Teaching Mands for Information Using “Why” to Children With Autism

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Abstract

Mands for information (MFIs) play an important role in language development and are important for successfully acquiring new information from one’s environment. Yet many individuals with autism do not acquire mands for information without direct teaching. Research has demonstrated effective procedures for teaching all “wh” forms, except for “why.” This study investigated procedures to teach the MFI “why” under control of the establishing operation and examined the extent to which teaching resulted in generalization. The intervention was effective in establishing the MFI “why” for 3 children with autism, and generalization to novel scenarios occurred for all participants.

Keywords Abolishing operations · Establishing operations · Mand for information · Why questions

Mands for information (MFIs) are classified as behavior in the form of question asking that is under the control of an establishing operation (EO), the consequence being information related to the EO (Sundberg, Loeb, Hale, & Eigenheer, 2002). This behavior often occurs in the form of “wh” questions, though any topography can serve as an MFI (e.g., “tell me”; Ingvarsson & Hollobaugh, 2010). MFIs play an important role in language development (Chouinard, 2007), and many researchers (e.g., Sundberg et al., 2002) have stressed the importance of investigating effective procedures to teach this skill because MFI repertoires allow individuals to acquire unknown information about the environment. For example, asking “What’s that?” may help an individual acquire new tacts (Lechago, Carr, Grow, Love, & Almason, 2010), and asking “How?” may allow an individual to navigate novel problems he or she encounters

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(Shillingsburg & Valentino, 2011). Some researchers (Ingvarsson & Hollobaugh, 2010) also suggest that effective MFI repertoires might result in decreased problem behavior and the simplification of tasks. For example, if a child can ask “how” to do something, he or she may be less likely to engage in problem behavior, and the task becomes easier because he or she can obtain the information about how to complete it.

Individuals with autism often struggle to acquire MFIs without explicit teaching, even if they have robust verbal behavior repertoires in other operants (Sundberg et al., 2002). One reason for this might be that information unrelated to preferred interests is not very valuable to individuals with autism; thus, a key feature of the MFI, the EO, is missing. To effectively teach MFIs to individuals with autism, researchers and clinicians must carefully contrive the EO and ensure responding is controlled by the EO (see Lechago & Low, 2015, and Raulston et al., 2013, for further discussion). Previous investigations into teaching MFIs to individuals with autism targeted a variety of “wh” forms, including teaching MFIs using “what” (e.g., Marion, Martin, Yu, & Buhler, 2011), “when” (e.g., Shillingsburg, Valentino, Bowen, Bradley, & Zavatkay, 2011), “where” (Betz, Higbee, & Pollard, 2010), “who” (e.g., Shillingsburg, Bowen, Valentino, & Pierce, 2014), “how” (e.g., Shillingsburg & Valentino, 2011), and “I don’t know, please tell me” (Ingvarsson & Hollobaugh, 2010). Recently, procedures have become even more complex, as researchers establish the effectiveness of textual prompts (e.g., Shillingsburg, Gayman, & Walton, 2016) and the effectiveness of speech-generating devices to teach MFIs to nonvocal children (Carnett & Ingvarsson, 2016).

There is a gap in the MFI literature related to teaching the mand “why.” Teaching an individual to ask “why” can be conceptualized as teaching “curiosity”—that is, asking questions to receive information about the environment. Asking “why” allows an individual to continue dialogue, act, or acquire new knowledge. Instructional arrangements must be designed carefully to ensure the individual is taught to only ask “why” under appropriate EO control (i.e., the information obtained is valuable because it is a form of conditioned reinforcement; Sundberg et al., 2002) and not when information is already available. Teaching individuals with autism to ask “why” under the appropriate stimulus conditions presents a unique challenge, given the subtle functional properties of the question. For example, individuals may ask “why” in situations where the information would not be valuable but attention or continued conversation may be. Asking questions when information is not valuable is common in early development, but by preschool age, most children ask questions readily to obtain information from their environment (e.g., Rowland & Pine, 2000). The question “why” can often lead to varied answers and continued EOs for new information. Additionally, the information must remain a form of conditioned reinforcement over repeated trials. Finally, it is important to demonstrate that the information has meaning (e.g., it allows the individual to interact socially with others, it increases the likelihood of academic success, or it satisfies other EOs such as during problem solving).

