired (e.g., Ghaemmaghami et al., 2018; Hanley et al., 2014). For example, at the beginning of FCT the goal may be that the client emits a simple response (e.g., saying "break" without making eye contact; handing a large picture to a listener in close proximity), but at the end of FCT the goal may be emission of a more developmentally appropriate response (e.g., saying "break please" with eye contact; selecting a small picture icon amongst options, placing on a sentence strip, and traveling to a listener; emission of specific mands). Similarly, practitioners may choose to teach FCRs by gradually progressing towards the context that was reported by caregivers to evoke problem behavior (Ghaemmaghami et al., 2018). For example,

initially a client may be taught to request a break when presented with relatively easy academic tasks, but eventually challenging tasks will be included in treatment sessions. Slowing progressing the instructional context to emulate the problematic conditions reported by caregivers may support low rates of problem behavior in FCT.

When problem behavior is controlled by an SRC, researchers and practitioners must decide whether to teach a specifying mand for each putative reinforcer or to teach an omnibus response that will result in all reinforcers simultaneously (i.e., omnibus mand). If the latter is selected, in part because the dangerousness of the problem behavior or the exigencies of the treatment context necessitate the immediate reduction of problem behavior, the omnibus mand may then be differentiated into specifying mands; however, it is not clear if the development of specifying mands will be hindered by the initial teaching of an omnibus mand.

In the current study, we first sought to replicate existing research by teaching an omnibus mand following an analysis showing problem behavior controlled by an SRC. The extent to which problem behavior was reduced and the speed with which the omnibus mand was acquired will be compared to that reported in the extent literature. We then attempted to extend this same literature by evaluating whether the strengthening of an omnibus mand precludes or allows for the development of specifying mands.

Methods

Participants and Setting

Three children who attended an intensive behavior analytic school for individuals with developmental disabilities served as participants. Participants were recruited by emails sent out to clinical teams in the school searching for students who engaged in problem behavior and who would benefit from FCT. Open-ended interviews (Hanley, 2012) were administered to two

teachers of each participant. Each participant was reported to engage in repertoires of problem behavior (e.g., crying, property destruction, aggression, screaming, self-injurious behavior) to access a variety of reinforcers (e.g., escape from demands *to* social attention, escape from demands *to* tangibles and social attention). Functional analyses designed from the open-ended interviews (i.e., Interview Informed Synthesized Contingency Analysis, IISCA) identified problem behavior controlled by at least two reinforcers for all participants. IISCA results for participants Raj and Cole are reported in Warner et al. (in press); IISCA results for Lee are available by request from the author.

Raj was a 5-year-old boy, diagnosed with ASD, who resided at home and attended a specialized behavior analytic day program. He had a history of engaging in severe problem behavior in the home and school. The interview revealed that he engaged in aggression (hitting, kicking, biting), self-injurious behavior (head-to-object hits, tailbone drops to the floor), and disruptive behavior (stomping, flopping, screaming, and crying) when teachers (a) removed his preferred items, (b) did not provide preferred forms of social attention (e.g., hugs, tickles, making faces) or comply with his mands to play in specific ways (e.g., Raj would guide his teacher towards a chair, stand on it, and then get on the teachers back for a piggyback-ride) and (c) presented academic work (e.g., identifying attributes on flashcards, sorting tasks). These establishing events were reported to occur in different combinations across the day but were most often all simultaneously presented when transitioning Raj from this free time back to work. Raj communicated using a combination of one-word phrases and sounds, modified sign language, and a speech generated device (SGD). Following the interview, an IISCA was conducted. In the test condition, the therapist removed toys and preferred items, discontinued playing with Raj or honoring mands to play in particular ways, and presented demands to do

academic work (e.g., sorting tasks, identifying attributes). Contingent on any instance of problem behavior, the therapist removed the demand, provided access to preferred toys, and provided social attention based upon any bids or mands to play. During the control condition, Raj had access to preferred toys, the therapist provided social attention or played with Raj in the way that he requested (e.g., gave Raj a piggyback ride, played with trains, played catch), and no work was presented. The results of the IISCA showed elevated rates of problem behavior in the test condition and zero problem behavior in the control condition suggesting that Raj's problem behavior was controlled by escape from demands to access both preferred tangibles and social attention (i.e., preferred forms of social attention and compliance with his requests to play). Following the IISCA, Raj participated in a progressive extinction analysis in which each distinct topography of problem behavior was sequentially placed on extinction; this analysis showed that his different topographies of problem behavior (those noted above that were reported to co-occur in the same situation) were controlled by the same SRC (Warner et al., in press).

This same process of interview, IISCA, and progressive extinction analysis was repeated for Cole and the same outcomes were obtained in that all reported topographies of problem behavior were shown to be sensitive to the same SRC (Warner et al.). Cole was an 8-year-old boy, diagnosed with ASD, who resided at home and attended a specialized behavior analytic day program due to a history of engaging in severe problem behavior that included aggression (hitting, kicking, biting, slapping, pinching, hair-pulling, charging, pushing), self-injurious behavior (hand-to-head hits, head-to-object hits), disruptive behavior (surface banging, throwing materials), as well as whining, complaining, and disruptive vocalizations (swearing, screaming, making threats to his teacher). Cole communicated vocally and used full sentences. IISCA results suggested that Cole's problem behavior was controlled by escape from demands (e.g.,

academic work such as problem-solving tasks and math worksheets), access to tangibles (e.g., iPad, Legos), and adult compliance with his mands (e.g., Cole would request that the therapist color in specific ways or change their body position).

Lee was a 10-year-old boy, diagnosed with ASD, who attended the same specialized school but lived in a residential setting due to a history of engaging in severe problem behavior that included aggression (biting, grabbing, hitting) and self-injurious behavior (stomping on his own feet, hand-to-head hits, head-to-object self-injury), additionally Lee engaged in high-pitched whining and crying. Lee was non-verbal and communicated by pointing (or guiding his teachers to the things that he wanted) and by using a SGD. Results of an IISCA suggested that Lee's problem behavior was maintained by escape from demands in which his teacher's attention was diverted (i.e., when he was asked to complete tasks on his own such as packing his backpack or when he was asked to wait while his teacher attended to something else), access to tangibles (Kindle, bubbles, and snacks), and attention (e.g., therapist's orientation directed towards Lee).

IISCA, baseline, and FCT sessions were conducted in treatment rooms at the school. Each therapy room contained a small table, chairs, toys and academic materials, and audio/video equipment. Sessions were conducted 3 to 4 days a week, three to five times per day, and lasted approximately 5 min each.

