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# Using Errorless Teaching to Teach Generalized Manding for Information Using "How?"

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Five reinforcing activities were presented to and interrupted for two participants with autism. An errorless teaching procedure was then introduced with two similar activities prompting the participants to request information saying "How?" in order to resume the activity. The dependent variable included both the cumulative number of times "How?" occurred and number of times he used the acquired information to access his reinforcer. Training was conducted across five clinicians to program for and determine generalization across both activities and people. Results suggest that one participant's manding for information generalized across activities and clinicians, although his utilizing the acquired information was not as apparent for 4 out of the 5 activities. The second participant's behavior suggested his manding to have generalized to 3 out of 5 activities but limited (2 out of 5) use of acquired information. A maintenance trial conducted three weeks after the study's conclusion indicated that the target behaviors were maintained.

Keywords: *errorless teaching, autism, manding, generalization*

Using Errorless Teaching to Teach Generalized Manding for Information Using "How?"

Typically developing children often learn to make requests when prompted and in the presence of a desired stimulus. As this ability, or "manding," becomes more sophisticated, the speaker is able to make this request when the stimulus is not present and without prompting. The mand is a verbal operant for which the response is under functional control motivating operation (MO) and specific reinforcement (Skinner, 1957; Michael, 1982, 1988, 1993). An MO is an environmental variable that alters the saliency of a stimulus, e.g. manding for water is under the control of a MO of being thirsty, reinforced by the consequence of being presented with water.

Simple mands can be understood as mands for activities or tangibles while more sophisticated mands for information are about

activities or tangibles (Lechago, Carr, Grow, Love, & Almason, 2010). The manded-for information could allow the speaker to access a reinforcer ("*Where* can I get a pretzel?"), Lechago, Howell, Caccavale, & Peterson, 2013). Indeed, most of the mands that sophisticated users of verbal behavior emit are those for information. While typically developing children frequently mand for information with little or no direct teaching, those with autism may not acquire this capability.

A possibility for this deficit could be attributed to the lack of reinforcing value of the information requested (Sundberg, Loeb, Hale, & Eigenheer, 2002). There may be a MO for the initial request for information but the consequences may not reinforce further attempts. Without direct instruction, children with autism frequently are unable to acquire an established questioning repertoire (Shillingsburg, Valentino, Bowen, Bradley, & Zavatkay, 2011),

Prompt and prompt fading procedures have been used in direct instruction to increase manding for information for children with autism. Manipulating MO, prompts and prompt fading with vocal information regarding the desired stimuli have evoked manding for information in preschoolers (Endicott & Higbee, 2007). In this study, MO were contrived by hiding preferred reinforcers and prompting (with subsequent fading) the participants to ask where they were or who had them. Whole word echoic prompting was used to evoke the mand "Where is it?" when the reinforcer was hidden and "Who has it?" when someone possessed it. Using whole word echoic prompting has been successful in teaching other participants to mand for information (Lechago et al., 2010; Sundberg, Loeb, Hale, & Eigenheer, 2002).

The use of prompting to teach unknown tasks can be accomplished several ways. Prompts can be delivered 'least-to-most' or 'most-to-least' (Libby, Weiss, Bancroft, & Ahearn, 2008). In least-to-most prompting, the least invasive prompt, e.g. initial sound rather than whole word, is typically delivered so that the participant can accomplish the task. In this procedure, mistakes are generally allowed but then corrected with a prompt. In most-to-least prompting, prompts are used to prevent, rather than to correct errors. This later method is commonly known as "errorless teaching." Errorless teaching minimizes or eliminates the probability of an incorrect choice by using a zero-second delay (initially) to prompt to the correct response (Terrace, 1963). Errorless teaching has been used to teach unknown skills to adults with autism and intellectual disabilities (Jerome, Frantino, & Sturmey, 2007) and to increase visual discrimination skills and decrease avoidance behavior in children with intellectual disabilities (Weeks & Gaylord-Ross, 1981).

Several studies have taught children with disabilities to mand for information; "which/when?," (Shillings-burg et al., 2011), "who/where?," (Sundberg et al., 2002), "what?," (Williams, Donley, & Keller, 2000) and "who/which?,' (Shillingsburg, Bowen, Valentino, & Peirce, 2014). However, teaching the mand "how" has not been investigated thoroughly (Shillingsburg & Valentino, 2011).

These aforementioned researchers implemented procedures to teach a child with autism to mand for information using "how" in order to obtain information to complete activities. Methods teaching participants to mand "how" may not be common in the literature because after learning how to complete the activity/access the reinforcer, the individual may no longer need to mand "how" because the skill has been learned. In the Shillingsburg and Valentino (2011) study, MO were contrived to ensure that the participant's behavior could be reinforced by "how." Their initial mand training trials were conducted using errorless teaching, with the immediate prompting (zero second delay) of a correct response. Thus, the participant's response was much more likely to be correct but not independent. Subsequent mand training trials implemented a 5 second delay with necessary prompting for no response or an incorrect response. The later procedure may have encouraged more independence but allowed the learning of errors while not promoting fluency because of the latency between clinician prompting and participant response.