Given the procedural challenges associated with contriving the EO to teach the MFI “why” and the ubiquity of the “why” mand, research on this topic is warranted. The primary purpose of this study was to investigate procedures to teach “why” controlled by the EO of access to relevant information. The secondary purpose of this study was to investigate generalization to novel scenarios in which having access to information about why something occurred would be important.

Method

Participants

Three males participated in the study. Participants had clinical diagnoses of autism that were given by independent specialists prior to the start of applied behavior analysis (ABA) services and these study procedures. All participants were chosen to participate in the study because they met the following criteria: They had scores in mid- to high Level 2 in the mand domain of the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008), they emitted at least one topography of mand for information (i.e., what, where, how, who, when) under multiple stimulus conditions, they demonstrated a strong listener and tact repertoire (scoring a minimum of Level 2 in these areas on the VB-MAPP), they complied with two- to three-step receptive instructions, and they exhibited little to no problem behavior. These criteria were developed by the primary researcher. There have been no published studies addressing official prerequisites needed to acquire the MFI “why.” Therefore, the primary author examined the content of the scenarios and hypothesized the skills that would be necessary to participate as a listener and a speaker. Additionally, the clinicians involved in the participants’ case indicated that manding for information using “why” would be a valuable next skill to target.

Kipp was a male and was 6 years, 1 month of age who scored mostly in Level 3 on the VB-MAPP. He manded for information using “what,” “where,” and “who.” Kipp emitted multiple vocal word responses across all operants and engaged in conversations involving several exchanges. Dexter was a male and was 6 years, 0 months of age who scored mostly in Level 2 on the VB-MAPP. He manded for information using “what” and “where.” He also manded for a variety of items and activities using phrases of four or more words, tacted over 200 nouns and verbs, and responded as a listener to multiple-word directions involving prepositions and pronouns. Neil was a male and was 5 years, 8 months of age who scored mostly in Level 3 on the VB-MAPP. He manded for information using “what,” “where,” and “who.” He tacted basic items, using prepositions, pronouns, and adjectives, and his overall tact repertoire consisted of sentences containing four or more words. He consistently followed three-step receptive instructions.

Setting and Materials

Sessions took place in the location of services for the participant: either at home (Neil) or in a center-based facility (Kipp and Dexter). The center contained child-sized chairs, tables, preschool-appropriate toys, and other age-appropriate stimuli typically found in educational environments (e.g., chalkboards and chalk, a ball pit, books, arts and crafts materials, writing utensils, games). Sessions in the home were held in the location of the house where typical ABA sessions were conducted (e.g., living room, bedroom) and contained furniture and standard home décor. All study procedures were integrated into the participants’ existing clinical programming.

Materials used for the six scenarios (see Table 1) included common play and household items such as a hat, chairs, teaching materials, car keys, and musical instruments.

Table 1 Description of six “why” scenarios

Antecedent	Prompted response	Sample consequences (Information given)
Scenario 1		
Experimenter puts a funny object on his or her body (e.g., funny hat, glove on foot).	Why did you do that?	Because I thought it would make you laugh! Because it feels good (e.g., on my head). Because it helps keep the sun out of my eyes.
Scenario 2		
Experimenter places participant’s work item in an odd location.	Why is the _____ there?	Oh! Because I was cleaning the floor! Because I lost my _____ and need to find it—want to help me look? So we have space to dance around!
Scenario 3		
Experimenter does a wheelbarrow across the floor or other activity (clapping quickly, spinning around).	Why are you doing that?	Because it’s fun! Because I can’t find my pen—can you help me look for it? Because it’s great exercise, and exercise helps us be more awake!
Scenario 4		
Experimenter takes a child’s preferred toy and puts it in an odd location in the environment (e.g., lampshade, inside a bowl).	Why is my toy there?	Because I thought it would make you laugh. So we could practice our prepositions! I was cleaning up and put it in the wrong place!
Scenario 5		
Experimenter abruptly turns off the lights in the room or alters the room in some way.	“Why did you do that?”	It was so hot! I thought that would cool us down a bit! So we can go to a new spot to play! I wanted to try out this new flashlight.
Scenario 6		
Experimenter gives the child a key or other item he or she typically does not get (not preferred).	“Why did you give me this?”	So we can lock the door and go to a new place. Because all of our stuff is in a bin—let’s go get it. I’d like you to hang on to it for me. It’s the key to my car and I’ll need it later!

