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ORIGINAL PAPER

Discrete-Trial Functional Analysis and Functional Communication Training with Three Adults with Intellectual Disabilities and Problem Behavior

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Abstract We conducted a sequence of two studies on the use of discrete-trial functional analysis and functional communication training. First, we used discrete-trial functional analysis (DTFA) to identify the function of problem behavior in three adults with intellectual disabilities and problem behavior. Results indicated clear patterns of problem behavior for each participant. Second, we used a modified multiple baseline design across participants to assess the effectiveness of functional communication training (FCT) on the acquisition of a replacement communicative response. We conducted postacquisition discrimination probes to evaluate the discriminated use of the new response. Results indicated that FCT was effective in producing acquisition and discriminated use of the replacement response for all participants. The study has relevance because of the empirical evidence of DTFA and its applicability to adults with intellectual disabilities.

Keywords Discrete-trial functional analysis · Functional communication training · Discrimination assessment · Vocational setting

Introduction

Problem behavior of adults with intellectual disabilities represents both a challenge for relevant stakeholders (e.g., staff and caregivers) and a major barrier to successful

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inclusion in the community because it interferes with the development of positive social relationships, increased levels of personal independence, and successful employment (Durand and Merges 2001; Fox et al. 2002; Meyer et al. 1991). Therefore, effective interventions aimed at enabling an individual to control his or her environment by providing socially acceptable means of communication may have the potential to reduce the frequency and intensity of problem behavior displayed by the individual while increasing his or her quality of life (Carr et al. 2002).

One approach to address problem behavior is function-based behavioral interventions. Function-based behavioral interventions consist of two steps. The first step consists of conducting assessments to identify the function of the problem behavior displayed by an individual. These assessments consist of non-experimental methods (e.g., interview and direct observation) and experimental methods (e.g., functional analysis). A novel assessment method that seems to be a viable and practical technique for conducting an experimental analysis of problem behavior in applied settings is discrete-trial or trial-based functional analysis (DTFA; Bloom et al. 2011; Lambert et al. 2012; LaRue et al. 2010; Rispoli et al. 2013; Schmidt et al. 2013; Sigafoos and Saggers 1995). DTFA consists of a series of systematic and rigorous trial-based assessments embedded into ongoing daily activities in an individual's current environment. Moreover, DTFA is an ecologically valid assessment method that has social validity and yields results similar to those obtained through functional analysis (FA; Bloom et al. 2011; LaRue et al. 2010).

DTFA has been used to identify the function of problem behavior displayed by children with autism and developmental disabilities in classroom settings (Rispoli et al. 2013; Schmidt et al. 2013; Sigafoos and Saggers 1995) and children with developmental delays in preschool settings (Lambert et al. 2012). It has been implemented by both typical agents (i.e., classroom teachers and behavior staff members; LaRue et al. 2010; Rispoli et al. 2013; Schmidt et al. 2013; Sigafoos and Saggers 1995) and atypical agents (i.e., trained graduate students; Bloom et al. 2011). Although there is emerging empirical evidence about the effectiveness of DTFA to identify the function of problem behavior in children with autism, developmental disabilities, and developmental delays, we could not locate any studies that examined the effectiveness of this assessment method for adults with intellectual disabilities in vocational settings.

The second step to function-based behavioral interventions often consists of implementing an intervention to teach a socially appropriate behavior that serves the same function as the problem behavior (Carr et al. 2002; Gresham et al. 2001; Van Houten et al. 1988). One function-based behavioral intervention aimed at teaching functionally equivalent replacement behaviors is functional communication training (FCT; Carr et al. 1999; Carr and Durand 1985). Functional equivalence refers to a group of two or more topographically different behaviors that produce the same effect on the environment (Carr 1988). FCT has been effective in reducing the frequency and severity of problem behavior displayed by individuals with developmental disabilities (e.g., Carr and Durand 1985; Carr et al. 1999; Day et al. 1994).

An important aspect of FCT consists of the conditional, or discriminated, use of the newly learned replacement behavior. Specifically, a new replacement behavior

is used in a discriminated way when the individual emits the new behavior to access reinforcement and does not emit the new behavior when the reinforcer is already in his or her possession or can be accessed independently (Chadsey-Rusch et al. 1993; Drasgow et al. 1996; Reichle et al. 2005). For example, an individual signs "Please" to obtain access to an item out of his reach or in the possession of a social partner, but does not sign "Please" when the item is in his or her reach and instead reaches for item.

The discriminated use of the new replacement behavior indicates whether the behavior is functionally equivalent to the problem behavior when the individual emits the new behavior to obtain reinforcement instead of engaging in problem behavior. One potential way to foster the discriminated use of a replacement behavior is to teach the behavior only when the individual displays behavioral indication to obtain access to reinforcement. Behavioral indication refers to observable behavior (e.g., eye gaze, reaching, and turning away) that represents internal states of motivation (Drasgow et al. 1996). Very few authors have examined the discriminated use of replacement behaviors in their studies (Chadsey-Rusch et al. 1993; Drasgow et al. 1996; Martin et al. 2005). We could not locate any FCT studies that assessed the discriminated use of a newly acquired replacement behavior with adults with intellectual disabilities and problem behavior in vocational settings.

The effectiveness of behavioral interventions based on DTFA results has not yet been researched extensively. We could locate only two studies that linked the results of the DTFA to an intervention to teach a functionally equivalent replacement response. Lambert et al. (2012) used DTFA to identify the function of problem behavior in three young children with developmental delays in a preschool setting and then developed an intervention based on the DTFA results. Data indicated that the frequency of problem behavior decreased to 0 levels for two of the three participants and to near 0 levels for one of the participants, whereas the frequency of the alternative response increased for all three participants after the intervention was introduced. Schmidt et al. (2013) first used DTFA to identify the function of severe problem behavior for three children with autism in a residential facility setting. Next, they taught each participant a functionally equivalent replacement communicative response using FCT. Results indicated that the intervention implemented based on the DTFA results was effective in producing acquisition of the replacement response for all three participants while decreasing the frequency of problem behavior.

One unique aspect of their study was the use of behavioral indication for timing delivery of instruction. Specifically, Schmidt et al. (2013) delivered instruction only when the participants indicated that they were interested in accessing a specific reinforcer and did not deliver instruction in those situations in which the participants did not show any interest in obtaining access to reinforcement. Although Schmidt et al. used behavioral indication to deliver instruction, the authors did not examine the effect of teaching a replacement response in the presence of behavioral indication or the discriminated use of the newly acquired response. A second unique aspect of their study was the collection of social validity data to examine staff's satisfaction with the ease of use, effectiveness, and outcomes of assessment and

intervention procedures. Additional research is necessary to extend the findings of these two studies by examining the effectiveness of function-based interventions on the acquisition of replacement behaviors for adults with intellectual disabilities and problem behavior in a vocational setting and assessing the discriminated use of the alternative communication response when the intervention agent delivers instruction in the presence of behavioral indication.

