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Teaching Mands to Older Adults with Dementia

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Abstract Millions of Americans are diagnosed with dementia, and that number is only expected to rise. The diagnosis of dementia comes with impairments, especially in language. Furthermore, dementia-related functional declines appear to be moderated by environmental variables (Alzheimer's Association, Alzheimer's & Dementia: The Journal of the Alzheimer's Association 8:131–168 2012; American Psychiatric Association, 2000; Engelman et al., Journal of Applied Behavior Analysis 32:107–110, 1999; Engelman et al., Journal of Applied Behavior Analysis 36:129–132, 2003) Traditional language tests are not likely to assess or inform treatment for deficits in manding (Esch et al., The Journal of Speech-Language Pathology and Applied Behavior Analysis 5:166–191, 2010), and the mand is a verbal operant about which little is known among this population. The current study evaluated whether contriving an establishing operation within a preferred activity using a prompt-probe intermix procedure and a transfer of stimulus control procedure was effective in establishing mands in older adults with dementia. The procedure was demonstrated to be effective with one participant, but results were inconsistent with the second participant. Modifications were made throughout training for both participants, showing the importance of individualizing interventions.

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Millions of Americans are diagnosed with dementia (Alzheimer's Association 2012). Although the hallmark deficit associated with dementia is memory impairment, other key criteria for diagnosis include language deficits. These language deficits could cause impairment in functioning socially and occupationally and result in significant decline from previous functioning levels (American Psychiatric Association 2000). For example, many individuals with dementia experience changes in social functioning and interaction style, such as increases in ambiguous content in speech (e.g., "I remember doing the thing at that place," substituting thing and place for specific terms) as well as decreases in on-topic verbalizations (Bourgeois 1993).

Research suggests that environmental variables can impact language even as the dementia progresses. Bourgeois (1993) evaluated the use of memory aids in conversations between older adults with dementia. Prior to treatment, the participants' conversations were frequently off topic. After Bourgeois provided participants with memory aids (books with pictures and text related to the person), she observed increased on-topic conversation in the conversation dyads. This is consistent with other applications of behavior analysis to reduce or reverse declines that are often attributed to aging or progressive disease processes such as dementia. For example, evidence suggests that individuals with dementia engage in less activity in a nursing home setting than those without

dementia, even though there is no physical reason for the declined activity (Resnick et al. 1997). Researchers have demonstrated that offering activities and prompts can result in high levels of engagement (Engelman et al. 1999). Other aspects of functional decline associated with dementia can also be remediated through behavioral interventions (e.g., increasing residents' independence during bathroom routines; Engelman et al. 2003). The success of such interventions may be surprising to those outside of the realm of behavioral gerontology, as functional declines (e.g., disengagement, incontinence, and inactivity) are believed to be part of the disease process, inevitable, and irreversible (LeBlanc et al. 2011). The success of behavioral interventions for functional declines is promising, and it is important to evaluate the extent to which language declines among older adults with dementia are the result of disease progression or the product of environmental contingencies that do not maintain such behaviors.

Outside of the realm of behavior analysis, speech-language pathology has already attempted to address language deficits associated with dementia. Typically, augmentative and alternative communication (AAC) strategies have been evaluated as a means of increasing communication (Silverman and Schuyler 1994) and interaction with staff (Bourgeois et al. 2001). Although older adults with dementia experience language deficits, they remain able to communicate and to engage in conversations in most social situations, though content may be lost. With time, the structure of language deteriorates, but the individual is still able to speak. As such, interventions focus more on taking advantage of existing skills and not on re-teaching skills. For example, reading and spelling repertoires seem to maintain long into the disease process (Baker et al. 2008), so AAC strategies, including the use of communication boards which allow older adults to spell out words and phrases, are common recommendations. Although some authors have suggested that AAC strategies (e.g., communication boards or a Touch Talker) are recommended for older adults with dementia, they do not appear to be commonly used (Beukelman et al. 2007; Silverman and Schuyler 1994). Silverman and Schuyler attribute this to the fact that many care providers assume that the decline is an inevitable part of the disease process and AAC strategies cannot impact the disease process.

Taken together, the literature suggests that efforts can and have been made to accommodate language deficits among older adults with dementia. However, those efforts are typically not focused on treatment. Also, in a nursing home environment, using AAC strategies would require staff members' compliance implementation. Although it is likely that any language intervention will require a level of staff compliance, it would be more ideal to target responses that are likely to have been in the person's vocal repertoire before the onset of dementia. If this could be achieved, the response effort on the part of staff may be reduced, because nursing home staff would be required only to comply with the reestablished repertoires rather than keep track of a memory book or other AAC-related materials. Additionally, individuals with dementia would be able to engage in the response at any time as opposed to relying on staff members' implementation of AAC strategies.

Skinner's (1957) analysis of Verbal Behavior provides an excellent framework for exploring the assessment and treatment of language deficits in persons with dementia. To date, only a handful of studies have extended Skinner's analysis to older adults (e.g., Dixon et al. 2011; Gross et al. 2013; Henry and Horne 2000; Trahan et al. 2014). Both Gross et al. (2013) and Henry and Horne (2000) demonstrated that individuals with dementia exhibited deficits in both speaker behavior (e.g., echoic, tact, and intraverbal) and listener behavior (e.g., compliance and receptive identification). Dixon et al. (2011) investigated the use of existing repertoires (echoic responses) to increase recall in three older adults with mild to moderate Alzheimer's. Participants were shown pictures belonging to 4 different categories. Some pictures were assigned to the echoic condition, in which the experimenter stated the word and the participant was instructed to repeat the word, so as to evoke the desired response. Other pictures were assigned to the nonechoic condition in which the experimenter did not provide an echoic prompt. The results of the study showed that all three participants recalled more pictures in the echoic condition than the nonechoic condition both immediately after viewing the pictures and at 1-week follow-up.

Although there is some research on verbal operants and intervention strategies that incorporate Skinner's analysis with older adults with dementia, there is a paucity of research on the mand with this population. However, Dwyer-Moore and Dixon (2007) demonstrated that functional communication training (FCT) with older adults with dementia could establish appropriate communication. The participants were taught to hand the researcher a break card to request a break from

demands. The results of FCT treatment demonstrated an 82 % overall reduction of disruptive vocalizations and gradual increases in independent communication with a break card. The break card response can be conceptualized as a mand. Baker et al. (2008), who described a behavioral conceptualization of aphasia, suggested that future research should evaluate mand repertoires as well as mand training with older adults. Esch et al. (2010) later pointed out that although existing traditional speech-language assessments for older adults can be used to assess many of Skinner's operants, the literature is lacking assessments that could be considered to assess the mand. In response to both Baker et al. and Esch et al., Gross et al. (2013) explicitly assessed mand repertoires with older adults with dementia but did not intervene when deficits were observed. Most recently, Trahan et al. (2014) demonstrated that older adults with dementia could be taught to exchange pictures of activities (identified as preferred based on verbal report of the participants) that resulted in 60-s access to those activities (i.e., mands for activities). However, Trahan et al. note that the stimuli were present when access was restricted and that responses may have been evoked due to the discriminative properties of the stimuli and not an establishing operation (EO). Additionally, distractor cards were not used, further limiting the researchers' ability to assess whether the response was under the control of an EO or the discriminative effects of the experimental conditions.