Measurement and Interobserver Agreement (IOA)

Problem behavior, omnibus mands, an obtaining a listener response, and specifying mands were measured across all conditions of the treatment analysis. *Problem behavior* included all topographies reported by caregivers and included as target responses in the IISCA (Table 1). Only independent communicative responses are reported. Communicative responses were considered prompted if the therapist provided a physical (Raj), vocal (Raj and Cole), or

gestural (Lee) prompt within 2-5 s prior to the participant emitting the target response. The *omnibus mand* for Raj was defined as Raj emitting a modified sign that consisted of him pointing both thumbs towards his chest or emitting a vocal approximation of the phrase "My way"; the *omnibus mand* for Cole was defined as vocal emission of the phrase "My way please"; the *omnibus mand* for Lee was defined as Lee pressing a button on his SGD that output the phrase "My way." *The obtaining a listener response* was defined as the participant independently obtaining the therapist's attention prior to emission of a mand[2]. The obtaining a listener response was defined as Raj tapping the therapist on the shoulder, Cole saying, "Excuse me," and Lee pressing a button on his SGD that output the phrase "Excuse me." *Specifying mands* were defined as independent mands for each putative reinforcer identified in the IISCA and were individualized for each participant. Specifying mands for Raj included the phrase "all done" (Raj placing one palm over the top of the other hand and moving his hands away from one another or a verbal approximation of the words "all done"), "stuff" (Raj placing an upward facing palm in front of his torso and moving his palm away from his body, or Raj placing his hand, with the palm facing up, on top of the table and sliding his hand away from his body, or Raj emitting a verbal approximation of "stuff"), and "play with me" (Raj shaking both fists in front of his chest or a verbal approximation of the word "play"). Specifying mands for Cole were defined as an independent emission of the vocal response "I want to stop working," "I want __ (present item/activity)," and requests for mand compliance (e.g., "Please stop talking," "Come watch this with me," "Stand over there"). Specifying mands for Lee were defined as Lee pressing a button on his SGD to output the mands: "I want to take a break," "Can we hang out?" "I want bubbles," "Can I have my Kindle?" and "I want a snack."

[2] The obtaining a listener response is similar to a call mand (Skinner, pg. 40).

IOA was assessed by having a second observer independently collect data on all targets during at least 20% of all sessions (range, 20%-50%), across all conditions, for each participant. Agreement was calculated by dividing sessions into 10-s intervals and dividing the number of agreements per 10-s interval by the number of disagreements plus agreements per 10-s interval, taking the average across intervals, and multiplying by 100. IOA, across all participants for all responses, averaged 98% with the lowest agreement score being 81% for a single target response (range, 81%-100%).

Experimental Designs

A concurrent operants design, in conjunction with a multiple baseline across participants, was used to evaluate the effects of FCT on problem behavior and acquisition of communicative responses. A multiple baseline design across specifying mands for different classes of reinforcement was used for each participant to evaluate whether the teaching procedures were responsible for the acquisition of specifying mands.

Procedures

Baseline. Raj's baseline sessions consisted of the therapist removing preferred items, terminating preferred forms of social attention, denying any bids to play, and presenting demands. Contingent on problem behavior, the therapist removed the demand, provided access to his preferred toys, and provided social attention based upon any bids or complied with requests to play in particular ways. Cole's baseline sessions included the therapist removing his toys and iPad, presenting academic demands, and ignoring any mands for therapist compliance. Contingent on problem behavior, the therapist removed the work, provided access to toys and the iPad, and complied with Cole's mands (e.g., the therapist would stand in specific locations within the session room, color in specific ways). Lee's baseline sessions consisted of the

therapist removing preferred tangibles (bubbles, Kindle, and snacks), presenting a demand, and diverting attention. Contingent on problem behavior, the therapist oriented towards Lee, removed the demand, and provided access to preferred items.

General Functional Communication Training. Participants were first taught an omnibus mand to access all reinforcers identified in the IISCA via prompting and differential reinforcement under progressively evocative conditions (see Table 2 for Raj, Table 3 for Cole, Table 4 for Lee). Following acquisition of the omnibus mand (e.g., "My way"), participants were taught an obtaining a listener response to recruit the attention of a listener prior to emission of additional mands (e.g., "Excuse me"). Last, specifying mands were taught sequentially for each reinforcer included in the SRC. Sessions consisted of repeated presentations of the evocative antecedents (or EO) used in baseline sessions; prompted and independent mands resulted in 30 s reinforcement, and problem behavior was placed on extinction. Physical (Raj), vocal (Raj and Cole), and gestural (Lee) prompts were used to teach all communicative responses and prompts were faded using a 2-sec delay prompting procedure. Prompts were provided immediately for all participants for two consecutive sessions. Following two consecutive sessions without problem behavior and zero errors emitting the target communicative response (e.g., omnibus mand) in at least 80% of opportunities, a 2-s delay was inserted following presentation of the EO; if the participant did not emit the mand within 2 s, the therapist prompted the response. Prompting was discontinued when the target response being taught occurred independently and in the absence of problem behavior.

Communicative responses were reinforced under progressively evocative conditions as described by Ghaemmaghami et al. (2018) and depicted as levels in Table 2 (Raj), Table 3 (Cole), and Table 4 (Lee). Evocative conditions (i.e., EOs) were gradually changed to emulate

the contexts that caregivers reported evoked problem behavior in the natural setting and became more challenging by including an increasing number of evocative elements. For example, at the beginning of FCT the first EO level may have included interruption, but not removal, of a preferred activity and a demand to do work. At the terminal level of FCT, the EO may have included the removal of the preferred activity and a demand to do work *with* the presentation of academic stimuli. Instructional levels included a gradual progression of shaping steps in an effort to maintain low rates of problem behavior while the instructional context, and communication expectations, became more challenging. Criteria to increase levels was at least two consecutive sessions with zero problem behavior and a minimum of 80% accurate emission of the communicative response within that shaping level.

Individualized Mand Training Procedures

Raj. Raj was taught a manual sign and vocal response for all communicative responses. Throughout FCT, a sign or verbal approximation was reinforced. All communicative responses (modified signs and verbal approximations) were decided upon through consultation with Raj's clinical team and a doctoral level speech pathologist.

Raj was taught an omnibus mand ("My way"), an obtaining a listener response (tapping the therapist on the shoulder), and three specifying mands for each category of reinforcement identified in the IISCA (e.g., "all done" for escape, "stuff" for tangibles, "play with me" for social attention and compliance with mands to play in particular ways). Following acquisition of the omnibus mand and the obtaining a listener response, specifying mands were taught sequentially using procedures similar to Ghaemmaghami, Hanley, Jin, et al. (2016). A specifying mand for escape was taught first. Following emission of the omnibus mand, the therapist said, "Sure you can have 'My way', what do you want?" and then prompted Raj to emit

the mand “all done.” Emission of the mand “all done” resulted in removal of demands and presentation of all reinforcers for which specifying mands had not yet been taught (tangibles and social attention; i.e., “all done” served as an omnibus mand). Following acquisition of the mand “all done”, the specifying mand “stuff” was taught. Specifically, after Raj emitted the mand “all done,” the therapist said, “What else do you want?” or “Do you want anything else?” and then prompted the mand “stuff.” The mand “stuff” resulted in delivery of tangibles and the mand “all done” resulted in removal of demands; social attention and compliance with any requests to play were provided in the absence of a mand. Last, Raj was taught the mand “play with me” which resulted in preferred attention from the therapist and compliance with any mands to play in specific ways. Mands for escape (“all done”) and tangibles (“stuff”) resulted in removal of demands and preferred items, respectively. Once all specifying mands were acquired, additional cues from the therapist (e.g., “What else do you want?”) were discontinued. Eight shaping levels were used throughout FCT (see Table 2). At level 6, Raj was no longer required to emit the omnibus mand to produce the SRC; any emission of the omnibus mand resulted in the therapist saying “Sure, what do you want?” or something similar.