Measurement

The primary dependent variable was the percentage of trials correct. During EO-present (EOP) trials, correct responding was defined as manding for information using “why.” To be scored correct, the participant was required to independently ask “Why?” within 3 s of manipulation of the EO (e.g., the therapist puts a hat on his or her head; see other scenarios in Table 1). Mands that included other words (e.g., “Why are you doing that?” “Why did you go there?”) were considered correct if the primary MFI “why” was included in the

question and the sentence was grammatically correct. Incorrect responses during EOP trials were defined as failing to emit a response within 3 s of EO manipulation or emitting any other vocal verbal response within 3 s. During EO-absent (EOA) trials, correct responding was defined as not asking a question that included “why.” Data were collected on a trial-by-trial basis during baseline, mand training, posttraining, generalization probes, and maintenance probes. The mastery criterion consisted of 100% correct and independent responding (i.e., emitting the correct MFI during all EOP trials and refraining from emitting the MFI during all EOA trials) across two consecutive sessions.

Interobserver Agreement and Treatment Integrity

Interobserver agreement (IOA) was assessed by having a secondary observer collect data for 30% of sessions for Kipp, 40% of sessions for Neil, and 53% of sessions for Dexter across all conditions. An agreement was scored if the same responses were recorded by both the primary and secondary observer on the same trial. Agreement was calculated by dividing the number of trials with agreements by the total number of trials and multiplying by 100. IOA was 100% for Kipp, 100% for Neil, and 100% for Dexter.

During all conditions, an observer scored implementation of the procedure using a treatment integrity checklist (see the [Appendix](#) for behaviors scored). To calculate treatment integrity, the number of steps completed correctly in the checklist were totaled and divided by the total number of steps. We summarized treatment integrity as the percentage of steps implemented correctly. For Kipp, procedural integrity was recorded during 20% of all sessions and averaged 93.8% (range 75%–100%). For Neil, procedural integrity was recorded during 40% of all sessions and averaged 99.4% (range 92%–100%). For Dexter, procedural integrity was recorded during 50% of all sessions and averaged 99.1% (range 92%–100%).

Experimental Design

A multielement design (Ulman & Sulzer-Azaroff, 1975) was used to compare the effects of mand training during EOP and EOA conditions. A nonconcurrent multiple-baseline across-participants design (Baer, Wolf, & Risley, 1968) was used to demonstrate replication of treatment effects.

Procedure

General Procedures During all trials, the participant was in his typical teaching area in the classroom or home. The experimenter cleared the area of all teaching and play materials, obtained the participant’s attention, presented the stimuli associated with the scenario (e.g., put on a silly hat), and directed the participant to look at the experimenter. One session consisted of 12 trials and included 6 EOA trials and 6 EOP trials. The order of trials was randomized each session. Six scenarios were created by the primary author (see Table 1), and each scenario consisted of the same antecedent manipulation (e.g., putting the participant’s work materials in an odd location, such as placing a chair on a table; Scenario 2), but the response the experimenter provided for “why” the event occurred differed on each trial to ensure participants were motivated to ask “Why?” (e.g., “Because I was cleaning the floor,” “Because I lost

my keys and I need to find them.”). All antecedents and consequences are described in Table 1. EOP trials consisted of arranging the antecedent as described in Table 1. EOA trials consisted of arranging the antecedent as described in Table 1 and immediately giving the reason (e.g., “I put your chair on the table because I lost my keys and need to find them!”). The antecedents were always the same within the scenario but differed across scenarios. Consequences consisted of fun activities or items, information, helping with a task, or work activities and were provided immediately after the participant emitted the mand for information either prompted or independently, depending on the type of trial; see the descriptions that follow. During all conditions, the 12 trials were intermixed with other language targets across a variety of verbal operants. This intermixing was done to assist with discrimination and to make the trials mimic the way someone would mand for information in the real world. Two MFI trials were never presented consecutively. A reinforcement schedule for correct responses to mastered targets that were intermixed was not specified.

Baseline The purpose of the baseline condition was to examine responding prior to intervention. During baseline, the experimenter presented one EOP trial and one EOA trial per scenario. During EOP and EOA trials, the trial was terminated following any type of response.