It is important that researchers who attempt to assess mands among older adults with dementia consider both the individual's reinforcement history and the presence of an EO (Michael 1988). Sundberg and Michael (2001) point out that one can either capture an EO or contrive the EO when training a mand. Sundberg et al. (2002) provide an excellent example of contriving an EO during mand training. In Experiment 1, two children were taught "where?" mands for information. Two different items, one preferred and the other nonpreferred, were used. The EO was contrived by hiding the items and instructing the children to retrieve them following a free-access period. Both children learned to mand for information when the EOs were contrived. In general, the children began to correctly mand for information in fewer sessions for the preferred missing item compared with the nonpreferred missing item. In Experiment 2, the "where?" component of Experiment 1 was replicated and a novel "who?" component was added. When the child asked where the item was, the experimenter said, "I gave it to a teacher." The child was then taught to mand "Who has it?" which was reinforced by the experimenter providing the name of the teacher. The results of Experiment 2 once again showed that contriving the EO resulted in effectively establishing mands.

In summary, language deficits have traditionally been thought to be part of the inevitable disease process of dementia, but preliminary research supports the use of Skinner's (1957) analysis to reestablish verbal repertoires, and in particular, mands. Training mands could not only lead to an improved quality of life by providing individuals with dementia the ability to access desired items and activities, attention, social interaction, and escape from aversive stimulation, but may also reduce aggression and other challenging behavior maintained by access to those stimuli, which might have developed due to diminished verbal repertoires. When training the mand, it is important to consider the EO (Michael 1988; Sundberg et al. 2002). Contriving the EO rather than capturing the EO is a better option for training mands in a controlled setting, as it allows for more teaching opportunities (Sundberg and Michael 2001). Due to the lack of research on teaching mands to older adults, it is important to start with a mand for which EOs can effectively and ethically be manipulated (e.g., mands for desired items and activities, whose reinforcing effects can be assessed relatively easily). Therefore, the purpose of the current study was to assess whether mands for items needed to engage in preferred tasks could be taught to older adults with dementia by contriving an EO. A broader goal was to further evaluate the extent to which verbal deficits among older adults with dementia can be remediated through behavior analytic interventions.

Method

Participants

The participants were Andrea, age 63, and Maggie, age 82. In order to ensure that the participants qualified for the study, the experimenter administered the Mini-Mental State Examination (MMSE; Folstein et al. 1975). The MMSE is a 30-point assessment with questions ranging in value from 1 to 3 points. A score of 24 or less indicates cognitive impairment. To qualify for the study, participants had to receive a score of 24 or lower. Andrea scored 10 and Maggie scored 12.

In order to utilize transfer of stimulus control procedures for the intervention, it was necessary that participants demonstrate either an echoic or a textual repertoire. We used 30 words from Gross et al.'s (2013) Verbal Behavior Assessment Battery (VBAB) to assess these repertoires. In the echoic assessment, the participants were asked the repeat the words. In the textual assessment, the participant was asked to read each of the 30 words. Andrea scored 93.3 % correct in both the echoic and textual assessments and Maggie scored 56.7 and 96.7 %, respectively, suggesting that both participants were able to read words, and that textual stimuli would therefore be a useful modality for training mands in subsequent parts of the study. We did not use the 3D mand section of the VBAB to assess the mand repertoires of Andrea and Maggie. Instead, we directly observed both participants in the natural setting to see if the target mands occurred in the natural setting. No mands were ever observed for either participant.

Setting and Materials

All sessions took place in an activity room containing two tables and eight chairs located at the nursing home facility, which was a 168-bed facility in Southern Illinois. No other residents were present. Materials included stimuli for the preference and reinforcer assessments (e.g., jigsaw puzzles, magazines, coloring/drawing activities, indoor gardening, and knitting), prompt cards, and paper and pencil for data collection. Engagement during the preference assessment was scored using laptop computers running Instant Data (version 1.4).

Response Measurement

The study included three different components—preference assessment, reinforcer assessment, and mand training—with different dependent variables for each component. The dependent variable for the free-operant preference assessments was percentage of time engaged with an activity. Engagement was defined as making physical contact with an item and orienting toward an item for at least 3 s. The dependent variable for the reinforcer assessments was cumulative number of card selections. A card selection was defined as picking up a card and handing it to the researcher, or simply pointing to the card. The dependent variable for mand training was the percentage of probes with independent target mands and the percentage of probes with other independent vocal responses. The independent target mand response was different for each situation. For example, training for Andrea included social situations (i.e., talking) and preferred activities (e.g., puzzles and coloring). During talking, the independent target mand response was "talk to me." During jigsaw puzzles, the independent target mand response was "puzzle piece, please" (this was the same for Andrea and for Maggie, across all three of Maggie's puzzles). During coloring, the independent target mand response was "colored pencil, please." A mand was marked as an independent or "correct" mand during a probe trial if the participant emitted the target mand response or an approximation to the target response (e.g., "talk" for "talk to me"; "puzzle" or "please" for "puzzle piece, please") within 30 s of the researcher presenting the instruction or situation (no prompts were provided during probes). A response was marked as an error during a probe trial if the participant did not emit the correct mand (or approximation) within 30 s of presenting the instruction or situation. In addition to independent target mands (and approximations), data were collected on any other independent vocal responses that occurred (e.g., "I don't know what to do," "Ok," and "Am I done?").

To obtain interobserver agreement (IOA), a second observer scored 100 % of verbal behavior, preference, and reinforcer assessments. For baseline, we collected IOA for 69 % of Andrea and 70 % of Maggie's session, and for mand training, we collected IOA for 35 % of Andrea and 29 % for Maggie's sessions. Agreements and disagreements for verbal behavior assessments, reinforcer assessments, baseline, and mand training were determined on a trial-by-trial basis. An agreement was scored if both observers recorded the exact same response in a given trial. Any variation between the two observers for a given trial (e.g., recording a different word or a different selection) was scored as a disagreement. We calculated percent IOA by dividing the number of agreements by the number of agreements plus disagreements, and multiplying that number by 100. IOA was 96.6 % for Andrea's verbal behavior assessment and 88.3 % for Maggie's. IOA was 100 % for all reinforcer assessments. IOA was 95 % for Andrea's baseline and mand training (range, 66 to 100 %) and 100 % for Maggie's baseline and mand training. IOA for preference assessment sessions was calculated by dividing the lower duration of engagement by the higher duration scored per item, multiplied by 100, and was averaged across items to get the total percentage for a

session. IOA averaged 89.6 % (range: 79.2 % to 100 %) for preference assessments.

We scored procedural integrity for 100 % of reinforcer assessment sessions and mand training sessions. During reinforcer assessments, we scored whether reinforcement was provided correctly; procedural integrity was 100 %. During mand training, we scored whether the correct instruction was given and whether the reinforcer was delivered contingent on the appropriate response; procedural integrity averaged 98.7 % for Andrea (range, 83 to 100 %) and 99 % for Maggie (range, 90 to 100 %).

Reinforcer Assessment

In order to identify appropriate activities for participants, the researcher administered a pleasant events schedule-Alzheimer's disease short form (PES-AD; Logsdon and Teri 1997). The PES-AD consisted of a list of 22 closed-ended questions asking whether the individual liked doing various activities (e.g., Do you like to do crafts?). The assessment was administered with both participants.