Prior to beginning sessions each day, Raj was allowed to select one to three toy items from his classroom to bring to the treatment room, and the therapist selected an additional one to three items that were age-appropriate and commonly available in the classroom. Raj often brought new toys from home and was therefore allowed to bring additional items to treatment sessions based on his preferences for that day. Tangibles items that were reported to contribute to problem behavior in the initial interview, and included in baseline sessions, remained consistent throughout FCT (e.g., train tracks, a ball, and character figurines).

Cole. Cole was taught vocal-verbal responses for all communicative responses. Cole was first taught the omnibus mand "My way please," and then taught to say, "May I have my way please?" to include an autoclitic frame. Next, Cole was taught to say, "Excuse me" to obtain the therapist's attention and wait for eye contact. Cole was taught two specifying mands. He was taught to say, "I want to stop working" to escape academic work, and "I want my ___ (present item/activity)" to access preferred items. Procedures were identical to the those used with Raj, however only a verbal prompt was issued by the therapist to teach communicative responses. If Cole brought a novel item into the treatment room (e.g., a new Lego set from home), the therapist would model a prompt for that specific item once at the beginning of the session (e.g., "If you want the Legos, say, 'I want the Legos'"). Shaping procedures for increasing the complexity of the mand and EO contexts included 14 levels (see Table 3).

Lee. Lee was taught all communicative responses using his SGD (i.e., TouchChat on his iPad). Lee was taught the omnibus mand, "My way," and he was taught to say, "Excuse me" and wait for eye contact to obtain the therapist's attention. Lee was then taught five specifying mands. He was taught to say, "I want to take a break" to access escape from demands and "Can we hang out?" to access social attention from the therapist. Three specifying mands for tangible items were taught: "Can I have my Kindle?" "I want bubbles," and "I want a snack." Following acquisition of the omnibus mand and the obtaining a listener response, Lee's SGD was changed so that the home screen only displayed the obtaining a listener button. Pressing the obtaining a listener button opened the next page which displayed the buttons "My way," "I want to take a break," and "Can we hang out?". A third page opened following a request to take a break, in which all specifying mands were available on the screen. Tangible items remained constant throughout FCT, unlike Raj and Cole, because Lee's problem behavior was reported to be

sensitive to denied access to specific items (Kindle, bubbles, and snacks) rather than "tangibles" in general. Gestural prompts were used to teach Lee all responses and six shaping levels were used (Table 4). In level 6, when specifying mands for tangibles were taught, the therapist waited for Lee to reach towards a specific tangible item (bubbles, Kindle, or snacks) and then provided a gestural prompt for that item on his SGD; prompt fading criteria remained the same as described above.

Results

Raj

In baseline, problem behavior occurred at elevated rates and communicative responses remained at zero. Introduction of the omnibus mand resulted in an immediate reduction of problem behavior and it was acquired within two sessions (Figure 1; see level 1). The omnibus mand occurred at steady rates, with minimal problem behavior, while the obtaining a listener response (tapping the therapist on the shoulder) was acquired (see levels 2-4). Raj acquired all specifying mands (e.g., "all done," "stuff," and "play with me") and problem behavior remained at near zero rates (average 0.07 responses per min, rpm) while specifying mands were taught (see levels 6-8). Following acquisition of the escape and tangible mands, the omnibus mand declined and decreased to zero at session 54. Increases in shaping levels resulted in minor variability in problem behavior, however rates of problem behavior remained below baseline levels, and at near-zero rates, with the exception of one session (session 32) in level 5. Results of Raj's treatment analysis demonstrated that acquisition of an omnibus mand did not preclude acquisition of specifying mands.

Cole

In baseline, problem behavior occurred at high rates with zero occurrences of the omnibus mand, the obtaining a listener response, and specifying mands for tangibles and escape; mands for compliance occurred during one baseline session. As was the case with Raj, introduction of the omnibus mand led to an immediate reduction of problem behavior and fast acquisition of the omnibus mand (Figure 2; see level 1). Cole acquired an obtaining a listener response(e.g., "Excuse me") in level 6 and specifying mands for escape (e.g., "I want to stop working") and tangibles items ["I want the __ (present item/activity)"] in levels 12 and 14, respectively. Problem behavior occurred at an average of 0.2 rpm while specifying mands were taught. Cole independently emitted mands for compliance without training (e.g., "Please stop talking," "Come look at this video"), therefore we did not explicitly teach these responses. It should be noted that mands for compliance occurred primarily during reinforcement intervals and were ignored by the therapist if they occurred during the EO. Increases in shaping levels resulted in variability in problem behavior throughout FCT and rates of problem behavior higher than baseline at level 3. Following level 3, shaping levels were modified so that changes occurred more subtly throughout the remainder of shaping. Results of Cole's treatment analysis demonstrated that acquisition of an omnibus mand did not preclude acquisition of specifying mands and also did not deter mands already in Cole's repertoire (mands for compliance).

Lee

In baseline, problem behavior occurred at elevated rates and to the exclusion of communicative responses. As was the case with both Raj and Cole, introduction of the omnibus mand resulted in an immediate reduction of problem behavior (Figure 3; see level 1), and problem behavior remained at zero for the remainder of FCR shaping. Lee acquired an obtaining a listener response (e.g., "Excuse me") in level 3 and specifying mands for escape (e.g., "I want

to take a break;") and tangibles (e.g., "I want bubbles," "I want a snack," and "Can I have my Kindle?") in levels 5 and 6, respectively. Lee was taught a specifying mand for attention ("Can we hang out?") in level 5, however this mand was emitted only once (session 54). From sessions 60-72, Lee exclusively requested bubbles following emission of the escape mand. To evaluate if the response was occurring as part of a communicative chain rather than occurring under evocative control, and to evaluate if the other tangibles remained relevant, we removed bubbles from the pool of items available at session 73. The mand for bubbles declined and specifying mands for Kindle and snacks re-emerged; bubbles were returned to the pool of items during the final session. Increases in shaping levels did not result in any variability of problem behavior. Results of Lee's treatment analysis demonstrated that acquisition of an omnibus mand did not preclude acquisition of specifying mands.