While the current literature provides programming for potential generalization with manding for information (Carnett & Ingvarsson, 2016; Ingvarsson & Hollobaugh, 2010; Lechago et al., 2010; Taylor & Harris, 1995; Shillingsburg, Bowen, Valentino, & Peirce, 2014), the single study teaching "how" (Shillingsburg & Valentino, 2011) has limited generalization potential. These last authors recommend using multiple clinicians and multiple exemplars of activities to promote generalization. Furthermore, limitations were also suggested with treatment integrity and maintenance.

Building upon Shillingsburg and Valentino's (2011) work to teach a child with autism to mand for information using "how," this study attempted to teach two adolescent boys with autism to generalize manding for information using "how." The present study incorporated generalization procedures from Shillingsburg et al., (2014) with use of multiple clinicians and untrained tasks. What varies with the former study is that the present study utilized errorless teaching for all mand training trials (independent variable) and generalization programming was implemented across clinicians, activities, with a follow-up maintenance check. Furthermore, the current study recorded the number of requests for information using "how" *and* the number of times the acquired information was used to access the reinforcer. Lastly, an internal measure of methodological fidelity was used to promote treatment integrity.

## Methods

### Participants

Melvin was a 12-year-old boy with autism and moderate intellectual disabilities. Both he and his brother, Bob (to be discussed later) participated in this study. Melvin was diagnosed at the age of 18 months by a clinical psychologist. He attended an approved private school serving youths with autism and other behavioral needs. Anecdotally, Melvin was very vocal in that his mother reported that he

habitually requests others to present him with activities that he was capable of accessing himself. He often whined for others to start a movie, access a website, etc. and tantrummed when his request was not granted. After his behavior escalated, he often did not attempt to access his reinforcer. Melvin has had no direct instruction in verbal behavior.

Bob, Melvin's brother, was a 17-year-old young man with autism and moderate intellectual disabilities. This information was provided by a recent medical evaluation. Bob was diagnosed at the age of three by a psychiatrist. He attended the neighborhood high school, where he was in a self-contained Life Skills class. Anecdotally, Bob was not very vocal, in that he gestured instead of vocalizing his needs, but used one or two word requests occasionally. His mother described him as a 'problem solver.' He attempted to find ways to access his reinforcers rather than request assistance from others. It appeared that he chose not to interact with others besides his brother and mother. Please see Table 1 for the participants' VB results across selected areas.

Table 1
*VB-MAPP Results Across Selected Areas*

| Participant | Mand | Listener Response | Motor Imitation | Independent Play |
|---|---|---|---|---|
| Melvin | 5.0 | 8.0 | 3.5 | 6.0 |
| Bob | 5.0 | 7.0 | 3.0 | 6.0 |

**Materials**

Both participants, as reported by their parents, watch preferred programs on computer screens and/or televisions when alone or with others. Two potentially reinforcing activities for each participant were identified by the participants' parents. For mand training, an essential component was removed (Table 2) in order to teach him how to request information to complete the activity. For the generalized, nontraining activities, five were identified (Table 3). These activities were also identified by the participants' parents with the intention that they would be of functional use and high interest to their children. If either participant appeared unmotivated at the presentation of the activities (walking away, engaging in another activity, or demonstrating escape behavior), then the contrived EO would have been determined to be not sufficiently motivating. This did not occur, as all novel stimuli appeared to motivate (physically gesturing/naming activity, staring, emitting sounds and/or jumping up and down) the participants' engagement.

Table 2
*Tasks Involved for Teaching the Mand, "How?"*

| Activity | Contrived EO | Errorless Teaching | Participant Response |
|---|---|---|---|
| iPad | muted program | "How to make it work?" and shows how to unmute | unmutes program |
| TV remote | unable to work | "How to make it work?" and shows how to use | manipulates remote |

Table 3
*Generalized Manding*

| Activity | Contrived EO | Clinician response |
|---|---|---|
| Computer | Can't play computer | Clinician shows how to manipulate mouse |
| iPad | Paused program | Clinician unpauses |
| Computer | Can't play computer | Clinician connects mouse |
| Video game | Can't play game | Clinician plays game |
| Computer | Disconnected monitor | Clinician connects monitor |

**Clinicians**

Five clinicians implemented the procedures of this study: 2 female and 3 male. Four completed an introductory course in Applied Behavior Analysis and received training regarding intervention procedures while the fifth was the university instructor. Schedules rotated so that the participants did not work with the same clinician two days in a row in order to program and observe any generalization effects across people.

**Setting**

All sessions took place in the family's home and were conducted individually for each participant. The primary clinician sat or stood in full view (within 5 to 7 feet) of the participant during the intervention. The secondary clinician (for data collection purposes) was in the participant's view but not as close as the primary (approximately 10-15 feet). The topography of the room was a furnished basement where a computer and television were by a wall approximately 12 feet opposite a staircase. This staircase connected the basement to the family's living room. Throughout the study, some family members, therapeutic support staff (TSS), or friends were present in the upstairs living room while each participant was involved in the basement. Background noise was not consistent during the study and the variations in ambient noise may have allowed for unaccounted variables to interfere with participant performance.