In sum, problem behavior displayed by adults with intellectual disabilities represents a barrier to participation in their daily environment and a challenge for stakeholders. Successful participation of adults with intellectual disabilities begins with communicative responses that allow them to interact with people in their environment in socially acceptable ways while decreasing the frequency of problem behavior. Our purpose in this study was to examine the applicability of DTFA in identifying the function of problem behavior in three adults with an intellectual disability and problem behavior, and then to assess the effectiveness of FCT in increasing the discriminated use of a new communicative response with a collateral decrease in the frequency of problem behaviors. The novel aspects of our study included the extension of DTFA to adults with intellectual disabilities in vocational settings, intervention occurring only when individuals displayed behavioral indication, and the assessment of the precise and discriminated use of the replacement behavior. Specifically, we addressed the following research questions:

1. Does DTFA identify the function of problem behaviors in three adults with intellectual disabilities in a vocational setting?
2. Does FCT based on DTFA assessment results produce an increase in the discriminated use of a new communicative response with a collateral decrease in the frequency of problem behaviors in three adults with intellectual disabilities in a vocational setting?

Study I

Method

Participants and Settings

Three adults with an intellectual disability and problem behavior participated in the study. All of the adults attended a vocational program where they received training on employment-related skills 5 days a week for approximately 6 h each day. The purpose of the vocational training was both to equip individuals with skills necessary to be successful in community-paid employment and to transition them to the competitive job market. Two executive directors at two agencies that served adults with disabilities nominated the three participants for the study because prior attempts to decrease the frequency and intensity of their problem behavior were unsuccessful, and thus the participants continued to display problem behavior throughout the day. Each participant received behavioral interventions as specified

in his or her behavior support plan at the beginning of the study. Examples of interventions included choice making, prompting, and differential reinforcement of alternative behaviors. Prior to the study, staff reinforced alternative behaviors such as following directions, initiating appropriate interactions with peers, and requesting an item or activity.

Antoine was a 27-year-old Caucasian male diagnosed with moderate intellectual disability, autism, and bipolar disorder mixed pattern. His problem behaviors consisted of physical aggression, self-injurious behavior (SIB), and repetitive verbal and motor behavior. Behavioral interventions implemented by staff prior to the onset of the study consisted of priming, prompting, and social stories. However, he continued to display problem behavior throughout the day. Antoine communicated through short phrases, but his repertoire was limited to several phrases and questions (e.g., "Go home," "What day is today?," and "What do you do tonight?"). He was ambulatory and needed minimal assistance with his daily living skills and activities.

Rick was a 32-year-old Caucasian male diagnosed with profound intellectual disability and schizophrenia. His problem behaviors consisted of physical and verbal aggression, property destruction, and SIB. Behavioral interventions implemented by staff prior to the onset of the study consisted of antecedent-based interventions, prompting, and differential reinforcement of alternative behaviors. Alternative behaviors consisted of following directions, responding appropriately to a peer, and requesting staff assistance. However, he continued to display problem behavior throughout the day. Rick communicated through vocalizations, gestures, and one intelligible word (i.e., "no"). He was ambulatory with an unsteady gait. Rick was able to feed himself and drink from a cup, but needed assistance with most of his daily skills and activities.

Tonya was a 23-year-old African American female diagnosed with severe intellectual disability and psychotic disorder not otherwise specified. Her problem behavior consisted of non-compliance, physical aggression, elopement, and snatching food and drink. Behavioral interventions implemented by staff prior to the onset of the study consisted of extinction, differential reinforcement of alternative behaviors, redirection, and response blocking. Alternative behaviors consisted of following directions, requesting an item, and maintaining at least 20 inches between her and another adult. However, she continued to display problem behavior throughout the day. Tonya communicated through vocalizations, facial expressions, gestures, and approximately ten intelligible words and phrases (e.g., "eat," "cookie," and "I love you"). She was ambulatory with an unsteady gait. Tonya required assistance with most of her daily skills and activities, but needed minimal assistance with feeding.

The study was conducted at two local vocational facilities. Antoine and Rick attended a vocational program located in a rural area that served approximately 30 adults with intellectual and developmental disabilities. For Antoine and Rick, discrete-trial functional analysis occurred in two instructional rooms, a hallway, and a dining room. Tonya attended a vocational program located in an urban area that served approximately 130 adults with intellectual and developmental disabilities. For Tonya, discrete-trial functional analysis occurred in several small instructional areas and a dining area.

Target Behavior and Recording System

We used two recording methods: response per opportunity and latency. An opportunity consisted of a situation in which the participant displayed behavioral indication for obtaining access to reinforcement. We considered each opportunity a trial. We further coded each participant's response as (a) problem behavior or (b) no response. We recorded the first response observed and the latency from the start of the trial to the first response during each opportunity for both the establishing operation component and the reinforcement component of the trial for each condition.

We did not record the duration of the problem behavior during the establishing operation component and the reinforcement component of a trial. For Antoine, we recorded (a) SIB, defined as placing fingers and knuckles in or near his mouth; (b) physical aggression, defined as raising or swinging an arm or hand and making contact with an open or closed fist with any part of another person's face, head, or other body part; and (c) repetitive verbal or motor behavior, defined as repeating a statement or a question two or more times within 5 s or repeating a non-functional motor behavior (e.g., placing items in closet) two or more times within 2 min of sitting next to a peer, staff, or another adult.

For Rick, we recorded (a) SIB, defined as pulling his hair, slapping his face, hitting his head with an open or closed fist or against objects, pinching his palms, finger, nose, or face; (b) property destruction, defined as hitting walls, windows, or objects with an open hand or closed fist, throwing objects at others or against walls, or biting objects; (c) physical aggression, defined as spitting, biting, kicking, hitting others by raising or swinging his arm or hand and making contact with another person's body, or pulling pants down; and (d) yelling, defined as emitting a word or vocalization above normal conversational level lasting at least 1 s. For Tonya, we recorded (a) physical aggression, defined as hitting others by raising or swinging an arm or hand and making contact with another person's body, grabbing, escaping by leaving assigned area, falling, sitting, or dropping to floor; (b) snatching food or drink that is in sight but has not been given to her; and (c) screaming, defined as emitting a vocalization, a word, or a phrase above normal conversation level lasting at least 1 s.

Procedure

Functional Assessment First, we reviewed each participant's records to collect information about prior behavioral interventions to address problem behavior and their effectiveness on reducing the frequency of current problem behavior. Second, we interviewed each participant's direct care staff using the functional assessment interview form (FAI; O'Neill et al. 1997) to obtain a description of the problem behavior and to identify variables that predicted and maintained problem behavior for each participant. Third, we conducted ABC observations (Bijou et al. 1968) during daily activities at times when problem behavior identified by staff was likely to occur. We observed each participant for a total of approximately 2 h a day for at

least 5 days. We used this information to develop hypothesis statements about the function of problem behavior for each participant.

For Antoine, functional assessment data suggested that his problem behavior served two functions: attention and automatic reinforcement. For example, when a staff member or another adult was in Antoine's physical proximity or was engaged in a conversation with one of Antoine's peers, he displayed repetitive verbal or motor behavior and staff would interact with him by either making a comment about his statement, question, or motor behavior or by asking Antoine a question. When Antoine was alone, he bit his hands or fingers and staff ignored him. For Rick, functional assessment data indicated two functions for his problem behavior: attention and access to tangibles. Specifically, when Rick's staff member left his room, Rick engaged in problem behavior and staff would return and talk to him. When staff denied access to a preferred item or activity by keeping an item out of reach or blocking the continuation of the activity, Rick engaged in problem behavior and staff would either give him the item or allow Rick to continue the activity. For Tonya, data suggested that her problem behavior served two functions: attention and access to tangibles. When staff did not interact with Tonya, she engaged in problem behavior and staff would turn toward Tonya, look at her, and talk to her. When food or drink was present in sight, Tonya grabbed food or drink or engaged in verbal and physical aggression and staff would allow her to consume the food or drink.