Mand Training The purpose of mand training was to teach the participant to mand for information. During mand training, only one scenario was targeted at a time. Sessions consisted of 12 trials of that scenario, 6 EOP and 6 EOA, randomized across trials for each session. Between one and three mastered tasks were interspersed on average, every three mand-training trials. During EOP trials, the experimenter implemented a 0-s prompt delay for the first two 12-trial sessions by providing a vocal prompt (e.g., “Why did you do that?”) immediately after the stimuli were presented. The experimenter prompted the full response, but the participant was only required to say “why” for the response to be scored correct. If the participant did not echo the “why” response, the experimenter would have terminated the trial and re-presented it, though this never occurred. After the first two sessions at a 0-s prompt delay, the experimenter moved to a 3-s prompt delay. Contingent upon correct responding (prompted or independent), as was done in baseline, the experimenter provided the information. General verbal interaction and praise related to the activity were provided if appropriate (e.g., “You’re dancing!”), but praise was never directly provided for asking the “why” question. In addition, upon correct responding, the experimenter allowed the participant to complete the activity (if applicable). Training continued at the 3-s prompt delay until the mastery criterion was met. Trials were interspersed with regular language programming. EOA trials were conducted identically to EOP trials, except that immediately after presenting the stimuli associated with the scenario, the information about why the event occurred was provided. During EOA trials, if the participant asked, “Why?”; made an incorrect response; or did not respond within 3 s, the trial was terminated. Scenario 1 was targeted with Kipp and Neil first, and Scenario 3 was targeted with Dexter first. The reason for this variation was to counterbalance scenarios to avoid sequence effects (O’Brien, 1968).

Posttraining Probes The purpose of the posttraining probe condition was to examine the effects of mand training. Following mastery of a scenario during mand training,

posttraining probes of that scenario were implemented. These probes were conducted identically to baseline, except that posttraining probes only included the previously targeted scenario. Posttraining probes included 12 trials (6 EOP and 6 EOA) of the targeted scenario. If the participant responded 100% correctly across two consecutive sessions during posttraining probes, the scenario was considered mastered. If the participant responded less than 100% correctly, mand training for that scenario was implemented again (although this never occurred).

Generalization Probes The purpose of the generalization probes was to examine generalized responding after teaching novel scenarios. Generalization probes occurred after each posttraining probe. These generalization probes included 12-trial sessions with 6 trials of EOA and 6 trials of EOP for all novel scenarios (one 12-trial session per scenario). The first generalization probe consisted of five scenarios. After the first generalization probe, the number of scenarios in remaining generalization probes varied based on participant performance (i.e., a participant who responded correctly to all five scenarios in the first generalization probe did not have a second generalization probe, whereas a participant who responded incorrectly in the first generalization probe session would have one or more in the second generalization probe session). Procedures were identical to baseline. If the participant scored 100% in the generalization probe, the scenario was considered mastered. If the participant scored less than 100%, mand training was initiated for that scenario, and then posttraining probes were conducted. This sequence continued until mastery occurred.

Maintenance Probes Maintenance probes were conducted 6 weeks after mastery of the last scenario (Kipp) and 4 weeks after mastery of the last scenario (Dexter). Maintenance probes were not conducted with Neil due to a transition in his services. Procedures and session arrangements were identical to baseline.

Results

Figure 1 shows the results for Kipp (top panel), Neil (middle panel), and Dexter (bottom panel). Baseline, mand training, posttraining probes, generalization probes, and maintenance probes (Neil and Kipp only) are depicted.

None of the participants emitted correct responses in any of the scenarios during baseline for EOA or EOP conditions. Kipp met the mastery criterion in Scenario 1 in two sessions at the 3-s prompt delay (a total of four 12-trial training sessions: two sessions at the 0-s prompt delay and two sessions at the 3-s prompt delay). Kipp's responding met mastery within two posttraining sessions for Scenario 1. Kipp's responding was 100% correct during generalization probes of all remaining scenarios, except for Scenario 6, during which he responded correctly 0%. Thus, Scenario 6 was targeted in mand training, and he met the mastery criterion within two sessions (similar to the first scenario: a total of four 12-trial training sessions, two at the 0-s prompt delay and two at the 3-s prompt delay). Kipp's responding met mastery within two posttraining sessions for Scenario 6. Kipp's responding was 100% correct for all scenarios at a 6-week maintenance probe.