Discussion

An omnibus mand ("My way"), initially taught as an alternative response to problem behavior, was acquired quickly and problem behavior immediately reduced to zero for all three participants. These fast effects are comparable to that reported by others who have taught an omnibus mand in FCT when problem behavior was controlled by an SRC (e.g., Hanley et al., 2014; Slaton et al., 2017; Taylor et al., 2018). Specifying mands for putative reinforcers included in the SRC were then acquired by all participants, providing preliminary evidence that teaching an omnibus mand does not preclude the acquisition of specifying mands. During the teaching of specifying mands, problem behavior remained at zero (Lee), near-zero (Raj), or was continued with the same variability seen during the shaping of the omnibus mand (Cole).

When problem behavior is controlled by an SRC, an omnibus mand seems useful as the first step in treatment. Rather than attempting to teach specifying mands for each reinforcer at

the initial stage of FCT, practitioners may opt for teaching an omnibus mand due to the speed with which problem behavior is eliminated. These findings are consistent with those of Slaton et al. (2017), who found that teaching an omnibus mand was effective in reducing problem behavior in all applications following synthesized analyses; by contrast when a specifying FCR was taught, treatment was effective in only half of applications. If multiple reinforcers are required to satisfy the establishing event controlling problem behavior, then teaching an omnibus mand seems to be an important and practical first step for treatment.

An omnibus mand may be most efficient at reducing problem behavior quickly following a synthesized analysis because of the simplicity of the response that satisfies multiple reinforcement contingencies. Teaching an omnibus mand is consistent with the common practice of teaching an efficient response early in FCT (Buckley & Newchok, 2005; Horner & Day, 1991; Richman et al., 2001). Skinner (1957) stated, "the net positive reinforcement is probably greatest for the simplest response which satisfies the contingencies, since such a response avoids the effort of executing a more complex form" (p. 209). If reducing problem behavior is a priority for practitioners, then teaching a simple omnibus mand may lend itself to quick reductions in problem behavior in contrast to teaching either a more developmentally appropriate (complex) mand or a set of specifying mands to produce individual reinforcers.

Practitioners are sometimes advised against teaching generalized mands early in communication training (Barbera, 2007, pg. 74). Sundberg and Partington (1998) contend that teaching a generalized mand initially (e.g., "more") will make it harder for children to acquire specifying mands later in training, specifically when teaching children using sign language (Sundberg & Partington, 1998, Chapter 4). It seems important then to distinguish between omnibus and generalized mands, considering the sound advice against teaching generalized

mands to persons with autism or developmental disabilities at the initial stages of communication training. An omnibus mand is a single response strengthened by interacting establishing operations and satisfied by the delivery of a particular combination of reinforcers. By contrast, a generalized mand is a response that may come under control of multiple deprivations, may be sensitive to many different reinforcers, and may never be satisfied by the reinforcers delivered (Skinner, 1957, p.41-42). For example, *please* is commonly used as a mand for compliance and is often followed by the delivery of a wide range of reinforcers. *Please* serves as a generalized mand; however, the mand itself does not specify the deprivation nor the desired reinforcer. It is interesting to point out that participant Raj emitted the omnibus mand at higher than optimal rates in the beginning of FCT (e.g., see Figure 1, levels 1-4, when omnibus mands occurred at a rate of 4 per min); following emission of the omnibus mand, Raj was provided access to all synthesized reinforcers, yet continued to emit the omnibus mand "my way" to access different forms of social and physical attention (hugs, tickles, playing chase). In this scenario, the omnibus mand served more as a generalized mand for additional types of attention. It is worth mentioning that although the form of FCRs commonly specify the reinforcer for problem behavior (e.g., Hagopian et al., 2005; Volkert et al., 2009), the topography of the response does not need to specify the desired reinforcer. The form of both omnibus and generalized mands lack specificity in that neither clearly pinpoint a particular action by the listener. The important difference is that omnibus mands are indeed controlled by specific EOs and reinforcers (suggested from an indirect interview and possibly affirmed in a functional analysis and further in a communication-based treatment), whereas generalized mands lack any specificity of EOs and reinforcers. The implication is that the path from omnibus to specifying mands is obvious

and, as shown by the current study, feasible. By contrast, how to advance the specificity of a generalized mand is not clear.

It should also be noted that the priority following a functional analysis is eliminating severe problem behavior, not necessarily satisfying objectives related to language development. Teaching an omnibus mand has been repeatedly shown to achieve this primary objective (e.g., Falcomata, Muething, et al., 2013; Ghaemmaghami, Hanley, & Jessel, 2016; Ghaemmaghami et al., 2018; Hanley et al., 2014; Jessel et al., 2018; Santiago et al., 2016; Slaton et al., 2017), and may therefore be considered a preferred starting point. This study shows that doing so also does not preclude efforts towards achieving language development objectives. It may even allow them to be more rapidly met, although further comparative research will be necessary to confirm if this is indeed the case. In sum, it is not a question of whether to teach an omnibus mand or specifying mands following analyses suggesting control by more than one reinforcer, rather, it is a question of what order will lead to the fastest reductions in problem behavior and acquisition of developmentally advanced communication.

Problem behavior may have been quickly reduced and remained low in the current study because of the detailed shaping procedure used to teach communicative responses. The current study replicated the systematic shaping procedure used by Ghaemmaghami et al. (2018) to increase complexity of communicative responses as well as increase tolerance to the contexts reported by caregivers that evoke problem behavior. Establishing operations were progressively increased to better emulate conditions in the typical environment and expose participants to minor delays to reinforcement. For instance, Raj did not access reinforcers for almost a third of the session time at the terminal shaping level despite reinforcers delivered on a continuous schedule. The current study determined the initial shaping step by observing the temporal and

qualitative features of the programmed establishing operation that evoked problem behavior in the functional analysis. For example, the duration of the EO was approximately 7 s during Raj's FA with three qualitative features present (e.g., toys were removed from Raj's hands, preferred attention was terminated, the therapist presented a demand to go to the table); the initial shaping step, therefore, was designed so that the duration of the EO lasted approximately 3 s before the therapist prompted the FCR and only two qualitative features were present (e.g., the therapist simply reached towards preferred items and signaled Raj to the table for work). Future research might better describe and compare different tactics for informing shaping steps when complex communication repertoires are to be developed so that the art of shaping can be more systematic and easily replicated by others. Future research might also compare methods for determining the aspect of context to be gradually introduced (e.g., increasing duration of the EO, number of qualitative features present during the EO, or both) and whether the form of the response should be shaped simultaneously or sequentially with the gradual introduction of the EO.

Of course teaching an omnibus mand is not necessary for all children with an intellectual disability or an ASD for whom mand training is relevant (Partington, 2010; Sundberg, 1998). An omnibus mand is unnecessary if problem behavior is not a concern or if a functional analysis does not reveal sensitivity to a synthesized contingency. Under these conditions, beginning the mand development process with specifying mands holds advantage. Furthermore, when problem behavior appears to be maintained by multiple reinforcers *within* a single generic class of reinforcement, such as tangibles, forgoing the omnibus mand and teach specifying mands (for various tangibles) has been shown efficacious (Rose & Beaulieu, 2018) and is probably more efficient than teaching an omnibus mand first.