DTFA We conducted DTFA to experimentally manipulate various contingencies present in each participant's vocational environment to verify the hypotheses developed through functional assessment. We implemented 10 trials for each DTFA condition for each participant over a period of 7 days. We conducted between one and five trials per day under one or multiple conditions. We distributed these trials throughout the day at times when opportunities arose naturally during daily activities and our ABC data indicated that problem behavior was most likely to occur. For example, we conducted tangible trials during meal, snack time, or unstructured activities. We embedded attention trials during one-on-one social interactions. When the participant was alone, we conducted automatic reinforcement trials. At the end of one trial, we waited at least 15 min before conducting another trial. A staff member, a behavioral consultant, and the researcher conducted a variable number of trials each day based on the staff member's availability and the participant's motivation. Prior to implementing the DTFA, we trained each participant's staff member to implement the protocol procedures because they expressed interest in being involved in the study. Training consisted of the researcher explaining each step of a trial, modeling it for the staff member, having the staff member practice one trial with the participant, and then providing performance feedback. We did not include the practice trial in the overall results of the assessment. Staff members did not have prior experience with DTFA implementation.

Each DTFA trial consisted of two components: the establishing operation and the reinforcement. The establishing operation component consisted of the researcher, staff, or behavioral consultant first presenting an antecedent or taking advantage of an antecedent that naturally occurred (e.g., a social partner enters the area with a drink in her possession), and then ending that component immediately if the

participant displayed problem behavior (e.g., grabbing, except during automatic reinforcement trials) or if the specified trial time elapsed. The establishing operation component lasted up to 2 min with the exception of tangible 1 (i.e., access to items or activities) condition for Rick. Reinforcement began immediately after the occurrence of problem behavior or when the predetermined time ended. The reinforcement component of the trial consisted of the researcher, staff, or behavioral consultant presenting the hypothesized maintaining consequence (i.e., attention and tangibles) for 2 min (with the exception of tangible 1 condition for Rick). If the participant continued to display problem behavior after being provided access to the reinforcer or if the behavior escalated to the point of producing harm to the participant or others, we followed the behavior crisis management procedures as specified in each participant's behavior support plan.

For Antoine, DTFA conditions consisted of attention and automatic reinforcement. The protocol for conducting an *attention* trial consisted of the researcher or behavioral consultant first sitting next to Antoine. Then, the researcher or behavioral consultant turned away from him and engaged in a discussion with one of Antoine's peers. The researcher or behavioral consultant continued to sit next to Antoine while ignoring him for up to 2 min. If Antoine engaged in problem behavior anytime during the first 2 min (establishing operation component) or time elapsed, the researcher or behavioral consultant ended the establishing operation component and immediately began the reinforcement component by turning toward Antoine, looking at him, and talking to Antoine for 2 min. For the entire 2 min of the reinforcement component of the trial, the researcher or behavioral consultant provided Antoine with undivided attention by looking at Antoine and talking to him. If Antoine did not engage in problem behavior during the establishing operation component, the researcher or behavioral consultant permitted access to the reinforcement component after the first 2 min elapsed. If Antoine interacted with a peer or an adult or left the assigned area at anytime during the trial, the researcher or behavioral consultant discontinued the trial.

The protocol for conducting an *automatic reinforcement* trial consisted of the researcher sitting in a corner of the room and observing Antoine for up to 2 min. If he engaged in problem behavior, the researcher did not provide any consequences and did not end the establishing operation component. At the end of the first 2 min, the reinforcement component began. During the reinforcement component, the researcher continued to observe Antoine for up to 2 min. He was allowed to leave the seat at any time. However, if Antoine engaged in an interaction with an adult or a peer or accessed tangibles (e.g., food, drink, items, and activities), the researcher discontinued the trial.

For Rick, DTFA conditions consisted of attention, tangible 1 (accessing items or activities), and tangible 2 (accessing a preferred video). The protocol for conducting an *attention* trial consisted of the researcher or staff member first sitting or standing in Rick's room, talking to him, and giving him a pat on the back approximately every 3 s for 1 min. Then, the researcher or staff member said that she needed to go and left the room. The researcher or staff member stayed outside the room for up to 2 min. They did not completely close the door so that they could continue to monitor Rick's behavior without being noticed by him. If (a) he or she heard or saw

that Rick engaged in problem behavior anytime during the first 2 min (establishing operation component), (b) Rick came to the door and walked across the threshold, or (c) time elapsed, then the researcher or staff member ended the establishing operation component and immediately began the reinforcement component by entering the room, talking to Rick, and giving him a pat on the back approximately every 3 s for the entire 2 min of the reinforcement component of the trial. If Rick did not engage in problem behavior during the establishing operation component, the researcher or staff member permitted access to the reinforcement component after the first 2 min elapsed.

The protocol for conducting a *tangible* trial for accessing items or activities consisted of the researcher or staff member first walking with Rick on the hallway and blocking access to a preferred item or interrupting a preferred activity for up to 1 min. If Rick engaged in problem behavior anytime during the 1 min (establishing operation component) or time elapsed, the researcher or staff member ended the establishing operation component and immediately began the reinforcement component by giving Rick access to item or activity. For the entire 1 min of the reinforcement component, the researcher or staff member allowed Rick access to the activity or item. If Rick did not engage in problem behavior during the establishing operation component, the researcher or staff member permitted access to the reinforcement component after the first 1 min elapsed. The researcher or staff member blocked any attempts to obtain access to activities or items from other sources during the establishing operation component. We used a shorter length (i.e., 1 min) of a trial for this condition based on the data collected during ABC observations on the latency of problem behavior in such situations.

The protocol for conducting a *tangible* trial for watching a preferred video consisted of the researcher or staff member first turning the television off. Then, the researcher made neutral statements (e.g., "It is nice today") every 10–15 s while looking at Rick. If Rick engaged in problem behavior anytime during the first 2 min (establishing operation component) or did not respond while time elapsed, then the researcher or staff member ended the establishing operation component and immediately began the reinforcement component by turning the television on and permitting Rick to watch a preferred video. For the entire 2 min of the reinforcement component of the trial, the researcher or staff member provided Rick access to a preferred video while continuing to make neutral statements approximately every 10–15 s. If Rick did not engage in problem behavior during the establishing operation component, the researcher or staff member permitted access to the reinforcement component after the first 2 min elapsed. If Rick left the room at any time during the establishing operation component, the researcher or staff member ended the trial.