Using the results from the PES-AD, we conducted a free-operant preference assessment (Roane et al. 1998) to identify the item with the highest percentage of engagement. At the beginning of each session, five items were presented and the participant was instructed to engage with as many items as she liked. The experimenter did not initiate any interaction with the participant and if the participant initiated a social interaction, the experimenter did not respond. In Andrea's preference assessment, attention from the experimenter was included after an initial session in which little item engagement occurred and Andrea continued to interact with the experimenter.

Procedures After the most preferred item was determined, we conducted reinforcer assessments to provide further evidence that interrupting a response chain or withholding an item would effectively contrive an EO during training. Reinforcer assessments were conducted by presenting trials using a concurrent operants paradigm. Three items were selected based on the preference assessment: a high preferred item, a medium preferred item, and a low preferred item. A high preferred item was the item with the highest percentage of engagement in the free-operant assessment; a medium preferred item was an item to which the individual answered "yes" during the PES, but low percentages of engagement occurred in the free-operant preference assessment; and a low preferred item was an item to which the individual answered "no" during the PES. Prior to each session, we implemented a presession exposure in which the participant was instructed to select the card (each was presented individually) and hand it to the researcher. When the participant handed the card to the researcher, the experimenter immediately provided access to the activity indicated on the card for 30 s. After the presession exposure, each participant was asked to select an activity from an array of three pictures (i.e., "Pick what you would like to do") by pointing or gesturing towards the card. After providing access to the activity for 1 min, the experimenter reset the cards (i.e., changed the location of the cards to control for position bias) and asked the participant to once again select the activity that he/she would like to do. Through visual inspection of the data, we considered an activity to be a reinforcer if at least two different activity data paths were differentiated. If two activities were frequently selected and clearly differentiated from the third activity, both were considered reinforcers and used for mand training.

A modified reinforcer assessment was conducted for Andrea because when we first tried conducting the original assessment, she attempted to talk to the experimenter and did not touch any items. Therefore, we conducted an assessment in which the experimenter talked to Andrea throughout the entire session, and three different activities were available to select. Three cards with printed text ("coloring/drawing," "jigsaw puzzles," and "knitting") were presented simultaneously in each trial. Selecting a card resulted in access to the corresponding activity for 1 min, with experimenter providing continuous attention. We also conducted a second reinforcer assessment with Andrea to evaluate attention as a reinforcer, in which cards with text showing, "talking," "math," and "quiet" were presented in each trial. If Andrea picked the "talking" card, the experimenter talked to Andrea for 1 min about things going on in the facility, the weather, and other social topics (e.g., animals, jobs, hobbies). If Andrea picked the "math" card, the experimenter vocally presented math problems for 1 min, stating both the problem and the solution (e.g., "1+1=2"). The math condition was included to determine whether any statement, regardless of content, functioned as a reinforcer or if the statement had to be a social interaction tailored to her interests. During this

condition, the experimenter did not respond differentially to Andrea if she attempted to talk to the experimenter. Instead, the experimenter simply continued to present math problems. If Andrea picked the "quiet" card, the experimenter did not interact with Andrea for 1 min.

For Maggie's reinforcer assessment, the cards presented were "magazines," "jigsaw puzzles," and "indoor gardening." Selecting a card resulted in access to the corresponding activity for 1 min with no experimenter attention available. During the activity reinforcer assessments for both participants (but not the attention reinforcer assessment), after a total of four selections occurred for the same card, the FR1 requirement was increased to an FR2 requirement. This was done because initial selections appeared to be undifferentiated for two items for each participant. Therefore, we increased the response effort for each activity after it was selected four times to determine if the participant would continue to select the item (or if the participant would switch to lower effort items.

Mand Training

Experimental Design A multiple-probe design across behaviors was used for Andrea, and a multiple-probe design across activities (different puzzles) was used for Maggie. Andrea was trained across three different activities because a reinforcer effect was demonstrated with three activities. For Maggie, a reinforcer effect only occurred with one activity, so four versions of that activity were used, three for training and the fourth as a control item.

Baseline The procedure for baseline started with presenting the instruction or situation, in order to contrive the EO. The situation for the talking activity involved the experimenter withdrawing attention. The experimenter provided attention to invite Andrea to the activity and to obtain assent, and then withheld attention for 30 s until the start of the trial. The instruction for the puzzle activity was "put one here" while the experimenter pointed to the empty puzzle space while withholding the necessary puzzle piece. The experimenter had constructed some of the puzzle, so there were connect pieces with a spot for another piece. The instruction for the coloring activity was "color in here" while the experimenter pointed to an uncolored area and withheld the colored pencils. The participant was given 30 s to emit a vocal response (after 30 s, the reinforcer was provided even if no response had occurred). For all three situations, reinforcement was provided regardless of the response. This was done during baseline to ensure continued compliance with the procedures (i.e., it was likely that participants would not continue to provide assent if all responses were placed on extinction for the entire baseline condition). Any vocal responses that occurred during that time, whether or not they were the target response, were recorded and reinforced during baseline. Reinforcement for the talking situation was the experimenter providing at least 30 s of conversation. Reinforcement for the puzzle situation was the puzzle piece that corresponded with the empty puzzle space. Reinforcement for the coloring situation was the colored pencil that the participant needed to color in the space.

Training The experimenter utilized a transfer of stimulus control procedure (using a textual prompt) within a prompt-probe intermix procedure (Olenick and Pear 1980). Each trial was initiated by contriving the EOs in the same manner as in baseline (except during sessions with Maggie's control puzzle; see below). During training, the target responses were differentially reinforced by providing the reinforcer that corresponded with the mand. The talking situation still involved withdrawing attention, but the time of withdrawal varied from 5 to 30 s depending on other factors during the session. Specifically, if Andrea appeared to be leaving the room, the withdrawal lasted less than 30 s. In order to decrease the possibility of a competing EO to leave the room, a low preferred item (magazines) was noncontingently available during the attention training activity for Andrea.

The textual prompt consisted of a white sheet of paper with the target response printed in 120 pt. Times New Roman font. The experimenter prompted the correct response by holding the sheet of paper in front of the participant immediately after the presentation of the instruction or situation (Olenick and Pear 1980). The experimenter prompted the response two times before conducting a probe. During the probe, the participant was given 30 s to emit the correct response, and no prompts were delivered. If the participant emitted the correct independent mand, the experimenter continued to probe until the response was incorrect or until the at least six trials had been conducted (if the fourth or fifth trial were prompted responses, trials continued until a probe was presented, and this sometimes resulted in more than six trials). If there was an incorrect response

during a probe trial, the experimenter conducted two additional prompt trials, followed by another probe trial. The session always ended with a probe, and that probe always fell on trial 6 or after, unless a session was terminated early (Andrea left the session once before the 6th trial). The number of trials per session ranged from 6 to 9, and prompts and probes both counted as trials. If a session ended on a correct independent mand during the final probe, the next session started with a probe trial. Otherwise, the next session started with a prompt trial. We attempted to fade textual prompts during training trials by gradually covering the words with white horizontal lines. Prompts were never presented during probes, and therefore fading was only needed during training trials.