Specifying mands are important because they are more precise forms of communication capable of specifying momentarily valuable objects, events, and interactions to naïve listeners (Durand, 1999; Durand & Carr, 1991; Khang, Hendrickson, & Vu, 2000). Additionally, specifying mands empower clients with the ability to request specific reinforcers at times when they are most valuable (Hanley et al., 1997). Establishing operations fluctuate; multiple reinforcers may be valuable at certain times (see also the relevant concept of complementary reinforcers in behavior economics literature; e.g., Hursh, 1978) and only one or some potentiated at other times. Attention from others may be less important when a client is engaged with a new toy or escape from instructions may not be important in relatively preferred academic contexts. Whether or not specifying mands are taught in treatment is currently at the discretion of treatment providers. Observing some but variable consumption of reinforcers during reinforcement intervals of IISCAs may allow one to determine the importance of teaching specifying mands sooner or later in the progressive development of skill-based repertoires (Hanley et al., 2014). If reinforcer consumption varies, then teaching specifying mands prior to developing tolerance responses and contextually appropriate behavior seems important.

When teaching multiple mands, it is important that mands occur under evocative control and not as part of a communicative chain in which responses simply occur in succession without sensitivity to establishing operations. For example, participant Lee exclusively requested a break and bubbles for several consecutive sessions. When bubbles were removed from the pool of available items at session 72, mands for bubbles decreased and mands for Kindle and snacks increased (this particular finding is similar to Pizarro & Borrero, 2017, who found that some clients may not request items in their absence). Aside from the few sessions just described for Lee, participants in the current study emitted specifying mands at variable rates throughout FCT

and within FCT sessions. For example, participant Raj emitted mands for tangibles and attention at variable rates, yet mands for escape were emitted consistently; sometimes Raj requested a break and attention, sometimes Raj requested a break and toys, and sometimes he requested a break with toys *and* therapist attention. If mands occurred simply as part of a communicative chain, we might expect emission of all communicative responses, in succession, on each opportunity. Additionally, the omnibus mand decreased to zero rates for two participants in the current study (Raj and Lee) without explicit programming. These findings suggest that participants acquired mands under the appropriate evocative conditions, although we admit this is an interpretation. Practitioners and researchers should consider manipulating establishing operations to verify that mands occur under evocative control (see Gutierrez et al., 2007), especially when multiple specifying mands are taught. For example, after specifying mands have been established, specific reinforcers within the SRC may be withheld from FCT sessions; alternatively, specific reinforcers may be provided noncontingently. If specifying mands persist, in either case, this might suggest that mands are not under evocative control and additional training is required.

In addition to their importance in the skill set of the client, an additional advantage of teaching specifying mands following an analysis showing problem behavior maintained by an SRC is that the relevance of each reinforcer[3] included in the synthesized contingency can be inferred by evaluating the extent to which each mand is acquired and the extent to which rates of problem behavior are affected by acquisition of each specifying mand (e.g., Ghaemmaghami,

[3] When a combination of reinforcers makes up an SRC, researchers and clinicians may question whether or not each reinforcer is part of the consequence controlling the operant class of behavior (i.e., problem behavior). Similarly, when multiple topographies of problem behavior are eligible for reinforcement in an FA (e.g., Warner et al., in press) clinicians may question if the observed topographies in the analysis are indeed controlled by the EO manipulated by the experimenter. Relevance, in terms of identifying contingencies controlling problem behavior, refers to the implication that the specific consequence following problem behavior does contribute to the maintenance of the operant class.

Hanley, Jin, et al., 2016; Slaton et al., 2017). When questions remain about the relevance of each individual reinforcement contingency within an SRC, researchers may choose to use inferential tactics[4] in treatment rather than in pre-treatment analyses. For example, if an acquired specifying mand persists and there is a concomitant reduction in problem behavior (or continued elimination of problem behavior), researchers and practitioners may use this observation as evidence of the relevance of that particular reinforcer to the SRC. This method of evaluating the relevance of reinforcers included in an SRC is somewhat indirect but it is advantageous to conducting functional analyses with both synthesized and isolated reinforcement contingencies (e.g., Fisher et al., 2016; Slaton et al., 2017) primarily because FCT affirmation allows for treatment to be experienced more immediately. The results of the current study affirmed the relevance of all synthesized reinforcers for Raj and Cole by acquisition and persistence of all specifying mands taught in treatment and continued elimination or reduction of problem behavior, replicating the results of Ghaemmaghami, Hanley, Jin, et al. (2016) and Slaton et al. (2017). Specifying mands only partially affirmed the relevance of the components of the SRC for Lee. Lee independently emitted the mand for social attention only once (session 53), suggesting attention may have been irrelevant to the maintenance of his problem behavior.

Future research should certainly investigate the relevance of individual reinforcers within an SRC but also investigate implications for including an irrelevant reinforcer within the contingency. Were it to occur, perhaps the worst outcome may be that the client will be taught a communicative response they won't frequently use (Lee in the present study) or that control of problem behavior by that reinforcer in the future might be mitigated (see the prevention work by Luczynski & Hanley, 2013, and review of this same program of proactively teaching responses

[4] See Sidman (pg. 127, 1960) for a description of using indirect evidence as a means for affirming a hypothesis.

for generic classes of reinforcement by Fahmie & Luczynski, 2018). Researchers might consider purposely including an irrelevant reinforcer (e.g., a stimulus or consequence likely not part of the reinforcement contingency controlling a client's behavior but readily available and common in their ecological environment) in an SRC and then evaluating the speed at which FCRs are acquired for both functional reinforcers and communicative responses for other items or activities. Specifically, researchers should evaluate if the inclusion of an irrelevant reinforcer is detrimental to skill acquisition or treatment progress. Said differently, does inclusion of an irrelevant reinforcer stunt client progress or lead to unsatisfactory outcomes? At this point it is unclear to the extent to which irrelevant reinforcers populate SRCs; however, researchers should continue to evaluate methods for decreasing the probability that irrelevant reinforcers will be included in an IISCA. For example, evaluating the correspondence between caregiver answers to specific questions with the behavior observed in the FA (e.g., engagement with all reported reinforcers; problem behavior upon presentation of idiosyncratic EOs when multiple examples may be provided) may help to identify if certain questions within the open-ended pre-assessment interview may be more likely to lead to the inclusion of an unnecessary reinforcer or provide helpful information for refining specific questions within the assessment tool. Alternatively, researchers might observe consumption of reported reinforcers during control conditions as a means for detecting if an unnecessary reinforcer may have been included in the SRC.