For Tonya, DTFA consisted of attention and tangibles. The protocol for conducting an *attention* trial was the same as the protocol for Antoine. The protocol for conducting a *tangible* trial to access food or drink consisted of the researcher or staff member first sitting next to Tonya and placing a small amount of food or drink on the table in her sight but out of Tonya's reach. Then, the researcher or staff member made neutral statements (e.g., "It is nice today") every 10–15 s while looking at Tonya. If Tonya engaged in problem behavior anytime during the first

2 min (establishing operation component) or time elapsed, the researcher or staff member ended the establishing operation component and immediately began the reinforcement component by giving Tonya access to food or drink. For the entire 2 min of the reinforcement component of the trial, the researcher or staff member provided Tonya with small amounts of food or drink while continuing to make neutral statements approximately every 10–15 s. If Tonya did not engage in problem behavior during the establishing operation component, the researcher or staff member permitted access to the reinforcement component after the first 2 min elapsed. The researcher or staff member blocked any attempts to obtain food or drink from other sources during the establishing operation component of the tangible trials.

Interobserver Agreement

The researcher was the primary recorder. Two undergraduate students majoring in elementary education and a behavioral intervention consultant served as secondary recorders. Secondary recorders received training prior to collecting interobserver agreement (IOA) data. The researcher and the secondary recorders independently coded the occurrence or non-occurrence of target behavior for each trial. We did not collect IOA for latency to problem behavior because it was a secondary measure. We calculated IOA across all DTFA conditions. An agreement was scored if the primary recorder and the secondary recorder documented the occurrence or non-occurrence of target behavior for both the establishing operation component and the reinforcement component of a trial. We calculated the percentage agreement scores by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying the quotient by 100. IOA was calculated for 30 % (3 of 10) of the trials of each condition for each participant. Agreement for each participant in each condition was 100 %.

Procedural Fidelity

The secondary recorders documented the procedural fidelity across conditions for 30 % (3 of 10) of the trials under each condition by using a checklist. The checklist consisted of a task analysis listing each step involved in conducting a trial for each condition of the DTFA. Each step involved in the task analysis defined the researcher, behavioral consultant, or staff member's behavior in observable and measurable terms. Each step involved in the task analysis was scored as completed or not completed. We calculated the procedural fidelity by dividing the number of steps completed by the total number of procedural steps completed plus not completed and multiplying the quotient by 100. Procedural fidelity for all participants under each condition was 100 %.

Social Validity

Following the conclusion of data collection, staff members provided anonymous written feedback on a questionnaire. The questionnaire consisted of five closed-

ended items in the form of a 4-point Likert scale. The questionnaire asked about staff members' perception of the DTFA, including their perception of clarity and ease of implementation, the amount of time required to implement the assessment, interference of the trials with their daily responsibilities, and their interest in learning more about this type of assessment. Responses were provided on a scale of 1 (strongly disagree) to 4 (strongly agree).

Results

DTFA Figure 1 displays the number of trials in which each participant engaged in problem behavior across DTFA conditions. In the attention condition, Antoine displayed problem behavior (i.e., repetitive verbal and motor behavior) in 10 of 10 trials during establishing operation and he engaged in problem behavior in 2 of 10 trials during reinforcement. In the automatic reinforcement condition, Antoine emitted hand biting for 10 of 10 trials for both the establishing operation component and the reinforcement component of the trials.

In the attention condition, Rick did not emit problem behavior during the establishing operation component of the trial, but he engaged in SIB in 1 of 10 trials during reinforcement. In the tangible 1 condition, Rick emitted physical aggression, property destruction, or yelling for 7 of 10 trials during establishing operation and he displayed SIB for 3 of 10 trials during reinforcement. In the tangible 2 condition, Rick engaged in yelling for 2 of 10 trials for both the establishing operation component and the reinforcement component.

In the attention condition, Tonya emitted physical aggression for 5 of 10 trials during establishing operation and she engaged in physical aggression for 1 of 10 trials during reinforcement. In the tangibles condition, Tonya displayed grabbing for 6 of 10 trials during establishing operation and she did not engage in problem behavior during reinforcement.

Latency to Problem Behavior Table 1 presents the mean latency to problem behavior and the percentage of problem behavior for both the establishing operation component and the reinforcement component across conditions for all participants.

Social Validity Staff members reported that the assessment procedures were clear ($M = 3.5$), easy to implement ($M = 3.0$), and they were interested in learning more about this type of assessment in the future ($M = 3.5$). Staff members disagreed with the statement that the assessment took a long time to implement ($M = 1.5$) and that the assessment interfered with their daily responsibilities ($M = 2.0$).

Discussion

Our purpose in this study was to examine the applicability of DTFA in identifying the function of problem behavior in three adults with intellectual disabilities in a vocational setting. The results of our study suggest that DTFA was an effective method when combined with other assessment procedures for identifying the function of problem behavior for each of the three participants included in the study. Our results extend the existing literature on DTFA in several ways.

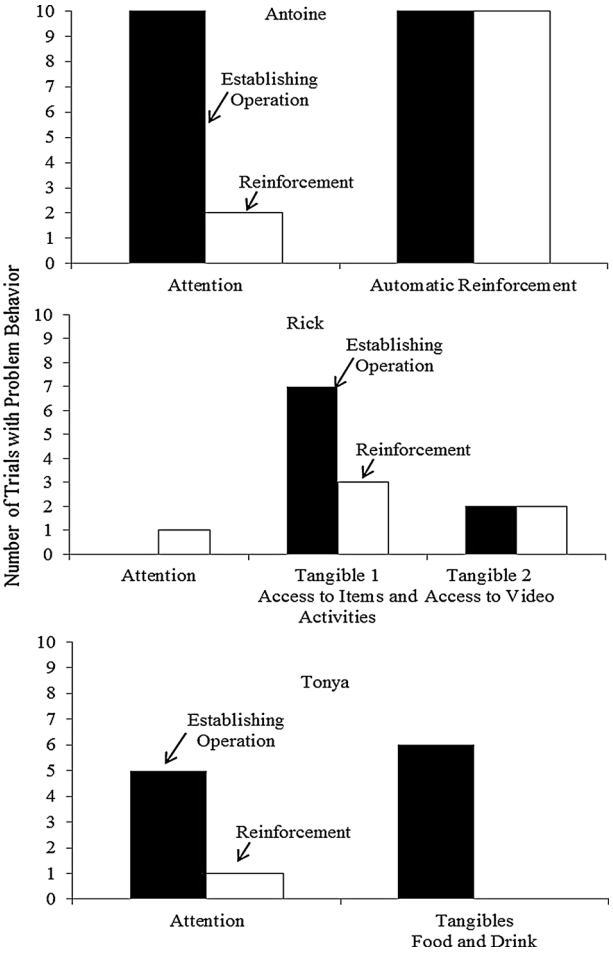

Fig. 1 Number of trials with problem behavior during both the establishing operation component and the reinforcement component for each of the three participants

First, our results provide emerging evidence for the use of DTFA as an effective assessment strategy for identifying the function of problem behavior in adults with intellectual disabilities in a vocational setting. The present data underscore the importance of conducting a fewer number of trials embedded in an individual's daily routines within his or her current environment where various environmental contingencies occur throughout the day. The implementation of a small number of trials embedded in daily routines reduces the potential acquisition of a new function of problem behavior in individuals exposed to successive trials in an analogue environment during traditional functional analysis (Van Camp et al. 2001). Thus, DFTA may have better ecological validity than analogue functional analysis procedures.