Due to the complete lack of responding for Andrea during training for one response, while another response responded to training, we added a contingency-specifying stimulus (CSS; Schlinger and Blakely 1987) at the beginning of each trial. The CSS stated the contingencies for engaging in the response. For example, a CSS for engaging in the "talk to me" response would be, "If you want me to talk to you, let me know." We did not use a CSS for Maggie, because she engaged in some responding during the first two responses trained.

Control During the control puzzle with Maggie, the instruction and the reinforcer were the same as in baseline and training, but instead of requiring Maggie to mand, the puzzle piece was given to her immediately after the instruction "put one here." This was done to evaluate whether correct responses were the result of a contrived EO or simply the presence of a puzzle (i.e., whether the response was evoked by an EO or a discriminative stimulus).

Results

Preference Assessment

The top panel of Fig. 1 represents the results of Andrea's free-operant preference assessment. The top item in Andrea's assessment was coloring/drawing, with 72.7 % engagement. The bottom panel of Fig. 1 represents the results of Maggie's free-operant preference assessment. The results show magazines to be the top item with 100 % engagement.

Reinforcer Assessment

The results of Andrea's attention reinforcer assessment are presented in the top panel of Fig. 2. In Andrea's attention reinforcer assessment, "talking" and "math" differentiated from "quiet." "Math" was selected more often than "quiet," and overall, attention conditions were selected 2 to 1 over the quiet condition. There was a consistent pattern of Andrea selecting either "talking" or "math" for a few trials, then selecting "quiet", possibly indicating periodic satiation with respect to social interaction.

Andrea's activity reinforcer assessment is presented in the bottom panel of Fig. 2. In this assessment, "coloring/drawing" and "jigsaw puzzles" differentiated from "knitting." The results indicate that both "coloring/drawing" and "jigsaw puzzles" were functioning as reinforcers for selection responses. No further differentiation occurred when reinforcement schedules for "jigsaw puzzles" and "coloring/drawing" were changed from an FR1 to an FR2.

Maggie Maggie's reinforcer assessment is presented in Fig. 3. In Maggie's activity reinforcer assessment, "Jigsaw puzzles" selections were similar to "magazines" and "indoor gardening." When the reinforcement schedule for "jigsaw puzzles" was changed from an FR1 to an FR 2, "jigsaw puzzle" selections started to differentiate from "Indoor gardening" and "Magazines." Maggie continued to allocate responding to the "jigsaw puzzles," even though with the FR 2 schedule, only every other selection of "jigsaw puzzles" resulted in access (i.e., the initial selection resulted in the cards being reset and the second selection resulted in access). The results of the activity reinforcer assessment indicated that "jigsaw puzzles" were functioning as a reinforcer for selection responses.

Mand Training

The results of Andrea's mand training are depicted in Fig. 4, which shows the percentage of probe trials (training trials are not depicted on the graph) with independent target mands and other vocalizations. During the baseline for "talk to me" and "puzzle piece, please," the percentage of probes with independent mands remained at 0 (consistent with direct observations of Andrea in the natural setting, in which she did not emit the target mands). Andrea emitted 100 % correct mands in the

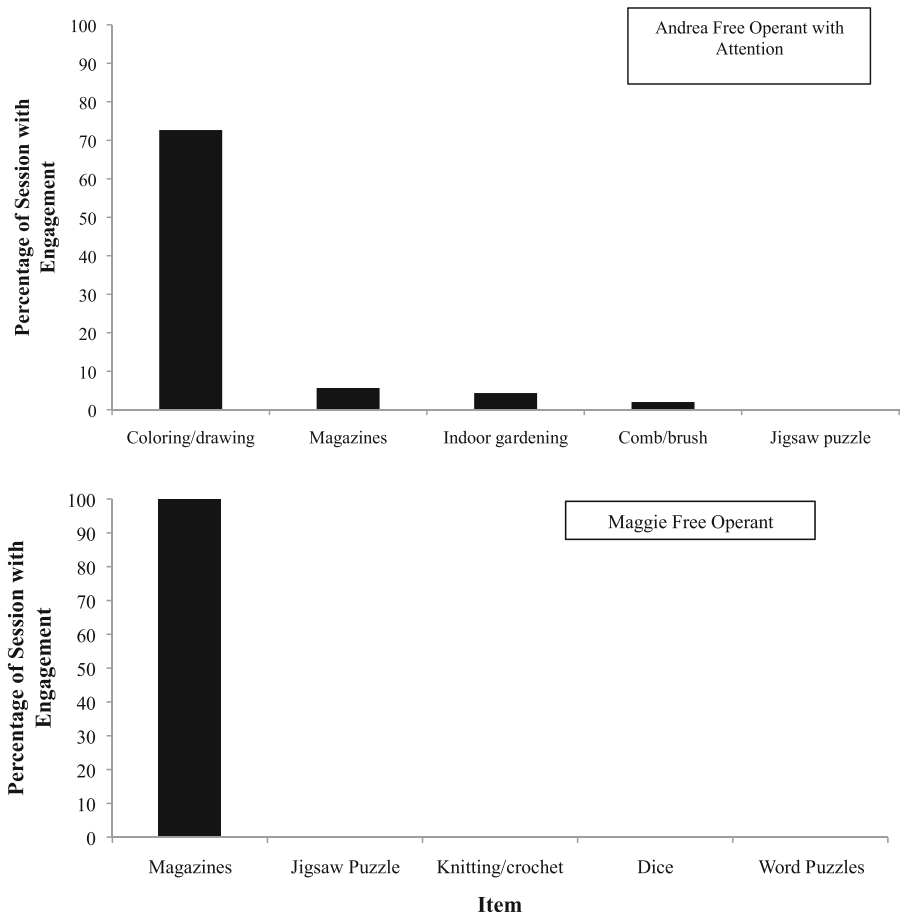

Fig. 1 The results of Andrea's (*top*) and Maggie's (*bottom*) free-operant preference assessment (for Andrea, experimenter attention was available) are presented here. The *bars* represent percentage of engagement with the items provided

first baseline probe for "colored pencil, please" but did not engage in any more independent target mands for the remainder of baseline.

Andrea started training for the "talk to me" mand first. From sessions 4 to 22, Andrea did not engage in independent target mands during any probes, but other vocalizations occurred more frequently than in baseline. In order to see if target responding would occur, a CSS ("If you want me to talk to you, let me know") was added in session 23. Subsequently, Andrea began emitting independent target mands during 70 % or more of probes. To assess whether the CSS could be removed, a reversal without the CSS was conducted; no independent target mands occurred during the reversal. The CSS was then reintroduced, and target responding returned to 100 %. Training was introduced for the "puzzle piece, please" condition at session 16 while "talk to me" remained at 0 in mand training. Due to the stable lack of responding of "talk to me," we attempted to determine if the noneffect would be replicated (this was done prior to adding the CSS). Andrea emitted independent target mands for the "puzzle piece, please" condition during 50 % of probes for sessions 17, 18, and 20. However, out of the next 7 sessions, independent correct mands occurred in only one session. Therefore, the instruction was modified at session 33 to "put a piece here" (by comparison, the other activities had more specific instructions, so "put one here" was changed to "put a piece here" to see if simply making the instructions more specific would impact responding). Independent target mands occurred during all but one of the remaining sessions. Other vocalizations continued to occur throughout "puzzle piece, please" training.