Naturally, some may be uncomfortable with using indirect evidence as a means for answering questions related to the maintenance of problem behavior in treatment rather than in an analysis (see discussion in Fisher et al., 2016). It is worth noting that much of science answers questions using interpretation without reliance on experimental demonstrations. Palmer (2003) eloquently illustrates a behavior analytic account of cognition based upon interpretation,

drawing similarities to scientific interpretations within the fields of "…geology, cosmology, evolutionary biology, and meteorology" (pg. 174). Behavior analysts have successfully treated severe covert self-injurious behavior (Grace, Thompson, & Fisher, 1996) and dangerous pill ingestion (Chapman, Fisher, Piazza, & Kurtz, 1993) using interpretation. Additionally, client response to treatment frequently guides the decision making of clinicians. For example, functional analyses may be modified after first attempts are inconclusive (Bowman, Fisher, Thompson, & Piazza, 1997; Fisher, Adelinis, Thompson, Worsdell, & Zarcone, 1998; Roscoe, Kindle, & Pence, 2010; Tiger, Fisher, Toussaint, & Kodak, 2009) and outcomes of initial FAs may lead to a closer look at a particular phenomenon (e.g., Fisher, Lindauer, Alterson, & Thompson, 1998); in some cases, a client's response to treatment may lead clinicians to re-evaluate initial hypotheses and begin again (e.g., Payne et al., 2014). Clients may be better served when remaining questions are answered in treatment rather than exhausting all experimental curiosities in the analysis, because they can begin to acquire new skills sooner. However, interpretation should not replace experimental demonstration. Functional analyses must continue to inform function-based treatments but indirect evidence (e.g., observations of newly acquired skills; persistence of problem behavior in treatment) may be especially useful when researchers have remaining questions from the assessment, particularly when treating problem behavior controlled by an SRC or multiply-maintained problem behavior.

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Table 1

Participants' topographies of problem behavior and communication modalities.

Participant	Problem Behaviors	Communication Modality
Raj	Hitting, kicking, and biting others; stomping, flopping, screaming, and crying; head-to-object self-injury, tailbone drops to the floor	Modified sign language, 1- and 2-word approximations, and SGD device
Cole	Whining, complaining, swearing, screaming, threatening teachers; hitting, kicking, biting, slapping, pinching, hair-pulling, charging, and pushing others; hand-to-head and head-to-object self-injury; surface banging, throwing materials	Vocal-verbal
Lee	Whining, crying; biting, grabbing, and hitting others; stomping on his own feet, hand-to-head and head-to-object self-injury	SGD device

Note. SGD= speech generated device (iPad with TouchChat).

Table 2.

Description of functional communication responses (FCR) and evocative context presentations used throughout functional communication repertoire shaping with Raj.

Level	FCR Criterion Changes	FCR forms	Progressive Changes to the Establishing Operation
1	A vocal approximation or modified sign of omnibus mand	*"My way."*	Therapist turned toward client and/or reached toward preferred toys.
2			+ Therapist made contact with toys, stopped complying with mands, and simultaneously presented a vocal demand (e.g., "*Time to go to the table.*")
3			+ Therapist removed preferred toys from child.
4	Child obtained a listener by tapping the therapist on the shoulder and pausing for eye contact.	*"Excuse me, (pause for acknowledgement), my way."*	+ Therapist diverted attention for 1-2 s; attention was diverted by the therapist walking towards the table where work would be presented with child traveling to the table.
5			+ Therapist withheld preferred attention for 3-5 s and presented a work task with child sitting at the table.
6	A vocal approximation or modified sign of first specific reinforcer	*"Excuse me," (wait for acknowledgment) "all done.*"	+ Therapist withheld preferred attention for additional 2-4 s and presented work task materials. After the child emitted the omnibus mand, the therapist asked *"Sure, what do you want?"*
7	A vocal approximation or modified sign of 2 specific reinforcers	"*Excuse me," (wait for acknowledgment) "all done" "stuff"*	+ Following delivery of the first specific reinforcer, therapist asked *"What else do you want?"*
8	A vocal approximation or modified sign of 3 specific reinforcers	"*Excuse me," (wait for acknowledgment) "all done," "stuff," "play with me."*	
Final		"*Excuse me," (wait for acknowledgment) "all done," "stuff," "play with me."*	Therapist removed preferred toys from child, did not comply with mands, withheld preferred attention, and presented a work task at the table. Following delivery of the first specific reinforcer, therapist asked "*What else do you want?*"

Note. Reinforcement was not provided unless target FCR form occurred after the entire establishing operation was presented.

Table 3.

Description of functional communication responses (FCR) and evocative context presentations used throughout functional communication repertoire shaping with Cole.

Level	FCR Criterion Changes	FCR forms	Progressive Changes to the Establishing Operation
1	A vocal request	*"My way, please."*	Therapist moved toward client and/or reached toward preferred toys and simultaneously presented a vocal demand (e.g., *"Alright, time to clean up."*)
2	A vocal request with eye contact, with prompter*		
3	A vocal request with eye contact, without prompter		+ Therapist politely interrupted activities**.
4	Autoclitic frame with eye contact	*"May I have my way please?"*	
5			+ Therapist made contact with 1 preferred toy that the child was not engaged with and waited momentarily to make eye contact with child.
6	Child obtained a listener using a vocal request.	*"Excuse me, may I have my way please?"*	
7			+ Therapist picked up preferred toys that the child was not engaged with.
8	Child paused current activity before emitting the omnibus mand.	"*Excuse me," (pause video/iPad) "may I have my way, please?"*	
9	Child paused current activity and put their hands on the table before emitting the omnibus mand.	*"Excuse me," (pause video/iPad and put hands on table) "may I have my way, please?"*	
10			+ Therapist removed all toys, including toys the child was engaged with. If the child was playing on the floor, they were required to sit at the desk.
11			+ Therapist presented a demand with work materials at the desk.
12	A vocal request of first specific reinforcer	*"Excuse me," (wait for acknowledgment with hands on table) "I want my way." "I want to stop working."*	+ After the child emitted the omnibus mand, the therapist asked, *"Sure, what would you like?"*

13	A vocal request of 2 specific reinforcers	*"Excuse me," (wait for acknowledgment with hands on table) "I want my way." "I want to stop working." "I want my ___ (present item/activity)."*	+ Following delivery of the first specific reinforcer, therapist asked *"anything else?"*
14			+ Therapist presented a stimulus to the child following the first *"Excuse me"* response to signal not repeating the obtaining a listener response.
Final		*"Excuse me," (wait for acknowledgment with hands on table) "I want my way." "I want to stop working." "I want my __ (present item/activity)."*	Therapist removed all preferred toys/items from the child, required the child to sit at the table, and presented a work demand with materials. Therapist acknowledged the child after a single request for attention. Following emission of the omnibus mand, the therapist asked *"Sure, what would you like?"*. Following delivery of the first specific reinforcer the therapist asked, *"Anything else?"*

Note. Reinforcement was not provided unless target FCR form occurred after the entire establishing operation was presented.
*A second prompter was used for step 2 to prompt eye contact.
**At step 3, the therapist interrupted iPad game or video at a natural stopping point. For example, the therapist allowed the child to finish the step of a game or waited until the end of a favorite scene before interrupting.