**Response Measurement**

The dependent variables were the independent cumulative responses ("How?") of the participants during nontraining scenarios and the cumulative number of times that the participant used that information to access their reinforcer. A response was scored as independent if the participant vocally manded "How?" within 5 seconds of the clinician contriving the EO, e.g. from the time the video game was paused until the response of "How?," the time from the computer

mouse was disabled to "How?," etc. For utilizing the information, a response was scored as occurring if the participant responded to the clinician prompting to use the acquired information to resume the activity.

**Interobserver Agreement**

A second observer was present during 74% of trials. Interobserver agreement (IOA) was calculated by dividing the number of agreements by the sum of agreements and disagreements between the primary and secondary clinicians and multiplying by 100%. An agreement was defined as both the primary and secondary clinicians agreeing that the participant's response was a mand for information using the word, "how." A disagreement was defined as one clinician interpreting the response differently than his/her counterpart. Please see Appendix B. IOA was 100%.

**Treatment Integrity**

Task analyses were completed for all training and nontraining procedures. Treatment integrity was calculated through the use of the Treatment Integrity Checklist to ensure treatment fidelity. The secondary clinician checked "Yes" if s/he agreed that the primary clinician-implemented task was accurate to the study's outlined methods and "No" if there was deviance, i.e. too long of a delay during errorless teaching, not capturing EO for the participant prior to presentations, providing a prompt during nontraining sessions, etc. Anything deviating from the stated methods was marked as "No" by the secondary clinician. Treatment integrity was calculated by subtracting the "No" tasks from the total number of tasks available for that activity and multiplying by 100%. With a second observer being present for 74% of the trials, treatment integrity was 100%. Please see Appendix A.

**Research Design**

An A-B design across conditions ("How?" scenarios) was implemented. Baseline (A) was followed by the introduction of training (B) for two conditions. Three additional nontraining conditions (similar to baseline, no treatment was implemented) were included to determine if trained skills had generalized. If manding for information occurred prior to training in any of the nontraining activities, training was not implemented for those activities. For the five identified nontraining activities for both participants, no manding for information occurred prior to training.

**Experimental Procedures**

**Assessment.**

The Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) (Sundberg, 2008) was used across four areas; mand, listener response, motor imitation, and independent play. The VB-MAPP attempts to provide a representative sample of a participant's existing verbal skills. The levels of the instrument correspond to the verbal abilities of typically developing at different ages; Level 1 (0-18 months), Level 2 (18-30 months), and Level 3 (30-48 months). The selected VP-MAPP areas were identified because of their relation to the methodological tasks involved. The participants' behavior was being trained to request information (mand) to access information. They would potentially be

able to respond to and apply this information (listener response) to access reinforcers. Although not being specifically trained in motor imitation, if they were able to physically imitate the clinicians (motor imitation), they may have been able to access the reinforcers without requesting information. Independent play was assessed to understand the participants' ability/duration to engage in reinforcers without the mediation of others. According to the selected VB-MAPP areas, both participants' manding and motor imitation abilities were at the beginner level (Level 1), while listener responding and independent play were assessed to be at the intermediate level (Level 2). Please see the following table for results.

**Baseline.** Baseline data were collected across the two training activities. Before any training sessions commenced, the participants were presented with their respective reinforcing activities (Table 2) that required information to fully access, but none was provided, to determine if they were able to request information to access it or physically enable the activities. Each activity was presented once per trial in a random order. Training began after there were no responses for four consecutive trials of baseline across all activities at the beginning of the study.

**Training Session.** The clinician engaged in the preferred activity (Table 2), in full view of the participant. After the participant demonstrated that he was motivated to participate as previously noted, he was presented with access to the activity (handing him the iPad and remote accordingly) and immediately prompted (errorless teaching = zero second delay) with the clinician saying "How?," once per trial. When the participant echoed "How?," then the clinician provided verbal (told into which port to plug the unconnected mouse, which button to push, etc.) and gestural prompts (demonstrated by pointing) to resume the activity. This occurred on every training trial during the study with no transfer (fading prompts) taking place. An identical procedure was then implemented for the second reinforcing teaching activity. After the two training sessions were presented to each participant (one for each activity) in random order, the five nontraining sessions commenced and data collected. Nothing else was done to increase the probability of an echoic response: No words were pronounced with a special emphasis or different tone of voice. The contrived EO was intended to be the only stimuli occasioning the mand for information.

**Nontraining Session.** Similar to the training procedure, the clinician engaged in the preferred activities (Table 3), in full view of the participants. After the participant was motivated to participate, the activity was interrupted (contrived EO) for which information was needed to resume/access it. As previously stated, a response was scored as independent if the participant vocally manded "How?" within 5 seconds of the clinician contriving the EO, e.g. from the time the video game was paused until the response of "How?," the time from the computer mouse was disabled to "How?," etc. He was then vocally and gesturally presented with the information needed to access his reinforcer. A latency of

responding greater than 5 seconds or none at all was not scored as independent. If a non-independent response was scored, then that specific activity was terminated. For utilizing the information, a response was scored as independent if the participant responded to the clinician prompting to use the acquired information to resume the activity, e.g. plugged in the computer mouse, turned the video game back on, etc. Trials ended when all five nontraining activities were offered to the participant, regardless of whether or not they manded for information regarding them. Mastery criteria were independent responses scored across all nontraining activities three times consecutively.