Table 1 Mean latency to the first occurrence of problem behavior and percentage of problem behavior

	Attention		Automatic reinforcement	
	EO	*R*	EO	*R*
Antoine				
Mean latency	30 s (10–90 s)	40 s (30–50 s)	8 s (2–20 s)	10.4 s (2–50 s)
Percentage of problem behavior	100 % (10/10)	20 % (2/10)	100 % (10/10)	100 % (10/10)

	Attention		Tangibles (food or drink)	
	EO	*R*	EO	*R*
Tonya				
Mean Latency	51 s (20 s–1 min 20 s)	1 min 30 s[a]	18.3 s (5–40 s)	0 s
Percentage of problem behavior	50 % (5/10)	10 % (1/10)	60 % (6/10)	0 % (0/10)

	Attention		Tangible 1 (items or activities)		Tangible 2 (preferred video)	
	EO	*R*	EO	*R*	EO	*R*
Rick						
Mean latency	0 s	1 min 55 s[a]	32 s (20–55 s)	23 s (10–50 s)	15 s (10–20 s)	26.5 s (23–30 s)
Percentage of problem behavior	0 % (0/10)	10 % (1/10)	70 % (7/10)	30 % (3/10)	20 % (2/10)	20 % (2/10)

For *percentage of problem behavior,* the first number in parenthesis represents the number of trials in which the participant engaged in problem behavior and the second number in parenthesis represents the total number of trials

EO establishing operation component of the trial, *R* reinforcement component of the trial

[a] Indicates the latency of the first occurrence of problem behavior on one single occasion

Second, the results of our study indicate variability in both the topography of the problem behavior displayed by each of the three participants across different conditions and the number of opportunities each participant engaged in problem behavior during DTFA conditions, providing evidence that the function of an individual's problem behavior may vary throughout the day depending on the establishing operations in place. One possible explanation for the observed variability in the topography and number of times each participant engaged in problem behavior during DTFA conditions may be related to stimulus control. Observations of Rick during DTFA conditions suggest that he engaged in SIB in the presence of one staff member, and emitted physical aggression and property destruction in the presence of a different staff member. Similarly, Antoine engaged in repetitive verbal and motor behavior only in the presence of verbal peers or staff members who responded to his behavior by engaging in a conversation with Antoine.

A second possible explanation for the observed variability may be related to the fluctuation in the reinforcing value of certain people because of various

events that occur in an individual's environment (Halle and Spradlin 1993). Data indicate that Antoine engaged in repetitive verbal and motor behavior on two opportunities during the reinforcement component of the attention condition when he had access to the researcher's undivided attention. During these two opportunities, he ended his conversation with the researcher and attempted to initiate a conversation with the IOA recorder who was in physical proximity. Antoine's data suggest that although he was motivated to interact with the researcher, the presence of the IOA recorder who was on-site only during a small number of trials may have resulted in a change in the reinforcing value of the researcher. Future studies need to examine how variables within conditions might influence the results of DTFA.

Third, our results indicate that the latency of the first occurrence of problem behavior was consistently lower in the establishing operation component of a trial than in the reinforcement component of a trial for socially mediated behaviors. The present data also show that the latency of the first occurrence of problem behavior was lower in the tangible condition compared to the attention condition for the participants included in the study. Recording the latency to the first occurrence of problem behavior during DTFA is important for two reasons. First, it allows practitioners not only to document the presence or absence of problem behavior in a naturally occurring situation but also to end the trial as soon as problem behavior occurs, reducing the likelihood that the problem behavior will escalate to the point of producing harm to the individual or others in his or her environment. Second, practitioners can use the latency to the first occurrence of problem behavior obtained during assessment to guide the delivery of reinforcement during intervention and to increase tolerance to delay of reinforcement by systematically introducing a delay between an individual's engagement in a communicative response and the delivery of reinforcement (Fisher et al. 2000).

Fourth, the results of our study provide supporting evidence that staff members working with adults with intellectual disabilities in vocational settings can implement DTFA and consider these procedures socially valid. This finding is important because the ecological validity of an assessment increases significantly when staff members implement the procedures in natural environments during daily routines as opposed to an assessment conducted by researchers in an analogue environment.

In sum, identifying the function of problem behavior in individuals with intellectual disabilities represents an important step in the development of effective interventions aimed at teaching alternative behaviors that are socially appropriate. The results of our study support the use of DTFA as a promising ecologically valid assessment strategy that has the potential to identify the function of problem behavior in adults with intellectual disabilities. We used the results from Study I to design Study II. The purpose of Study II was to teach each participant a functionally equivalent communicative response and to assess the acquisition and discriminated use of the newly acquired behavior for each participant included in the study.

Study II

Method

Participants and Settings

The participants and settings for Study II were the same as for Study I.

Target Behavior and Recording System

We classified each participant's response into two categories, namely (a) prompted response or problem behavior and (b) independent communicative response. We recorded the two responses for each opportunity. An opportunity consisted of a situation in which the participant displayed behavioral indication (e.g., eye gaze and reaching) for obtaining access to reinforcement. We considered each opportunity a trial.

Design

We used a modified between-subject multiple baseline design across three participants (Kazdin 2011) to assess the effects of FCT. The modification consisted of introducing the intervention for the second participant before we demonstrated a clear effect for the first participant and introducing the intervention for the third participant before we demonstrated a clear effect for the second participant. The conditions of the modified multiple baseline design consisted of baseline, FCT, and maintenance. We conducted postacquisition discrimination probes to assess the precise use of the new communicative response.

Procedure

Identification of Functionally Equivalent Communicative Response We began by analyzing the assessment results collected in Study I to identify the problem behavior currently used by each participant to obtain access to reinforcement. Next, we consulted with staff members about the function of problem behavior they considered the most important to target during the intervention and potential socially acceptable communicative responses that would be easy for them to recognize and reinforce. We then selected a new communicative response that was easily discriminable to others and was functionally equivalent to problem behavior. For Antoine, we targeted his saying, "I want to talk to you." For Rick, we selected "Please" which consisted of tapping chest 2–3 times with open palm within 3 s of presentation of opportunity. For Tonya, we identified her saying "Please."

Baseline Baseline sessions consisted of eight trials to use the selected communicative response during typical routines in each participant's vocational setting. We embedded these trials throughout the day in situations when behavioral indication to access the desired outcome was probable (e.g., social interactions, structured and unstructured time, and snack or lunch). We also embedded a break of

at least 10 min between trials. For Antoine, the protocol for conducting a trial to access attention consisted of the researcher or behavioral consultant sitting or standing within 2–3 feet of Antoine and starting a conversation with one of his peers. If Antoine initiated an interaction with the researcher or the behavioral consultant by independently saying, "I want to talk to you" or by emitting repetitive verbal or motor behavior within 2 min, he or she interrupted the conversation with Antoine's peer, started a conversation with Antoine, and talked to him for 20 s to 30 s. If Antoine did not initiate an interaction within 2 min, the researcher or the behavioral consultant ended the conversation with Antoine's peer and resumed the trial when the next opportunity occurred.

For Rick, the protocol for conducting a trial to access items or activities consisted of the researcher standing or sitting within 2–3 feet of Rick. Then, the researcher interrupted an activity or blocked access to an item by keeping the item out of Rick's reach. If Rick requested access to item or activity by signing "Please" or by engaging in problem behavior within 1 min, the researcher permitted access to item or activity. If Rick did not request access to item or activity with 1 min, the researcher greeted Rick, left the area, and resumed the trial when the next opportunity occurred.