Table 4.

Description of functional communication responses (FCR) and evocative context presentations used throughout functional communication repertoire shaping with Lee.

Level	FCR Criterion Changes	FCR forms	Evocative Context Changes
1	Omnibus mand using SGD device	*"My way."*	Therapist removed preferred items, cued child to sit at table and complete demand, and diverted attention for 3-5 s.
2	Omnibus mand with eye contact		+Therapist diverted attention for 5-7 s.
3	Child obtained a listener using SGD device	"*Excuse me, my way."*	+Therapist diverted attention for 7-10 s and waited briefly before making eye contact with the child following the obtaining a listener response.
4	Child obtained a listener and paused for acknowledgment with hands folded. *SGD device set up with an additional page.	*"Excuse me," (pause for acknowledgement with hands folded) "my way."*	
5	Specific FCR for escape or attention using SGD device	*"I want to take a break"* or *"Can we hang out?"*	
6	Specific requests for reinforcers following a break request using SGD device	*"I want bubbles." "I want a snack." "Can I have my Kindle?"*	+Following a request for a break, the therapist asked, *"What else do you want?"*
Final		"*Excuse me," (waits for acknowledgment with hands folded) "I want a break." "I want bubbles." "I want a snack." "Can I have my Kindle?" "I want to hang out."*	Therapist presented a work demand, diverted attention for 7-10 s, and waited briefly before making eye contact with the child following an obtaining a listener request. Following a request for a break, the therapist asked, "*What else do you want?"*

Note. Reinforcement was not provided unless target FCR form occurred after the entire establishing operation was presented.
*Lee's SGD device was modifed at Step 4 to include a page for the obtaining a listener response. For exampe, after pressing the "*Excuse me*" icon, a second page would open with specific reinforcers.

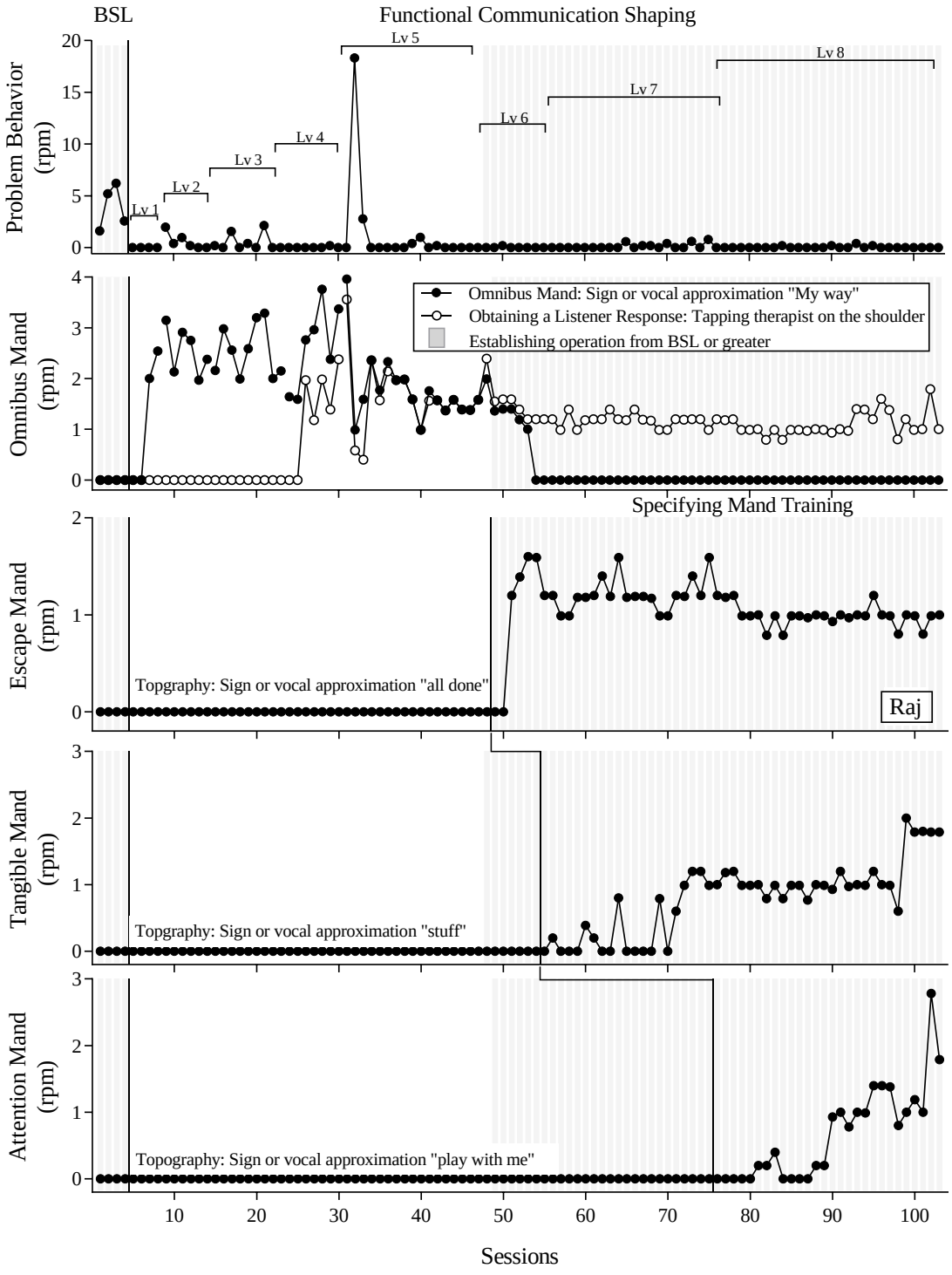

Figure 1. Results of FCT and shaping procedure for Raj (see Table 2 for details).