**Maintenance.** Approximately three weeks after mastery criteria had been met for manding "How?," maintenance data were collected. With no additional training being provided, the participants were presented with the nontraining activities to determine if they have retained the skills necessary to access them. One trial was conducted for each of the five activities.

## Results

As the data indicate (please see Figures 1 and 2), Bob achieved mastery criteria for 3 out of 5 nontraining activities for manding for information while Melvin mastered all five. For applying the manded-for information, data suggest that Bob engaged in this behavior (albeit at a slower rate of acquisition) for 2 out of 3. Melvin's data suggest that he applied the manded-for information to access 4 out of the 5 nontraining activities. Throughout the study, Melvin would mand for an activity to be resumed but not how this study's methods instructed him. He would mand "Play bowling, please. Show the movie, etc." As delineated in the Methods section, these requests were not granted. Data for the training trials are not displayed, as the target behavior occurred on 100% of trials, due to errorless teaching. This behavior cannot be considered as independent, however, as zero-second delay prompting was used.

Despite mastery criteria not being met for the two activities manipulating the computer mice for Bob, the training sessions were terminated. These two activities required that Bob directly come in close proximity to the clinician(s), down from the stairs, and sit at the computer at the opposite wall. Across the 34 trials, Bob seldom ventured off the steps: He stood at the base of the steps approximately 2-3 times and for durations under a minute. Consequently, his sitting at the computer and manipulating the unfamiliar and unconnected mice was not possible. Thus, potential generalization to these two untrained activities could not be determined. The three activities where generalization did occur were able to be completed at a distance from the clinician(s). The iPad was brought to him on the stairs where he manded for information and used that information to resume the activity. The video game responses occurred in a similar fashion. For the computer monitor being disconnected, Bob watched the monitor and manded for information from afar. Being at a distance, he was not in a position to utilize this acquired information.