Fig. 1 Percentage correct responding during baseline, posttraining probes (PT), generalization probes (GP), and maintenance probes (MT) for Kipp (top panel), Neil (middle panel), and Dexter (bottom panel). S = scenario. Closed diamonds represent EOP trials, and open circles represent EOA trials

Neil met the mastery criterion for Scenario 1 within a total of seven training trials (two at the 0-s prompt delay and five at the 3-s prompt delay). During posttraining probes of Scenario 1, Neil's responding met mastery criterion immediately. Neil mastered Scenario 5 during generalization probes and responded variably in all other scenarios. Thus, we included Scenario 2 in mand training. His responding in Scenario 2 met mastery criterion within six mand training sessions (two at the 0-s prompt delay and four at the 3-s prompt delay). Posttraining probes of Scenario 2 revealed immediate mastery. Generalization probes included Scenarios 3, 4, and 6 (Scenario 5 was not included in the generalization probe again because it occurred at 100% in the previous generalization probe), and Neil responded 100% correctly for Scenarios 3 and 6. Mand training included Scenario 4 because it was the only scenario left unmastered. Neil's responding met mastery criterion in Scenario 4 within five mand training sessions (two at the 0-s prompt delay and three at the 3-s prompt delay). Posttraining probes of Scenario 4 revealed immediate 100% correct responding across two sessions.

Dexter met mastery criterion in Scenario 3 within eight mand-training trials (two at the 0-s prompt delay and six at the 3-s prompt delay). His responding met mastery criterion for Scenario 3 immediately during posttraining probes. Generalization probes revealed 100% correct responding to Scenarios 1, 2, and 4; 0% correct responding to Scenario 6; and 60% correct responding to Scenario 5. Thus, Scenario 6 served as the target in mand training, and mastery occurred within nine training trials (two at the 0-s prompt delay and seven at the 3-s prompt delay). Dexter responded 100% correctly during the generalization probe of Scenario 5. A 4-week maintenance probe revealed Dexter emitted 100% correct responding across all scenarios.

Table 2 represents a visual depiction of the number of training sessions required for generalization in each scenario and the total number of mand training sessions before mastery of all scenarios for each participant.

Discussion

This study is an empirical investigation of procedures to teach children with autism to mand for information by asking “why” under the control of the appropriate EO. As can be seen in Table 2, the procedures resulted in the establishment of the MFI repertoire for all participants, and responding generalized to at least one novel scenario after mand training was completed with one target scenario (Table 2). Trials to mastery ranged from four (Kipp: Scenarios 1 and 6) to nine (Dexter: Scenario 6). Generalization was established in 67% to 80% of scenarios across participants.

There are several areas future researchers should explore. First, Scenario 6 took the longest time for Dexter to acquire and was the only scenario where generalization did not occur for Kipp. In examining the teaching arrangements, the reason for this pattern of responding for Kipp and Dexter could be that Scenario 6 was slightly different from the other scenarios in that the experimenter gave the participant an item, instead of manipulating something in the environment. Each of the three children had a long history with ABA services, and so receiving items was quite common during their intervention using positive reinforcement. It is possible that the EO may not have been as strong as it was in the other scenarios targeted because receiving an item represented such a common experience for participants. It is also possible that other antecedent

Table 2 Master and generalization data for all participants

Scenario	No. mand training sessions to mastery	Total no. of mand training sessions (scenarios targeted) before generalization occurred	No. of mand training sessions before mastery of all scenarios
Kipp			
1	4	Not applicable (targeted first)	8
2	0	1	
3	0	1	
4	0	1	
5	0	1	
6	4	Generalization did not occur; this scenario was targeted	
Neil			
1	7	Not applicable (targeted first)	18
2	6	Generalization did not occur; this scenario was targeted	
3	0	2	
4	5	Generalization did not occur; this scenario was targeted	
5	0	1	
6	0	2	
Dexter			
1	0	1	17
2	0	1	
3	8	Not applicable (targeted first)	
4	0	1	
5	0	2	
6	9	Generalization did not occur; this scenario was targeted	

variables explain the lack of generalization. The common controlling antecedent variables (e.g., unusual and unexpected visual stimuli) that were present during training scenarios were likely not as salient in this scenario (i.e., receiving a putative neutral item).