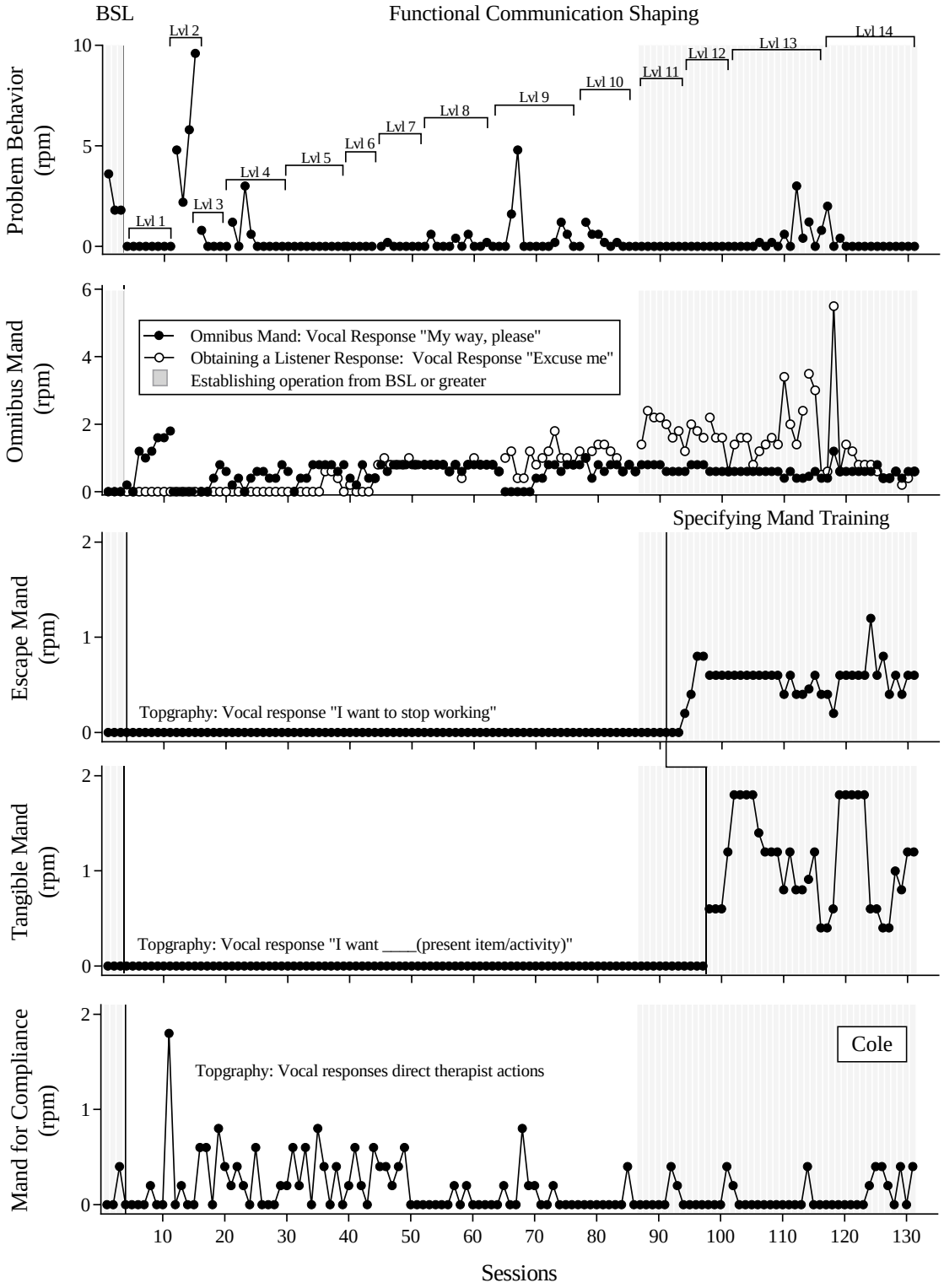

Figure 2. Results of FCT and shaping procedure for Cole (see Table 3 for details).

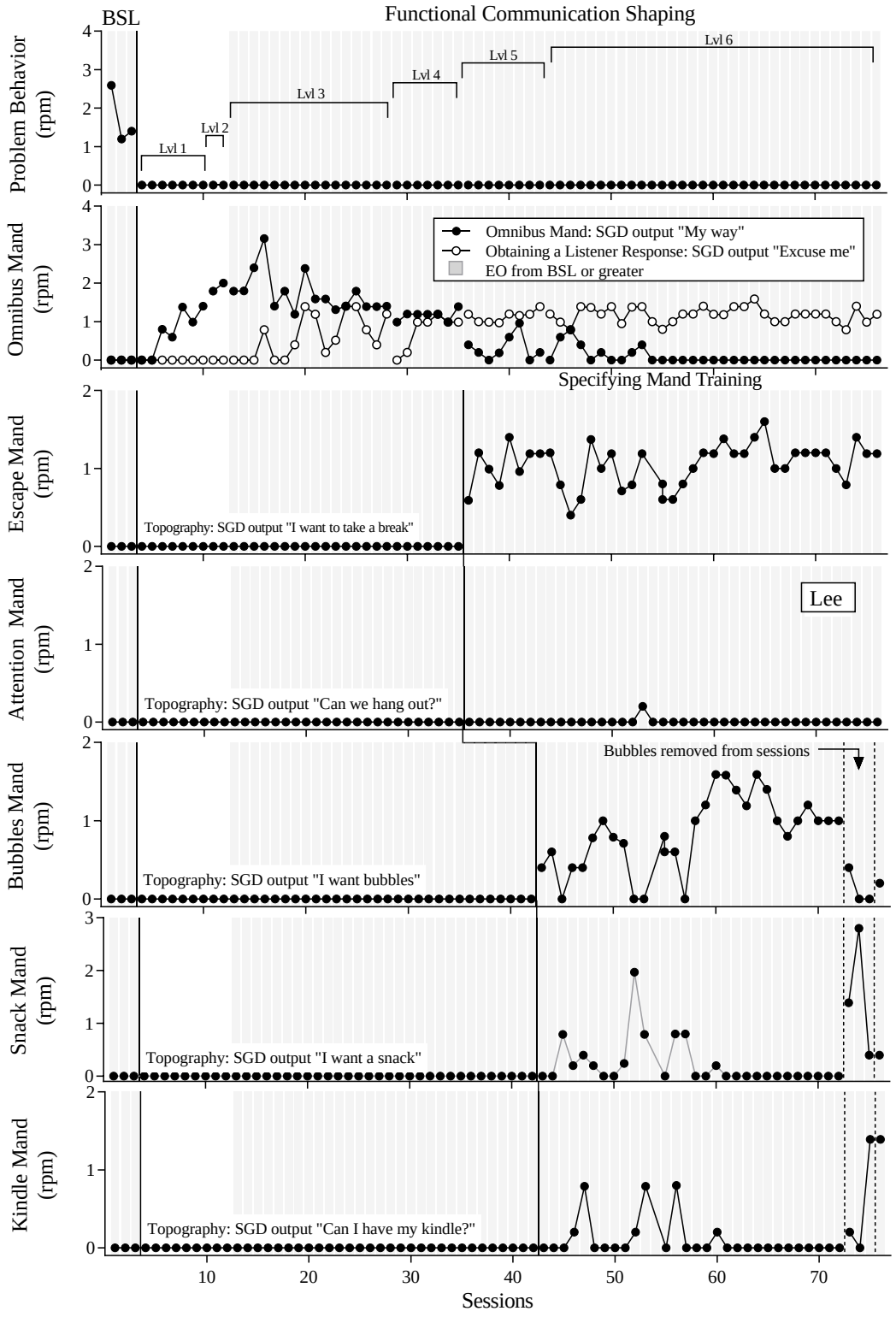

Figure 3. Results of FCT and shaping procedure for Lee (see Table 4 for details). Bubbles were removed from sessions 72-75, indicated by the dotted phase line.