At session 19, training for "colored pencil, please" was introduced. Independent target mands immediately occurred upon introduction of mand training for the

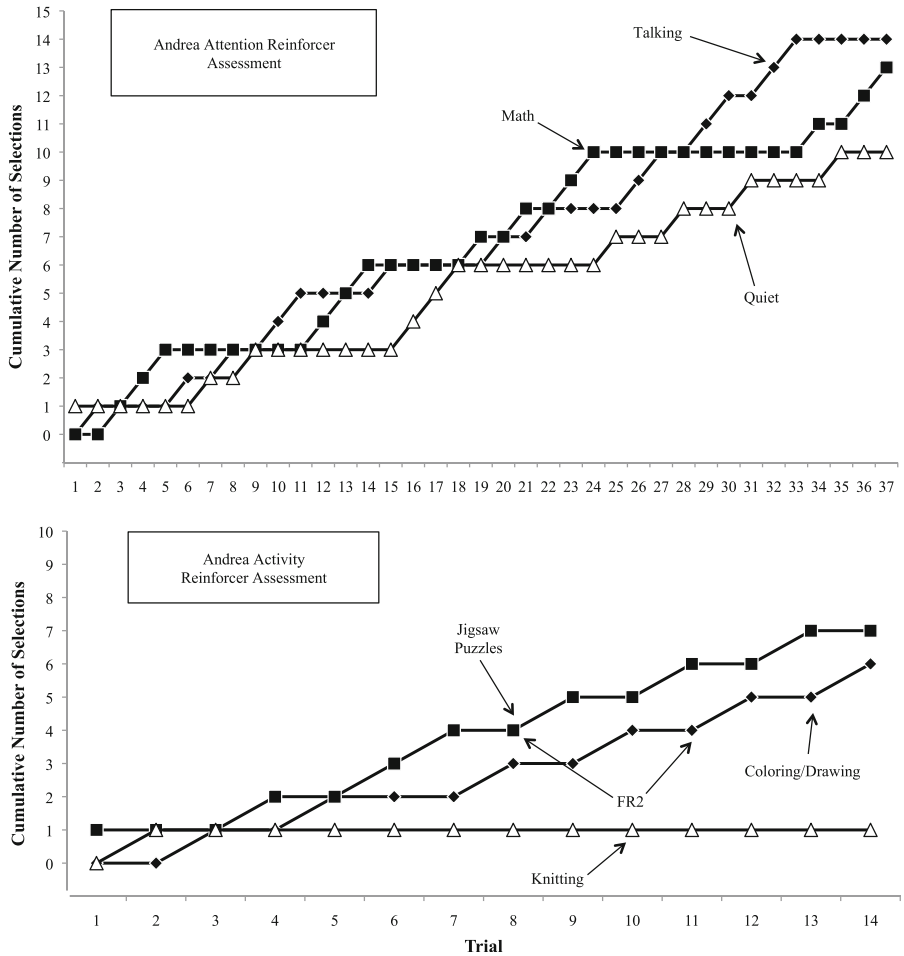

Fig. 2 *Top*, results of Andrea's reinforcer assessment of attention. *Bottom*, results of Andrea's reinforcer assessment of activities. The FR2 denotes the point at which the schedule of reinforcement for that selection changed from an FR1 to an FR2

"colored pencil" and after session 20 maintained at 75 % of probes or higher for the remainder of the condition. The percentage of probes with other vocalizations decreased over the same period of time.

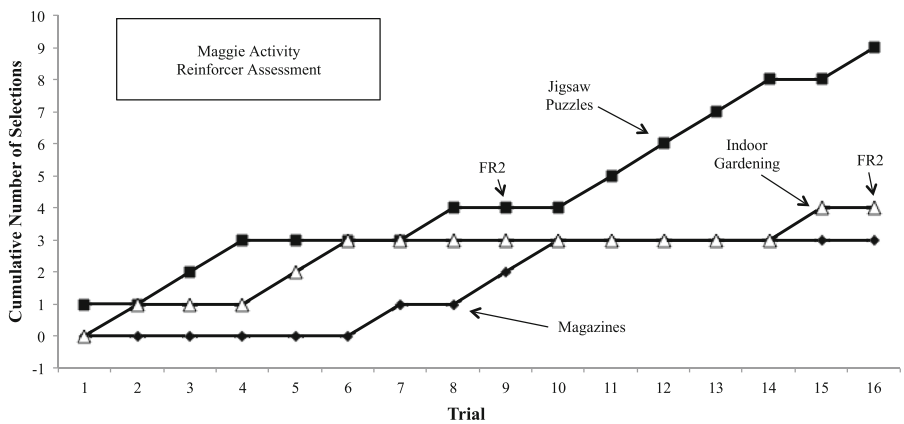

Fig. 3 The results of Maggie's reinforcer assessment are shown here. *Closed diamonds* represent cumulative selections of "Magazines." *Closed squares* represent cumulative selections of "Jigsaw puzzle." *Open triangles* represent cumulative selections of "Indoor gardening." The FR2 denotes the point at which the schedule of reinforcement for that selection changed from an FR1 to an FR2