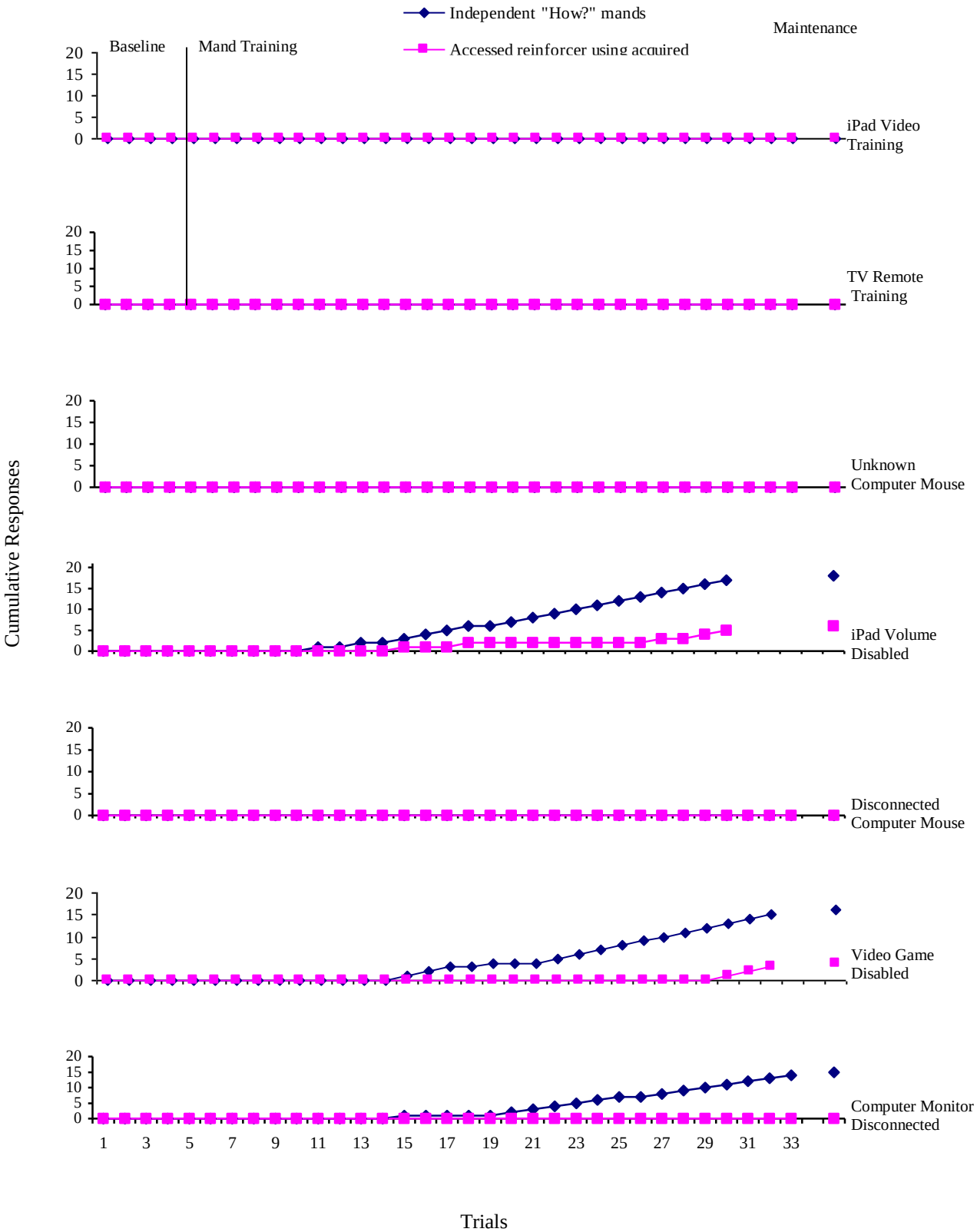


*Figure 1.* Bob's cumulative number of mands for information using "How?" and number of times he applied that information to access that reinforcer for each activity.

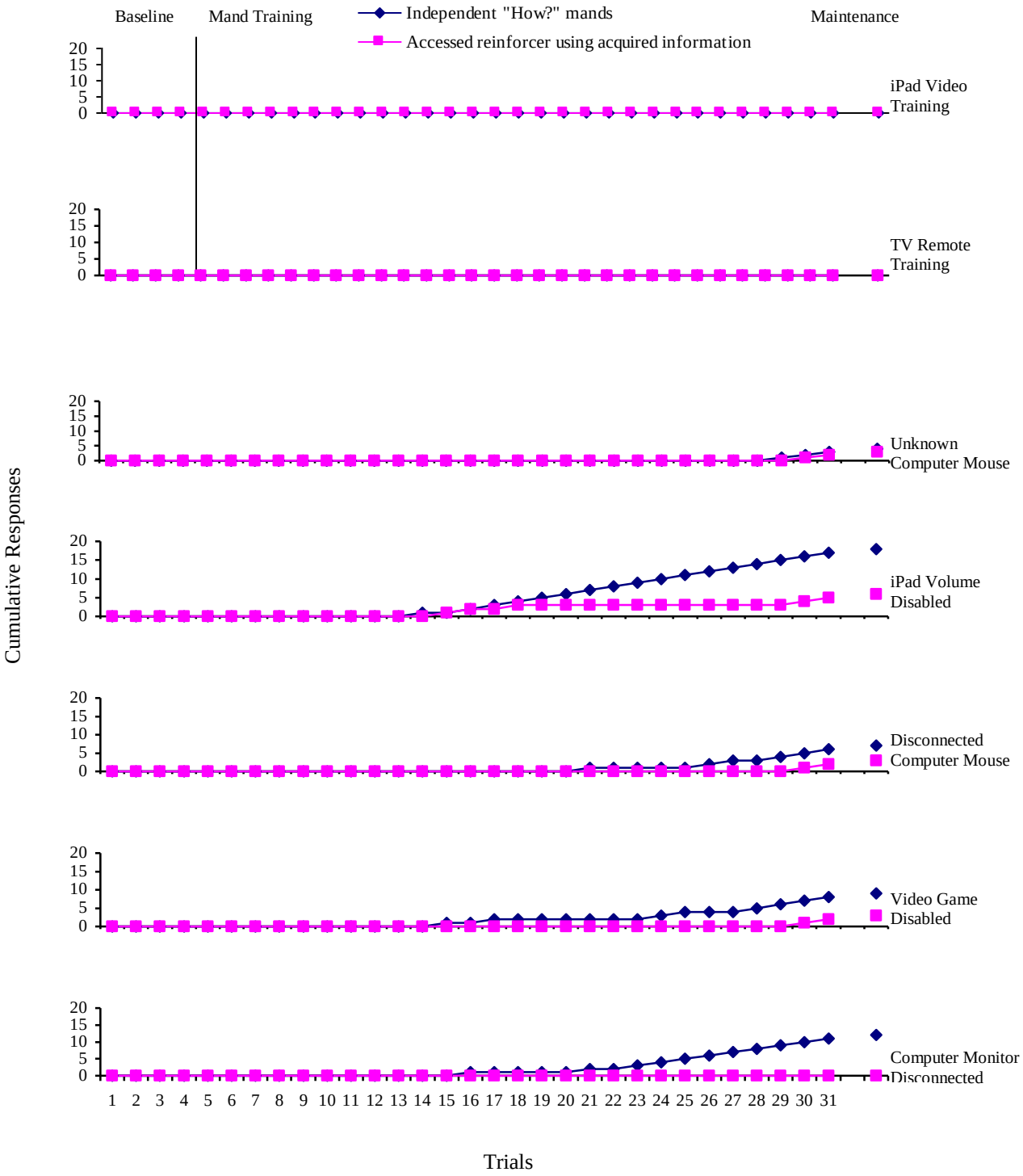


*Figure 2.* Melvin's cumulative number of mands for information using "How?" and the number of times he applied that information to access that reinforcer for each activity.