For Tonya, the protocol for conducting a trial to access food or drink consisted of the researcher or a staff member first placing a small amount of food or drink on the table in Tonya's sight but out of her reach. If Tonya requested access to food or drink by independently saying, "Please" or by grabbing food or drink within 2 min, the researcher or the staff member allowed Tonya access to food or drink. If Tonya did not request access to food or drink within 2 min, the researcher or the staff member removed the food or drink and resumed the trial when the next opportunity occurred.

Functional Communication Training Intervention for Antoine began immediately after obtaining a stable pattern of data in baseline. Our instructional procedures consisted of constant time delay, differential reinforcement, and error correction. We used verbal prompts for training and for error correction. Each training session consisted of eight opportunities to use the targeted communicative response to request attention. We embedded a variable number or eight opportunities throughout the day based on each participant's display of behavioral indication to access reinforcement (e.g., eye gaze and reaching). If behavior indication occurred, we used the opportunity to implement intervention. If no behavioral indication occurred, we did not conduct any training and resumed the intervention when the next naturally occurring opportunity arose. We conducted training sessions 4–5 days per week during normal routines in each participant's vocational setting. The researcher and a behavioral consultant provided intervention on a variable number of opportunities based on the behavioral consultant's availability and on Antoine's behavioral indication to access attention. A participant reached acquisition criterion when he or she used the new communicative response 100 % of the trials for four consecutive sessions.

When an opportunity occurred, the researcher or the behavioral consultant began the intervention by sitting or by standing within 2–3 feet of Antoine. Then, Antoine was given a latency of 3 s to initiate an interaction. If Antoine independently said,

"I want to talk to you," the researcher or the behavioral consultant looked at Antoine and talked to him for approximately 30 s. If Antoine initiated an interaction within 3 s but it consisted of a different statement than the targeted communicative response, the researcher or the behavioral consultant immediately interrupted Antoine and delivered a verbal prompt to ensure correct responding (e.g., "I want to talk to you"). If Antoine said, "I want to talk to you" after being prompted, the researcher or the behavioral consultant looked at Antoine and talked to him for approximately 30 s. If Antoine emitted a different statement after being prompted or engaged in repetitive verbal or motor behavior, the researcher or the behavioral consultant left the area.

After 20 intervention sessions, Antoine displayed no behavioral indication to access attention from people in his environment. Thus, we had no opportunities to teach the new communication form because of Antoine's lack of motivation. According to staff, he displayed similar patterns of behavior approximately every 2 or 3 months prior to the beginning of the study. Specifically, he did not engage in social interactions with peers or staff members. These patterns of behavior lasted for approximately 4 weeks. We decided to interrupt temporarily the intervention with Antoine and start the intervention with the second participant.

We began the intervention for Rick before demonstrating an effect of the intervention on the targeted communicative response for Antoine for two reasons. First, after 20 intervention sessions, Antoine displayed no behavioral indication to access attention from people in his environment and consequently we had no opportunities to implement intervention. Second, Rick's performance in baseline was consistent at a 0 level and adequate to predict his level of performance without intervention. The instructional procedures for Rick were the same as for Antoine, except (a) the types of prompts used for training and error correction and (b) the intervention agent. We used physical and gestural prompts for training and physical prompts for error correction. The researcher implemented all training sessions for Rick.

After nine intervention sessions, we interrupted the intervention temporarily because of limited training opportunities due to an increase in the frequency and intensity of Rick's problem behavior followed by an increase in the crisis management procedures implemented by staff members. Two factors contributed to the increase in the frequency and intensity of Rick's problem behavior. The first factor was related to Rick's transfer from the community training home to an intermediate care facility. The second factor was related to an increased dose of medication prescribed by the consulting psychiatrist to address Rick's behavior problem. After we restarted the intervention for Rick, we implemented massed trial training as a booster to increase his acquisition rate of the sign "Please." The protocol for conducting massed trial training was the same as for intervention with the exception of number of trials implemented. We conducted approximately 10–15 trials each day based on Rick's behavioral indication to access reinforcement. We implemented massed trial training after we assessed Rick's acquisition of signing "Please" during normal opportunities.

We began the intervention for Tonya before demonstrating an effect of the intervention on the targeted communicative response for Rick for three reasons.

First, we were not able to estimate the length of time needed by Rick to adjust to his new residential environment and changes in medication. Second, Tonya's performance was consistent at a 0 level and adequate to predict her level of performance without intervention. Third, staff members were concerned about Tonya's repeated exposure to baseline conditions because of the potential strengthening of problem behavior. The instructional procedures for Tonya were the same as for Antoine, except the intervention agents were different. The researcher and a staff member implemented a variable number of intervention sessions based on Tonya's behavioral indication to access food or drink and staff member's availability.

Maintenance Probes We conducted maintenance probes for two participants following their last training session. We collected maintenance data for Antoine 1 month after the last intervention session when he displayed behavioral indication to access reinforcement to assess his level of performance on saying "I want to talk to you." The maintenance probes occurred under the same conditions as baseline. Because maintenance data indicated a moderate decrease in Antoine's use of the new communicative response, we conducted postacquisition training. The protocol for conducting postacquisition training sessions was the same as for intervention. We did not conduct maintenance probes for Rick because the behavioral consultant included this intervention in Rick's behavior support plan, and thus staff members continued the intervention after we ended the study. We conducted maintenance probes 1 month following the last intervention session for Tonya to assess whether she continued to use the newly acquired communicative response.

Discrimination Probes We embedded the discrimination probes during naturally occurring routines based on the participant's behavioral indication to obtain access to reinforcement over a period of 3 days. Discrimination probes consisted of three example probes and three non-example probes. Example probes consisted of opportunities to use the new communicative response to obtain access to reinforcement. An opportunity illustrating an example probe consists of a situation where a food item is in the participant's sight, but out of her reach. To obtain access to the reinforcer (i.e., food item), the participant would have to use the new communicative response (i.e., "Please"). Non-example probes consisted of occasions to withhold the new communicative response. An opportunity illustrating a non-example probe consists of a situation where an adult is in the physical proximity of a participant and engaged in a conversation with him. In this situation, the participant already has access to reinforcer (i.e., attention), and thus he needs to withhold the new communicative response (i.e., "I want to talk to you"). Emitting the new behavior in the example probes but withholding the new behavior in the non-example probes, is evidence of discriminated responding. Table 2 presents both the example probes and the non-example probes across participants.