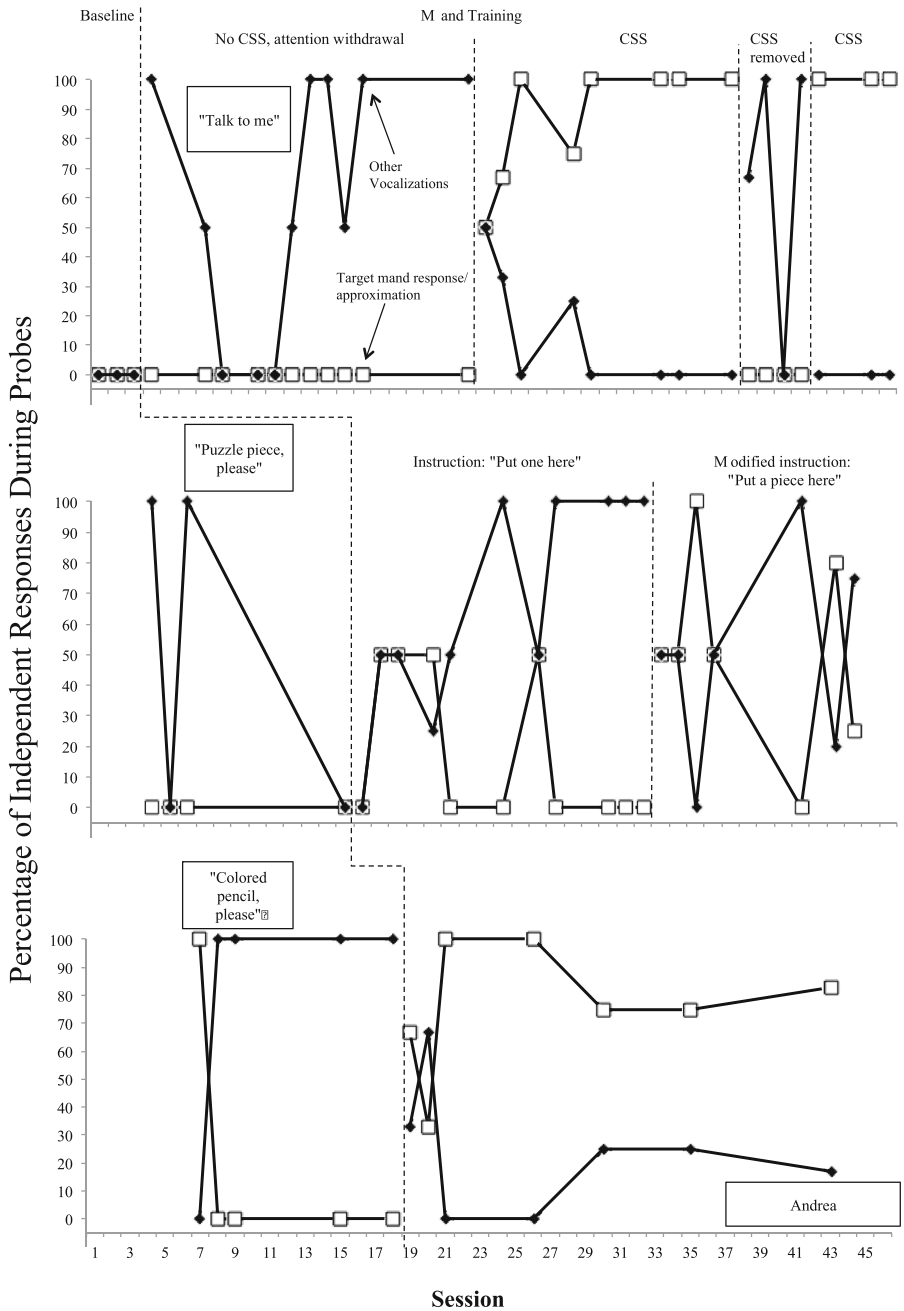

Fig. 4 Andrea's mand training results are presented here. *Open squares* represent cumulative independent target responses/approximations, and *closed diamonds* represent other vocalizations that occurred outside of the target responses/approximations

In between probes for all three activities, the researchers attempted to fade the prompts during training trials. Prior to fading, Andrea emitted prompted mands with 100 % accuracy during training, but the fading process resulted in less reliable responding (in fact, she eventually stopped responding during training trials). Therefore, the full prompt was used for the remainder of training sessions.

The results of Maggie's mand training are depicted in Fig. 5. Maggie engaged in 0 % independent target mands for all baseline sessions for each puzzle, consistent with direct observations of Maggie in the natural setting, in which she did not emit the target mands.

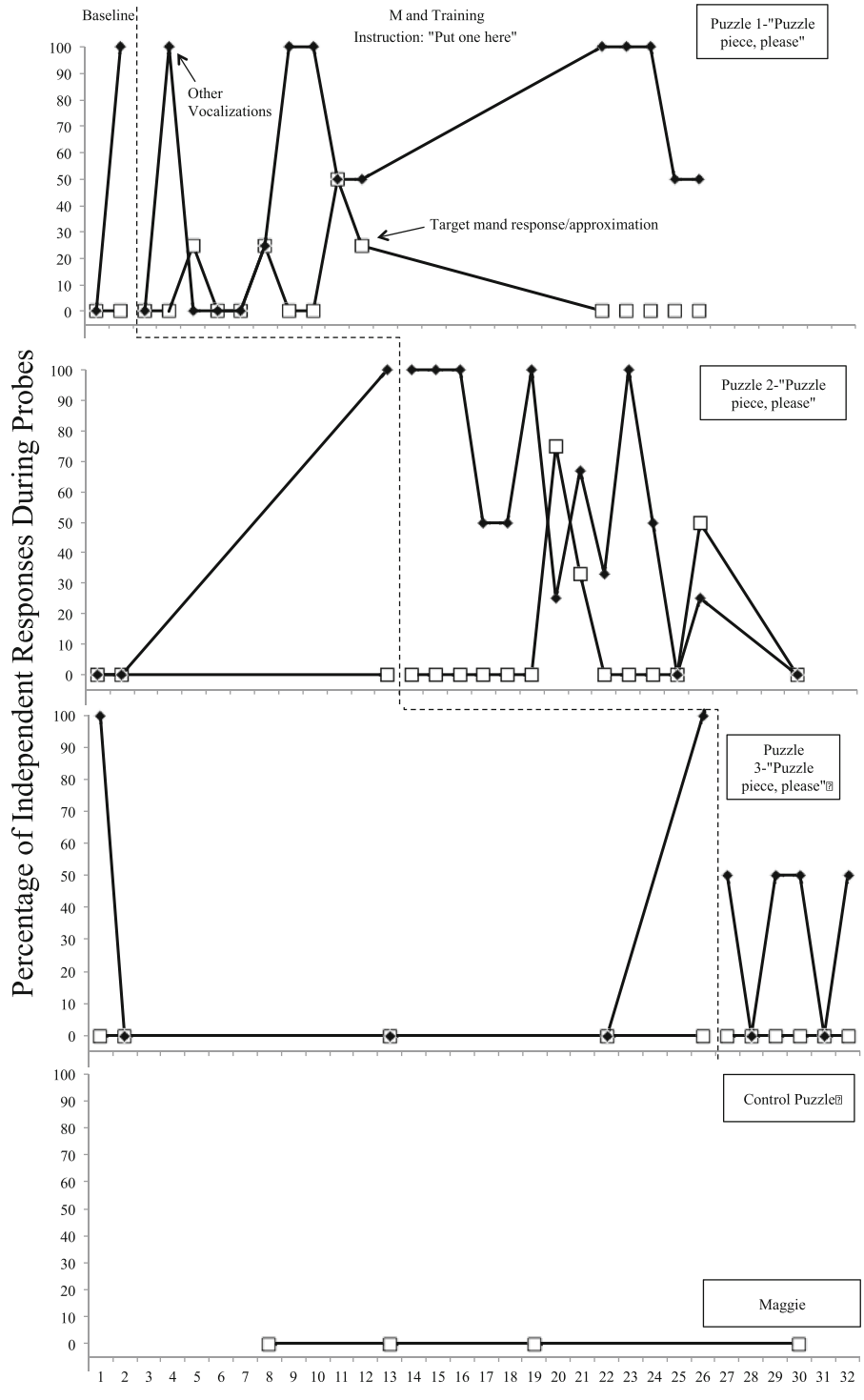

Fig. 5 Maggie's mand training results are presented here. *Open squares* represent cumulative independent target responses/approximations, and *closed diamonds* represent other vocalizations that occurred outside of the target responses/approximations

Maggie started training for puzzle 1 first. Independent target mands were observed during 25–50 % of probes for sessions 5, 8, 11, and 12 but did not occur in any other sessions for puzzle 1. After Maggie emitted

independent puzzle 1 target mands for two consecutive sessions, training for puzzle 2 began. For puzzle 2, Maggie emitted independent target mands in 30–70 % of probes during sessions 20, 21, and 26 but did not engage in any mands for the remainder of puzzle 2 sessions. After Andrea engaged in independent target mands/approximations during 50 % of probes in session 26 for puzzle 2, training was introduced for puzzle 3. No independent target mands occurred during probes in puzzle 3. Maggie engaged in other vocalizations for all three puzzles. Independent target mands/approximations stayed at 0 % in the control puzzle throughout all sessions. As in Andrea's sessions, the researcher attempted to fade the prompts during training sessions (not depicted on the graph), but Maggie did not reliably respond to the faded prompts. That is, similar to Andrea, Maggie stopped responding during training trials when the script was faded; therefore, the full prompt was used throughout the majority of training sessions. Sessions stopped when Maggie did not assent to the activity for three consecutive days.