## Discussion

### General Discussion

Before mastery criteria were met, Melvin often tacted the contrived aspect of the activities during the trials, i.e. "They're broken!" and "It doesn't work!" Although it was beyond the procedures of this study, future efforts could employ a tact-to-mand transfer procedure across operants to teach manding for information. A similar echoic-to-mand transfer procedure could be considered for Bob, as he frequently echoed the vocal stimuli of the activities.

Bob's mother also reported that he frequently sits on the steps when his father works on the computer. Bob's unwillingness/inability to work in close proximity and/or previous history of staying on the stairs when adults were in the basement may have compromised the ability to determine generalization effects. As previously mentioned, Bob often manded for information to resume the computer activities with the mice from afar but did not attempt to manipulate them. Future studies could expand the operational definition of the target behavior to observe more sensitive generalization effects.

As per the participants' mother, "Bob tended to be a problem solver and Melvin repeatedly vocalized his needs that which he could obtain himself." Her perceptions did appear to typify the behavior of the participants. As evidenced by shying away or cringing when closely approached, Bob did not seem to want to participate with the clinician-presented reinforcers. He was more receptive and engaging with the activities when the clinician was at a distance. Originally, mastery criteria were identified when independent responses were scored across nontraining activities three times consecutively. However, Bob did not approach (place himself in physical proximity, 2-3 feet, to access the activities) two of the nontraining activities. As previously noted, more pairing may address this obstacle to instruction. Additionally, it is possible that baseline may have extinguished responding in that repeated presentations of the reinforcing activity with no delivery of that activity may have reduced the effectiveness of that and similar activities as a reinforcer. In any within-subject design, however, baseline should not be disregarded. Future studies could ensure that the experimental activities have a history of reinforcement prior to withholding reinforcement during baseline, though a historically dense schedule of reinforcement may decrease the saliency as a reinforcer. Perhaps pairing the clinician's presence with the participants' reinforcers may encourage compliance despite reinforcement being withheld during baseline.

Melvin did behave as his mother described before the commencement of the study in that he did vocalize for stimuli that he may have been able to access himself. As previously mentioned, if his responses differed from the operational definition of the target behavior, "How?" it was not reinforced. While some activities saw more robust responding (iPad and

computer monitor), his responses were generally consistent suggesting his previous tact-mand "It's broken" was extinguished for these activities and the target behavior of manding for information increased. Lastly, it appeared that Melvin's utilization of the manded for information increased as he attempted on his last two trials to problem-solve and resume the interrupted activities. While manding "How?" before the clinician's prompts, he independently attempted to activate the unfamiliar mouse and connect the disabled mouse.

For Melvin, 3 of the 5 nontraining activities reflected consistent manding-for information (albeit late responding for the unknown computer mouse). While it can be supposed that some activities were more salient than others, another possible explanation for the variation in responding was competing reinforcers. Melvin engaged in self-stimulating behavior with string, lint, etc. On those trials where he had possession of these articles and was engaging in self-stimulation, it was more challenging to capture MO. To ensure that appropriate levels of MO are present in order to conduct this type of training and better encourage consistent responding, competing/distracting reinforcing activities should be eliminated or minimized.

There appeared to be no trend with any individual clinician potentially affecting the responding of the participants. The participants responded or did not respond comparatively across clinicians. As Melvin achieved mastery criteria for 100% of the activities with Bob achieving 60%, it can be believed that the target behavior was generalized across people. The schedules of the clinicians rotated so that the participants did not work with the same clinician two days consecutively to program for generalization across people. Figures 1 and 2 suggest that generalization across clinicians occurred for both participants because of the semi-consistent responding. In other words, the same clinician implemented the experimental procedures every 4-5 trials. If the participants manded for information only to certain clinicians, their data should have suggested an increase and then a plateau equivalent to clinician rotation. While there were some plateaus in vocalizing "How?," it appears that (disabled video game for Bob in trials 19-21 and 25-27 for Melvin) there were no trends which might suggest greater responding to a particular clinician. There may not be enough use of the acquired information responding data to determine to make any claims about generalization effect.

Recording generalization probes across multiple items and contexts is a strength of this study, as well a conducting maintenance probes. As previously mentioned, the is a paucity of research regarding the generalized manding for information. Maintenance probes also allowed the conclusion as to whether the manding will be maintained post intervention. Adequate IOA and treatment integrity checks also strengthened reliability and validity.

**Establishing Operation**

EO was determined by making eye contact, motioning towards, and/or repeating the name of the reinforcing

stimulus. Thus, there was no measurement of intensity for EO, only whether it was present or not. The participants may have been more or less motivated on some trials but the methods of this study were not sensitive enough to reflect this variable. It could be expected in this situation that the target behavior would be more likely to occur if the participant was motivated to respond. However, motivation is not an 'all or nothing' variable. Future studies could consider measuring EO on a Likert scale, e.g. 0 = did not look at activity, 1 = looked at activity, 2 = looked and motioned to activity, 3 = looked, motioned, and walked to activity, etc. Those trials where manding for information and/or applying that information does not occur while motivation is scored to be high should reevaluate the methods. Conversely, if the target behavior occurs while the utilized Likert scale suggests low motivation should also reevaluate the methods. Melvin's responses were staggered in that 3 of the 5 activities reflect consistent incorrect or no responding preceded and followed by correct manding for information. This may be related to competing reinforcers or lack of appropriate EO for responding.