Interobserver Agreement

The primary recorder and secondary recorders were the same as for Study I. We calculated IOA across all baseline, intervention, maintenance, postacquisition, and discrimination phases for each participant. The procedures for collecting and calculating IOA were the same as for Study I. For Antoine, we calculated IOA for

Table 2 Discrimination Probes

Participant	Example probes	Non-example probes
Antoine	If Antoine had no social interactions for at least 5 min, then	If Antoine had no social interactions for at least 5 min, then
	Stand or sit within 2–3 feet of him	Stand or sit within 2–3 feet of Antoine.
	Do not talk to Antoine	Initiate a conversation with Antoine
	Wait 3 s for Antoine to initiate an interaction	
	Expected response: says "I want to talk to you"	Expected response: talks to you
Rick	Hold an item in Rick's sight but out of his reach	Place an item on the table in front of Rick within his reach
	Expected response: signs "Please"	Expected response: takes the item
	Interrupt an activity by taking away or blocking access to an item	Stand within 1–2 feet of Rick and allow him to continue activity
	Expected response: signs "Please"	Expected response: continues activity
Tonya	Place food in sight but out of Tonya's reach	Place food in Tonya's reach within 10 inches of her chest
	Expected response: says "Please"	Expected response: takes it and eats
	Cup or can with liquid in sight but out of Tonya's reach	Cup or can with liquid in Tonya's reach within 10 inches of her chest
	Expected response: says "Please"	Expected response: takes it and drinks

31.2 % (10 of 32) of the baseline trials, for 20.4 % (67 of 328) of the intervention trials, for 37.5 % (3 of 8) of the maintenance probes, for 21.1 % (27 of 128) of the postacquisition trials, and for 33.3 % (2 of 6) of the discrimination probes. For Antoine, mean IOA was 100 % for baseline sessions, 100 % for intervention sessions, 100 % for maintenance probes, 97.1 % (range 80–100 %) for postacquisition sessions, and 100 % for discrimination probes.

For Rick, we calculated IOA for 30.3 % (17 of 56) of the baseline trials, for 25.4 % (59 of 232) of the intervention trials, and for 33.3 % (2 of 6) of the discrimination probes. For Tonya, we calculated IOA for 30.3 % (17 of 56) of the baseline trials, for 30.5 % (44 of 144) of the intervention trials, for 37.5 % (3 of 8) of the maintenance trials, and for 33.3 % (2 of 6) of the discrimination probes. For both Rick and Tonya, mean IOA was 100 % for baseline sessions, 100 % for intervention sessions, and 100 % for discrimination probes. For Tonya, mean IOA was 100 % for maintenance probes.

Procedural Fidelity

The procedural fidelity procedures were the same as for Study I. For Antoine, the mean procedural fidelity was 99.7 % (range 83.3–100 %) for intervention sessions and the mean procedural fidelity was 97.6 % (range 83.3–100 %) for postacquisition intervention sessions. For Rick, the mean procedural fidelity was 100 %. For Tonya, the mean procedural fidelity was 98.6 % (range 80–100 %).

Social Validity

The procedures for collecting social validity data were the same as for Study I, except that the number and the content of the items differed from Study I. The questionnaire consisted of six closed-ended items in the form of a 4-point Likert scale. Items consisted of statements about staff member's perception on the impact of problem behavior on the participant's quality of life, the effect of the intervention on the participant's frequency of problem behavior, the participant's benefit of learning a new communicative response, the clarity and easiness of implementation, interference of intervention with staff's daily responsibilities, and staff member's willingness to continue the intervention in the future. Responses were provided on a scale of 1 (strongly disagree) to 4 (strongly agree).

Results

FCT Figure 2 presents the results of the FCT intervention for the three participants. Baseline data indicated that all three participants' performance on the new communicative response was stable at a 0 level. Baseline data also revealed that the participants' problem behavior continued to occur as it produced functional social reinforcers. All three participants acquired the new communicative response after the implementation of the FCT intervention. However, the acquisition pattern was different for each of the three participants.

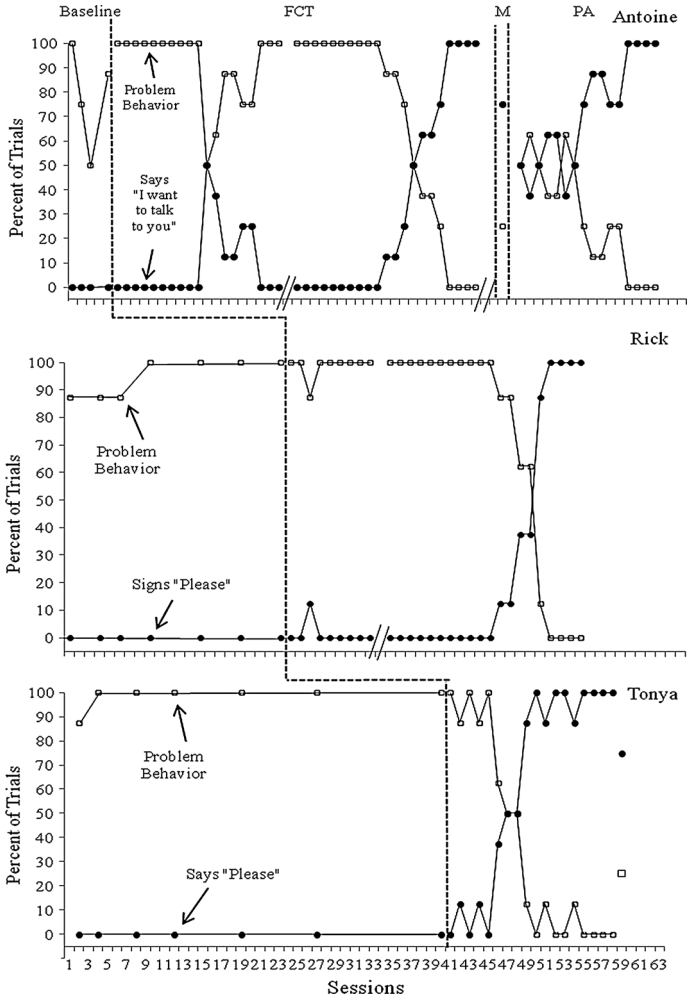

Fig. 2 Percentage of trials with problem behavior and communicative response during baseline, functional communication training (FCT), maintenance (M), and postacquisition (PA)

Following FCT intervention, Antoine's performance on acquisition trials remained stable at the baseline level for the next 10 intervention sessions, then increased to 50 % (4 of 8) of the trials for the eleventh intervention session, and decreased to baseline level for the next three intervention sessions. After restarting the intervention following a 4-week interruption, Antoine's performance on acquisition trials maintained stable at a 0 level for the next 10 intervention sessions and then began to improve by increasing to 100 % (8 of 8) acquisition trials for saying "I want to talk to you" and maintained stable at this level for four consecutive intervention sessions. Antoine required 320 trials over 40 intervention sessions to reach the acquisition intervention criterion. Antoine's performance on maintenance probes decreased to 75 % (6 of 8) of the probes for saying "I want to

talk to you." After we implemented postacquisition training, Antoine's performance on the acquisition trials showed variability for the next seven intervention sessions and then increased to 100 % (8 of 8) acquisition trials for saying "I want to talk to you" and maintained stable at this level for four consecutive intervention sessions. Antoine required 128 postacquisition trials over 16 intervention sessions to reach the intervention criterion.

Following the FCT intervention, Rick's performance on acquisition trials for signing "Please" remained stable at baseline level with one exception during the third intervention session when his performance increased to 12.5 % (1 of 8) of the trials. After restarting the intervention following a 4-week interruption, Rick's performance on acquisition trials remained stable at baseline level for 11 consecutive intervention sessions. After we implemented massed trial training, his performance began to improve by increasing gradually to 100 % (8 of 8) acquisition trials for signing "Please" and stabilized at this level for four consecutive intervention sessions. Rick required 232 trials over 29 intervention sessions to reach the acquisition intervention criterion.