There is an alternative explanation for the findings of this study. It is possible that the participant learned to say “why” only during the times the researcher arranged an antecedent condition and did not provide an immediate explanation. This experimenter behavior could have served as an (stimulus-delta) for saying “why.” Thus, the difference in the stimulus conditions present in each type of trial (i.e., the presence vs. the absence of the information) could have served a discriminative function. Future researchers should keep the consequences constant across both types of trials to further isolate the potential effects of the EO. Additional evidence of EO control may have been demonstrated if data were collected on what the participants did after receiving the information. For example, if after being provided information that the reason for providing a key was to play with toys in a

locked bin, the child went to the bin to access the toys. In the EOA condition, the correct response was trying to unlock the bin. Finally, we did not collect data on joint attending skills. Future researchers may wish to collect and report on these skills to improve the external validity of similar procedures. Specifically, because each scenario involved a novel event as an EO, demonstration of joint attention (Gomes, Reeve, Brothers, Reeve, & Sidener, 2019; Meindl & Cannella-Malone, 2011) may have facilitated the acquisition of manding “why” under those conditions.

Participants in the current study continued to ask the “why” question across multiple trials within a setting (i.e., they emitted the mand on Trial 1, Trial 2, etc.). One hypothesis for this continued behavior is that the behavior was maintained by attention or access to tangible items. However, given that the information was always changing (e.g., the “reason” was different), the information itself could have functioned as conditioned reinforcement, allowing the participants to persist with the MFI in the same scenarios. When the question “why” develops in typically developing children, it may serve an attention function (e.g., a young child asks “why” multiple times, even in the face of a similar or nonsensical answer), so the behavior established in the current study may mimic the way in which this repertoire develops naturally. Given the population under study (children with autism receiving ABA services), it is very difficult to train under pure EO conditions (i.e., where no antecedent verbal or visual stimuli are present in the learning trial). Future researchers could use activities such as science experiments because these types of activities may teach participants to ask why events occur (e.g., a balloon dipped in dry ice shatters) that may be consistent with the way this type of language typically occurs.

The EO for asking a question is an increase in the value of specific verbal information as a form of conditioned reinforcement (Sundberg et al., 2002). In the current procedures, it is difficult to determine the extent to which participants used the information and that the information functioned as conditioned reinforcement. Future researchers may evaluate the effects the information has on the behavior of participants. Instructional arrangements could evaluate what participants do after receiving the information—for example, go to the closet to obtain a jacket to go outside after receiving information about why everyone in the class has a jacket on. Future research could evaluate whether participants engage in an activity or continue a conversation after obtaining the information. Anecdotal information in this study suggests participants engaged in an activity they might not have otherwise accessed as a result of receiving the information. However, specific data on their behavior were not recorded, so it is difficult to directly interpret the function of asking the “why” question.

Studying MFIs remains a fruitful area for future research. When teaching “why,” future researchers should program and assess for generalization to other people and places, spontaneous emission of the MFI pre-and postintervention, and discrimination of the MFI “why” with other MFI forms (e.g., what, where, how). This generalization could be assessed by specifically rotating in new people and conducting trials in new places. Researchers could write specific scripts that evoke different types of MFI forms to program and assess for discrimination. Within the overall literature on mands for information, future researchers should focus on identification of the types of skills required to successfully respond to different prompts used in MFI teaching arrangements, the overall skills that might predict success in acquisition of MFI forms, and the number of mands and types of mands that should exist prior to successful acquisition of MFIs. More research is needed to determine whether a most efficient teaching hierarchy exists—for example,

should “what” and “where” be taught prior to “how” and “why” forms? Finally, it is unknown whether the teaching procedures used and the outcomes achieved in the current study were socially valid. Thus, research on the social validity of teaching procedures and outcomes is warranted (Wolf, 1978). This study represents one in a growing body of literature on establishing this skill in individuals with autism.

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Compliance with Ethical Standards

Conflict of Interest All authors declare that they have no conflicts of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all participants included in this study.

Appendix

Behavior Scores for Procedural Integrity

Treatment Integrity for Baseline, Posttraining, and Generalization Probes

1. Did the experimenter set up the antecedent according to the scenario description?
2. Did the experimenter provide the information if the response was correct?
3. Did the experimenter terminate the trial if the response was incorrect?

Treatment Integrity for Mand Training

1. Did the experimenter set up the antecedent according to the scenario description?
2. Did the experimenter implement the correct prompt delay (0 s or 3 s)?
3. Did the experimenter intersperse the MFI trials with regular language programming?
4. Did the experimenter provide the information if the response was correct?
5. Did the experimenter terminate the trial if the response was incorrect?

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