It is a possibility that the "how" responses were under discriminative control rather than EO, i.e. the stimuli, training setting, therapist, or some other stimulus came to evoke responding. If the responses were actually functioning as mands for information, that "information" should serve a dual function: It should set the occasion for the response (e.g., enabling the iPad) that enables access to the preferred activity and in the presence of the relevant MO, it should reinforce asking the "how" question. The fact that the participants often did not engage in the activity after responding "how" casts some doubt on whether these activities were reinforcing or whether the participants were motivated to access the activities at the time. Although "how" responding began to be emitted by both participants, it can't be determined if the response is under the control of the EO for information to access the activity. Indeed, the nature of the "how" mand for information suggests that its consequence should over time abolish the relevant EO. This should be true unless the tasks are constantly changing. One would expect the participants to learn how to solve the problem themselves (e.g., connect the computer mouse without being told how) over repeated trials. When the participants know how to solve the problem, the relevant EO is no longer in place, and they should no longer mand "how." It is possible that the vocal response "How?" was more appropriately classified as an echoic under partial contextual control of the interruption. Future efforts could provide opportunities to engage in activities in which the information is not needed and observe if the "how" response is not emitted during those trials. This could provide support for EO control of the responses. Furthermore, it is possible that the participants simply needed more trials to learn to engage in the responses independently).

The activities were not covert as to when they were going to be interrupted (contrived EO). Perhaps

when the participants saw the activity was going to be interrupted, it may have served as an additional discriminative stimulus to request information. However, this could hardly be considered independent, as there would be multiple stimuli controlling the response. Additionally, it may not be functional in an applied setting. Future studies could consider being overt with the contrived EO and transferring to covert presentations which could possibly promote both acquisition and encourage independence.

**Language Assessment Association**

How did the participants respond relative to their VB-MAPP (Sundberg, 2008) subtest assessments? The study's methods attempted to have the participants acquire the ability to mand for information and investigate the application of that information and did not individually instruct across operants. Thus, relating participant performance to their subtest assessments is speculative. The limited outcomes could be a function of the participants' limited mand repertoires (Level 1, VB-MAPP). According to the VB-MAPP, manding for information exceeds what can be expected from Level-1 mand performance. It could be reasonable to estimate that the higher a VB-MAPP assessment, the more likely a participant would acquire the target behavior. Since both Melvin and Bob's assessment suggested that their Lister Responding ability was higher than their Motor Imitation, vocal prompts may have been more likely to encourage acquisition. Future research could conduct similar assessments and ensure that areas of strength (Listener Responding versus Motor Imitation) be addressed by providing the corresponding type of prompt.

**Limitations and Future Research**

A consideration for future studies should be the availability of the reinforcers. During the parent interview before the commencement of the study to determine potential reinforcers, computer activities were identified as especially salient for both participants. While this did appear to be accurate, both participants had non-contingent access before and after every trial. Thus, a participant could essentially not respond, wait for the clinician to leave, and indicate to the attending staff or family member what he wanted access to the computer. If the participants were denied access to the computer, the acquisition of the target behavior may have occurred and more quickly.

Perhaps the results may have been different if a formal preference assessment was used to identify the tasks, as opposed to anecdotal input from the participants' parents. Having these data on whether the identified activities functioned as reinforcers would better support their consideration for mand training.

As previously stated, when teaching "How?" mands for information, the MO should be lost when the participant has the information. In other words, once the information was given, the activities should no longer be "nontraining" activities. Treatment Integrity (see Appendix B) suggests that the outlined experimental methods were implemented with fidelity (100%). Why didn't "How?" responding plateau and the use of the acquired information to resume the activity increase? As the

previous paragraph stated, the participants had access to nontraining activities after the clinicians finished the sessions. Perhaps the session/clinician was negatively reinforcing in that the participants responded "How?" to finish the sessions. Considering that "How?" was acquired (in most scenarios) before utilizing any information, it is a possibility. Future research could produce the manipulation without its being caused by the clinician, e.g. programming the iPad to lock after a minute of inactivity, TV to sleep after one minute, etc. This method could be more naturalistic, less contrived, and not be attributed to the clinician. Furthermore, when the TV sleeps during viewing, the clinician could initiate the trial by saying, "Oh, Melvin, the TV is asleep. Turn it back on."

Melvin occasionally manded appropriate requests "Play bowling, please. Show the movie, etc.," but these were not reinforced. Considering that Melvin's manding was assessed to be at Level 1 of the VB-MAPP, future studies could provide a prompt when a functionally and socially appropriate non-target mand was emitted.