Discussion

The results of the current study suggest that mand training by using contrived EOs and a prompt-probe intermix procedure among older adults with dementia may have varied results. The procedure was effective at getting mands to occur and continue to occur for Andrea but was not effective at getting mands to occur and continue to occur for Maggie. Although mands did not reliably occur for Maggie, the results of the current study provide preliminary evidence that decreases in verbal repertoires among older adults with dementia can be ameliorated using behavior analytic procedures—a topic that has received limited attention from researchers to date (Baker et al. 2008; Esch et al. 2010). These data have several additional implications. These implications include the role of supplemental stimuli used in the training of mands, the potential role of the MO in mand training for older adults residing in nursing homes, and the role that preference assessments played in identifying reinforcers.

During Andrea's mand training, a CSS was added in order to set the occasion for mands for one target response ("talk to me"). Attention was briefly withheld before each session to ensure that the EO was in place. Andrea's other statements and attempts at getting the experimenter's attention suggest that the EO was in place, yet after many prompts to say, "talk to me," Andrea did not independently emit the response without the CSS. One possible explanation is that there may be contingencies in nursing home settings that overpower the EO. For example, in the nursing home setting, saying "talk to me" may rarely be reinforced. If Andrea had that history, it is possible that the CSS was actually a discriminative stimulus, signifying that reinforcement was available for appropriate responses. However, in our experimental arrangement, the CSS was not necessarily associated with the differential availability of attention because if Andrea had emitted the target response when the CSS was not present, reinforcement still would have been provided. Schlinger and Blakely (1987) state that CSSs have often been classified as discriminative stimuli, but many CSSs have "function-altering effects" where they do not evoke behavior, but rather alter the function of other stimuli and therefore strengthen relations among those stimuli and behaviors.

Maggie's results did not provide solid evidence that the mand training was the only reason for the occurrences of target mands. Some independent target mands occurred in the mand training phase for puzzles 1 and 2, but the effect was not immediate, and no mands occurred at all for puzzle 3. These results are even more interesting when viewed in light of Maggie's reinforcer assessment, in which she allocated responding solely to the jigsaw puzzle after the reinforcement schedule increased to FR2. There are a few potential interpretations of these findings. One possibility is that the response effort to emit the target mands was too great. However, this may not be a likely explanation, because approximations were accepted during this study. Anecdotally, over time Maggie's responses became more specific, appropriate, and consistent (i.e., "I need the piece" and "Where's the piece at?"). Because the target response tended to match the researcher-desired form even when approximations were accepted, it is unlikely that the lack of responding was due to the response not being in Maggie's repertoire.

Another interpretation for Maggie's results is that there was no EO in place, or alternatively, that an abolishing operation (AO) was actually in place. There are three procedural factors that could have contributed to the loss of the EO. One factor is that the multiple-probe design was implemented across three different puzzles instead of three different activities, possibly resulting in Maggie becoming satiated with respect to

this activity. Another factor is that the prompt-probe intermix procedure resulted in a high ratio of prompts to probes, making access to the puzzle piece frequent throughout the session, which could have served as an AO that reduced the number of mands. Future research should look at alternative methods for training mands with older adults (e.g., using a progressive prompt delay instead of a prompt-probe intermix), especially in situations where the individual will have frequent exposure to the same reinforcer. Finally, during mand training, Maggie's ability to engage in the activity was restricted in a way that it had not been during the reinforcer assessment. That is, during the reinforcer assessment, selections resulted in access to a puzzle with pieces that she could put in any place, representing a more natural simulation of the activity. During mand training, however, only one piece was provided and it was restricted to one that fit an open spot. This may have decreased the reinforcing effectiveness of engaging with the puzzle or could have caused the training puzzle activity to be essentially a different activity from the one demonstrated to have reinforcing qualities in the reinforcer assessment.

One interesting and unexpected finding was that the results of the reinforcer assessment did not correspond with free-operant preference assessment results. Andrea's highest preferred item in the free-operant assessment was "coloring/drawing," but in her reinforcer assessment, both "coloring/drawing" and "jigsaw puzzles" were shown to have a reinforcing effect. Maggie's most preferred item in the free-operant assessment was "magazines" but in the reinforcer assessment, "jigsaw puzzles" was shown to have a reinforcing effect. Currently, no published research has evaluated free-operant preference assessments among older adults with dementia, nor has the approach been compared with other preference assessment approaches. Additionally, free-operant preference assessments are not necessarily designed to produce hierarchical results (c.f., Hanley et al. 2003) similar to those produced by multiple stimulus without replacement (MSWO; DeLeon and Iwata 1996) or paired stimulus (PS; Fisher et al. 1992) assessments. It is possible that the free-operant preference assessment may have resulted in displacement of other stimuli by the first stimulus selected. However, Beattie and Baker (2014) obtained results suggesting that free-operant preference assessments typically predicted reinforcement effects (and often did so better than MSWO assessments), which differs from the results of the current study. However, it may be that the type of preference assessment (e.g., engagement versus selection based) better predicts the reinforcement effect when matched to the response used to demonstrate a reinforcement effect. Future research might evaluate the relationship between assessment type and response type used in reinforcer assessments among older adults with dementia. Additionally, future research might include variations in reinforcer assessments (e.g., restricting access to an item after it has been selected a predetermined number of times) that may also help interpret differences in preference and reinforcer assessment results.

There are a few limitations to the current study. The first limitation is that attempts at fading the textual prompt during training trials were unsuccessful. Despite the amount of exposure Andrea and Maggie had to the words on the prompt cards during training, and the fact that both responded without prompts during all probe sessions, neither could consistently respond to faded prompts, and full prompts had to be used on the majority of prompt trials. Future studies should look at other ways of fading prompts, because true manding requires the response to be under the control of the EO exclusively. For example, researchers might try a delayed presentation of the prompt. That is, instead of providing the prompt immediately in a faded form as was done in the present study, researchers might try gradually increasing the prompt delay from 0 to 5 s. Another limitation to the current study is that only two participants were included and both participants had similar cognitive impairment based on their MMSE scores. It is possible that individuals with different levels of impairment could respond differently to the type of mand training used in the current study. Also, based on both participants' assessments, textual prompts were the most suitable prompts to use for mand training. Future research could examine whether individuals might respond differently to training using echoic prompts.