Following implementation of FCT, Tonya's performance on acquisition trials increased to 12.5 % (1 of 8) acquisition trials for saying "Please" and showed variability for the next four intervention sessions. Her performance continued to increase to 100 % (8 of 8) acquisition trials for saying "Please," showed variability for the next four intervention sessions, and then stabilized at 100 % (8 of 8) acquisition trials for saying "Please" for four consecutive intervention sessions. Tonya required 144 trials over 18 intervention sessions to reach the acquisition intervention criterion.

Maintenance Probes For both Antoine and Tonya, the level of performance on the new communicative response decreased from 100 % (8 of 8) trials to 75 % (6 of 8) of the probes 1 month after the last intervention session.

Discrimination Probes Each of the three participants used the new communicative response in a discriminated way 100 % (6 of 6) of the time for both the three example probes and the three non-example probes.

Social Validity Staff members reported that the problem behavior affected or improved the participant's quality of life ($M = 3.5$) and the participant benefited from learning a new communicative response ($M = 3$). Staff members also reported that the new communicative form reduced the participant's frequency of problem behavior ($M = 3$). Staff evaluated the intervention procedures as relatively easy to implement ($M = 2.5$) and they were willing to continue to implement the intervention in the future ($M = 3$). Staff members disagreed with the statement that the intervention interfered with their daily responsibilities ($M = 2$).

Discussion

Our purpose in this study was to examine the effects of FCT based on the results of the DFTA in Study I for three participants with intellectual disabilities in a vocational setting. The results of Study II suggest that our FCT procedures were an effective method in producing acquisition and discriminated use of a new communicative response with a collateral decrease in problem behavior for each

of the three participants included in the study. The findings of our study contribute to the existing literature on FCT in several ways.

First, our results are consistent with recent findings on the effectiveness of FCT developed based on the DTFA results to address problem behavior in children with autism in a residential facility setting (Schmidt et al. 2013) and children with developmental delays in a preschool setting (Lambert et al. 2012). FCT was effective in producing acquisition of a new communicative response for the three adults included in the study. However, the acquisition patterns and the number of trials necessary to learn the new communicative response were different for each of the three participants. Initially, Antoine's level of performance maintained at the baseline level, then was variable for several intervention sessions, and finally decreased to baseline level. After we reintroduced the intervention after a 4-week interruption, his performance maintained to baseline level initially and then reached the acquisition criterion. Antoine's performance during postacquisition training was variable for several sessions and then increased to criterion level. He needed 320 trials to reach the acquisition intervention criterion during FCT and then an additional 128 trials to reach the acquisition intervention criterion during postacquisition.

Rick's acquisition data indicate that his level of performance maintained stable at baseline level initially and then gradually increased to criterion level after the implementation of massed trial training. Rick needed 232 trials to reach the acquisition intervention criterion. Tonya's level of performance was variable and maintained near or at baseline level initially, then gradually increased and showed variability for several sessions, and finally reached the acquisition intervention criterion. Tonya needed 144 trials to reach the acquisition intervention criterion. One possible explanation for the different acquisition patterns and number of trials necessary to acquire the new communicative response by the three participants may be related to response competition and variations in stimulus conditions. Specifically, Antoine had additional communicative responses (e.g., "Hi," calling a person by name) in his repertoire and the possibility that these responses were reinforced outside the intervention likely influenced the probability of the response "I want to talk to you." Similarly, the motor component of the sign "Please" targeted for Rick and the limited number of naturally occurring opportunities for intervention in the vocational setting decreased the likelihood of a fast acquisition of the sign "Please" while increasing the probability of using the existing forms to access reinforcement. For Tonya, variations in the stimulus conditions (i.e., intervention agent) may have evoked "Please" as the response used to access food or drink in the presence of the researcher and evoked existing forms (i.e., reaching, grabbing) in the presence of staff members who had reinforced these forms in the past. A second possible explanation for the slow acquisition rate for the first two participants may be related to their level of intellectual functioning. Specifically, individuals with significant intellectual disabilities very often require a large number of trials to master a new skill (e.g., Carr et al. 1978; Carr and Kologinsky 1983; Drasgow et al. 1996).

Second, the results of our study provide empirical evidence that teaching a new communicative response when an individual displays behavioral indication may increase the probability that the individual will use the new response in a

discriminated way. These findings are consistent with previous research on behavioral indication (Chadsey-Rusch et al. 1993; Drasgow et al. 1996; Martin et al. 2005) but it extends the current literature by examining the discriminated use of a new communicative response to adults with intellectual disabilities in a vocational setting. In this study, we did not examine the potential contribution of behavioral indication in producing generalization of the newly acquired communicative responses. Future studies need to extend the present findings by examining the relationships between behavioral indication and generalization of communicative responses across settings and social partners.

Third, the assessment of social validity is an additional aspect of intervention addressed in this study. Staff members indicated that the participants benefited from learning a new communicative response that replaced problem behavior. These findings support the social validity data reported by Schmidt et al. (2013). However, staff members reported that although the intervention procedures were relatively easy to implement, they encountered one difficulty during training. The difficulty in implementing the intervention related to the identification of appropriate conditions in which to provide training (e.g., when the individual displayed behavioral indication but before he or she engaged in problem behavior). Future studies need to address this aspect by identifying the most effective staff training approach in providing the skills necessary to implement interventions during naturally occurring opportunities when an individual is highly motivated to access reinforcement.

One aspect merits further discussion. All three adults included in this study were diagnosed with a psychiatric disorder according to the criteria in the *Diagnostic and statistical manual of mental disorders, fourth edition* (American Psychiatric Association 1994) based on a psychiatric evaluation conducted by a consulting psychiatrist. Although the purpose of our study was not to examine the applicability of DTFA and FCT to adults with comorbid intellectual disability and psychiatric disorder, we hope that our work will encourage researchers to conduct future studies to evaluate the effectiveness of behavioral interventions for adults with a dual diagnosis. As noted in the literature on dual diagnosis, the effectiveness of function-based interventions for individuals with a dual diagnosis has been under-researched (Paclawsky and Yoo 2004). It would be interesting to examine the extent to which different characteristics of various psychiatric conditions, medication, and the interaction between medication and behavioral interventions might influence the results of DTFA and the acquisition patterns of socially acceptable communication forms by individuals with a dual diagnosis.

One limitation in our study that influences the interpretation of data on the overall effectiveness of our intervention relates to Antoine's and Rick's acquisition data and the timing of intervention for the second and the third participant. We had to interrupt intervention for both Antoine and Rick because (a) Antoine no longer displayed behavioral indication to access attention and (b) Rick's living situation changed, his medication was changed, and his problem behavior escalated in intensity and frequency such that staff asked us to temporarily refrain from instruction until Rick adjusted to the changes. We decided to implement the intervention for the second and third participants before demonstrating an effect of the intervention for the first participant based on several factors. First, the level of

performance on the new communicative response for the second and the third participants was stable at a 0 level and was adequate to predict each participant's performance without intervention. Second, withholding intervention from the second and the third participants for an undetermined time raised clinical and methodological concerns. Our clinical concerns involved staff members' distress with extended baseline conditions and with withholding treatment for participants with substantial problem behavior. Our methodological concern consisted of prolonged baselines that may have resulted in an increase in the efficiency of the two participants' problem behavior because of repeated exposure to the same baseline assessment conditions. Thus, our ability to demonstrate experimental control with our experimental design was limited, but the circumstances compelled us to move forward in the best interest of the participants and of the staff.

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