Future efforts could allow for more pairing the clinicians with the preferred stimuli of the participants. Bob may have been capable in displaying this generalized skill but unwilling. Impaired social interaction is a significant characteristic of autism. Whether it is deficient or absent, increasing a person with autism's ability to interact with others is a common component of instruction. While generalization training methods were paramount, more pairing may have remedied this potential limitation.

A limitation of this study was the simultaneous initiation for both training activities of the independent variable. Multiple treatment interference (Cooper, Herron, & Heward, 2007) may have occurred for a participant's behavior being influenced by the effects of one or the other training procedures. Because both variations of the IV were commenced simultaneously, the more effective (if either) training activity cannot be determined. The IV (training activities) was not implemented during baseline. As in errorless teaching, a zero second delay prompt was simultaneously provided for both training scenarios of the IV. Thus, it cannot be determined which scenario of the IV (iPad or TV remote) could have been more effective. Displaying the target behavior occurred on 100% of trials for the IV, as can be expected. Because whole-word prompting was used, this very method of errorless teaching encourages correct responses. As previously mentioned, in multiple baseline designs, the independent variable is not applied to the next activity until the previous setting has changed. Future research could delay the commencement of additional training activities (IV) to determine treatment effects of those already begun. Additionally, future efforts implementing errorless teaching should fade prompts. A zero second delay was used across all trials. To encourage independence, a transfer procedure where prompts are systematically delayed to 1, 2, 3 seconds, etc. to none being provided, could be implemented.

The data suggest that the participants' behavior may not have been as reinforced by the secondary

reinforcer of information as much as the resumption of the reinforcing activity itself. It could be that the "how" response became part of a chain whose terminal reinforcer was access to the reinforcer, and possibly have functioned as a mand for the activity, rather than for information. For Melvin, the data indicate that he utilized the manded-for information to access 4 out of 5 of the mastered nontraining activities. For the fifth, he did not utilize the manded-for information at all suggesting that he may not have been manding for information but requesting the activity itself. The results are similar for Bob in that of the three nontraining activities mastered, he utilized the manded-for information for only two. Perhaps they may not have understood the information provided or did not have the listeners' repertoire to use the information. Future research could only provide gestural and/or vocal prompts on *how* to access the reinforcers rather than directly enabling the resumption of the reinforcing activity. Furthermore, the manded for information should be easy to utilize by ensuring that a participant possesses the prerequisite skills necessary for task completion. Melvin did not utilize the information to plug in the disconnected computer monitor because he may not have possessed the fine motor skills.

Another limitation with this study was the inconsistency with levels of prompting. Clinicians indiscriminately used vocal, gestural, or a combination of both prompts in response to the participants' manding "How?." The participants may have responded better to one type. Perhaps those trials where the participants utilized the manded-for information from the clinician's vocal prompt may have suggested more independence than those requiring a gestural one. Additionally, a directive (mand) may have been better to give to the participant after requesting "How?" rather than labeling (tacting) how to access the activity. In other words, tell him to do it rather than tell him what to do. Future efforts should utilize consistent levels of prompting and fade accordingly.

While there are potential methodological improvements to be made, this study has potential value for clinicians and teachers to teach people with autism to request and apply information. Teaching participants how to apply manded-for information could potentially increase independence. Going beyond the two participants with autism in the current study, this type of self-sufficiency training has utility for those dependent on others for adaptive behavior. In teaching "how?" to access information and directly reinforcing that behavior with that information, independence could be encouraged across people with disabilities and settings.

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## Appendix A

Treatment Integrity Form

| **I. Teaching Procedures** | **Yes** | **No** |
|---|---|---|
| 1. Was MO captured for teaching task #1? Was the setting manipulated to ensure that the participant was motivated to engage in the activity as evidenced by reaching for or looking at item/activity? | | |
| 2. For teaching task #1, was errorless teaching employed (zero second prompt)? *iPad manipulation* | | |
| 3. Was MO captured for teaching task #2? Was the setting manipulated to ensure that the participant was motivated to engage in the activity as evidenced by reaching for or looking at item/activity? | | |
| 4. For teaching task #2, was errorless teaching employed (zero second prompt)? *TV remote incapacitated* | | |
| **II. Generalized Procedures** | **Yes** | **No** |
| 1. Was MO captured for generalized procedure #1? Was the setting manipulated to ensure that the participant was motivated to engage in the activity, as evidenced by reaching for or looking at item/activity? *unfamiliar mouse* | | |
| 2. Was MO captured for generalized procedure #2? *iPad manipulation* | | |
| 3. Was MO captured for generalized procedure #3? *unconnected mouse* | | |
| 4. Was MO captured for generalized procedure #4? *unfamiliar video game controller* | | |
| 5. Was MO captured for generalized procedure #5? *unconnected computer monitor* | | |

## Appendix B

Interobserver Agreement

| **Generalized Tasks** | **Yes** | **No** |
|---|---|---|
| 1. Successfully manipulated unfamiliar computer mouse | | |
| 2. Successfully manipulated iPad | | |
| 3. Successfully connected mouse to computer | | |
| 4. Successfully manipulated unknown video game controller | | |
| 5. Successfully powered computer monitor | | |