The results of this study suggest a number of other areas for future research. In particular, two aspects that should be of consideration but were not evaluated in this study are the level of deprivation in the natural setting and the potential schedule of reinforcement. In order to encourage mands outside of the training context, it would be important to evaluate the level of deprivation of a stimulus that occurs in the natural environment compared with the level of deprivation needed within session. For example, if mands for activities occur only when the older adult is deprived of those activities for

several days, making the activity available more often (which would be necessary for the response to occur outside of the training session) may decrease EO and impact the maintenance of the response. Additionally, researchers might evaluate the schedules of reinforcement that typically operate. That is, on what schedule are mands reinforced in the natural environment? We did not see any mands during our anecdotal observations, so it was not possible to determine to what extent staff members reinforced mands. If mands are trained on an FR 1 schedule but an FR 1 schedule is not possible in the natural setting, the mand might not maintain in the natural setting. Similarly, another consideration is to demonstrate staff compliance with trained mands so that extinction of trained mands does not occur. Indeed, it is possible that the decrease in vocal verbal behavior observed in nursing home dwelling older adults with dementia could be due in part to extinction. In "Talk to me" training sessions with Andrea, during deprivation periods when the experimenter was turned away, there were a few occasions where Andrea would get up out of her chair and physically move in front of the experimenter. It is possible that staff had in the past reinforced the behavior of moving in front of staff instead of politely asking for interaction. If that is the case, then physical movement may be a better cue for staff to reinforce mands. Future research should look at alternative mand modalities in settings where it is difficult for staff to comply with all mands to see with which mand modality staff will be most likely to comply.

The current study provided additional evidence for training mands using contrived EOs with older adults with dementia by controlling for some of the limitations noted by Trahan et al. 2014. Specifically, we incorporated stimuli with reinforcing properties demonstrated via preference and reinforcer assessments. Additionally, this study taught discriminated vocal responses (for Andrea) that were unique to each activity, addressing a potential limitation of Trahan et al. (2014). The results of the current study stress the importance of individualizing mand treatments, and making changes during the process of treatment. Older adults with dementia have many daily needs, and it is important for them to be able to communicate these needs to caregivers in a socially appropriate manner. Therefore the mand is an important verbal operant to assess and teach with this population. The results of the current study leave many opportunities for future investigations on manding among older adults with dementia.

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References

Alzheimer's Association. (2012). 2012 Alzheimer's disease facts and figures. *Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 8*, 131–168. doi:10.1016/j.jalz.2012.02.001.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

Baker, J. C., LeBlanc, L. A., & Raetz, P. B. (2008). A behavioral conceptualization of aphasia. *The Analysis of Verbal Behavior, 24*, 147–158.

Beattie, S., & Baker, J. C. (2014). *Evaluation of preference and subsequent stimulus engagement among older adults with dementia manuscript in preparation*. Manuscript in preparation.

Beukelman, D. R., Fager, S., Ball, L., & Dietz, A. (2007). AAC for adults with acquired neurological conditions: a review. *Augmentative and Alternative Communication, 23*, 230–242. doi:10.1080/07434610701553668.

Bourgeois, M. S. (1993). Effects of memory aids on the dyadic conversations of individuals with dementia. *Journal of Applied Behavior Analysis, 26*, 77–87. doi:10.1901/jaba.1993.26-77.

Bourgeois, M. S., Dijkstra, K., Burgio, L., & Allen-Burge, R. (2001). Memory aids as an augmentative and alternative communication strategy for nursing home residents with dementia. *Augmentative and Alternative Communication, 17*, 196–210. doi:10.1080/714043383.

DeLeon, I. G., & Iwata, J. C. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis, 29*, 519–533.

Dixon, M., Baker, J. C., & Sadowski, K. A. (2011). Applying Skinner's analysis of verbal behavior to person's with dementia. *Behavior Therapy, 42*, 120–126. doi:10.1016/j.beth.2010.05.002.

Dwyer-Moore, K. J., & Dixon, M. R. (2007). Functional analysis and treatment of problem behavior of elderly adults in long-term care. *Journal of Applied Behavior Analysis, 40*, 679–683.

Engelman, K. K., Altus, D. E., & Mathews, R. M. (1999). Increasing engagement in daily activities by older adults with dementia. *Journal of Applied Behavior Analysis, 32*, 107–110. doi:10.1901/jaba.1999.32-107.

Engelman, K. K., Altus, D. E., Mosier, M. C., & Mathews, R. M. (2003). Brief training to promote the use of less intrusive prompts by nursing assistants in a dementia care unit. *Journal of Applied Behavior Analysis, 36*, 129–132. doi:10.1901/jaba.2003.36-129.

Esch, B. E., LaLonde, K. B., & Esch, J. W. (2010). Speech and language assessment: a verbal behavior analysis. *The Journal of Speech Language Pathology and Applied Behavior Analysis, 5*, 166–191.

Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for

identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis, 25*, 491–498.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). Mini-Mental State: a practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12*(3), 189–198.

Gross, A. C., Fuqua, R. W., & Merritt, T. A. (2013). Evaluation of verbal behavior in older adults. *The Analysis of Verbal Behavior, 29*, 85–99.

Hanley, G. P., Iwata, B. A., Lindberg, J. S., & Conners, J. (2003). Response-restriction analysis: I. Assessment of activity preferences. *Journal of Applied Behavior Analysis, 36*, 47–58. doi:10.1901/jaba.2003.36-47.

Henry, L. M., & Horne, P. J. (2000). Partial remediation of speaker and listener behaviors in people with severe dementia. *Journal of Applied Behavior Analysis, 33*, 631–634. doi:10.1901/jaba.2000.33-631.

LeBlanc, L. A., Raetz, P. B., & Feliciano, L. (2011). Behavioral gerontology. In W. W. Fisher, C. C. Piazza, & H. S. Roane (Eds.), *Handbook of applied behavior analysis* (pp. 472–488). NY: The Guilford Press.

Logsdon, R. G., & Teri, L. (1997). The pleasant events schedule—AD: psychometric properties and relationship to depression and cognition in Alzheimer's disease patients. *The Gerontologist, 37*, 40–45. doi:10.1093/geront/37.1.40.

Michael, J. (1988). Establishing operations and the mand. *The Analysis of Verbal Behavior, 6*, 3–9.

Olenick, D. L., & Pear, J. J. (1980). Differential reinforcement of correct responses to probes and prompts in picture-name training with severely retarded children. *Journal of Applied Behavior Analysis, 13*, 77–89. doi:10.1901/jaba.1980.13-77.

Resnick, H. E., Fries, B. E., & Verbrugge, L. M. (1997). Windows to their world: the effect of sensory impairments on social engagement and activity time in nursing home residents. *Journal of Gerontology, 52B*, S135–S144.

Roane, H. S., Vollmer, T. R., Ringdahl, J. E., & Marcus, B. A. (1998). Evaluation of a brief stimulus preference assessment. *Journal of Applied Behavior Analysis, 31*, 605–620. doi:10.1901/jaba.1998.31-605.

Schlinger, H., & Blakely, E. (1987). Function-altering effects of contingency-specifying stimuli. *The Behavior Analyst, 10*, 41–45.

Silverman, F. H., & Schuyler, H. J. (1994). Can AAC help persons with dementia? *Augmentative and Alternative Communication, 10*, 60. doi:10.1080/07434619412331276750.

Skinner, B. F. (1957). *Verbal behavior*. Engelwood Cliffs: Prentice-Hall.

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

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

Trahan, M. A., Donaldson, J. M., McNabney, M. K., & Kahng, S. (2014). Training and maintenance of a picture-based communication response in older adults with dementia. *Journal of Applied Behavior Analysis, 47*, 404–409.