Application of a Pyramidal Training Model on the Implementation of Trial-Based Functional Analysis: a Partial Replication

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Abstract We employed a pyramidal training model (PTM) to teach staff to correctly implement and collect data for trial-based functional analysis (TBFA) in simulated situations. First, we trained four behavioral consultants (BCs) in a group format, who each trained one behavior technician (BT) in an individual format. We utilized a non-concurrent multiple baseline design to evaluate the effect of the training. During generalization probes, participants implemented TBFA with a novel problem behavior. This study will contribute to the literature on teaching staff how to conduct TBFA. This study demonstrates the application of a two-level PTM. This study illustrates how agencies can utilize the Task Analysis Training Protocol within a PTM to train staff on implementation of TBFA.

Keywords Functional analysis · Pyramidal training · Trial-based functional analysis

Functional analysis (FA) is considered the gold standard in identifying maintaining variables of problem behavior (e.g., self-injurious behaviors, aggression) and in guiding the development of effective interventions across various populations and settings (Beavers, Iwata, & Lerman, 2013). Since the inception of the multi-element FA, a number of variations

have been developed to help address specific concerns and issues such as time constraints and environmental control issues (Iwata & Dozier, 2008). The trial-based functional analysis (TBFA; Sigafoos & Saggers, 1995) is used to systematically assess the effects of environmental variables in settings where control of such variables is not always possible. In fact, the benefit of TBFA is that it may be conducted when naturally occurring scenarios present themselves (Rispoli, Ninci, Neely, & Zaini, 2014). For example, a teacher may capture the opportunity to run a tangible condition when the student has had access to a preferred item for the last hour or a demand condition at the beginning of a math lesson.

A number of studies have evaluated the effect of face-to-face training methods to teach clinicians how to conduct a TBFA. For example, Kunnavatana, Bloom, Samaha, and Dayton (2013) trained four teachers to conduct a TBFA using a combination of didactic teaching and practice with feedback. However, during an in situ maintenance phase, three of four teachers required additional feedback. Alternatively, researchers have utilized the pyramidal training model (PTM) to efficiently and effectively train staff on specific procedures. The benefit of the PTM is that once an individual is trained, they can subsequently train multiple other people without relying on the “expert.” This method of training is beneficial when access to experts or highly skilled trainers is limited. Lambert, Bloom, Kunnavatana, Collins, and Clay (2013) utilized a PTM to successfully teach six supervisors in a residential service setting, who then conducted group training for nine house managers to conduct and collect data during TBFA with nine adults with developmental disabilities. Each house manager implemented TBFA with an actual client during baseline and during the post-training phase.

While the work of Lambert et al. (2013) contributed to the literature of PTM and TBFA, it has some limitations. First, data on the performance of the supervisors and duration of the

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training was not reported. Second, the house managers implemented the TBFA for only one topography of problem behavior. Thus, the generalization of the TBFA implementation to other topographies of problem behavior is unknown. Third, the house managers implemented TBFA with actual clients during baseline and during the post-training phase. Instead, it might be more appropriate to have novice TBFA implementers practice and conduct this procedure with actors in simulated analyses before working with clients. Doing so may reduce the trainees' and the clients' risk of getting harmed or injured due to poor fidelity of TBFA implementation. Finally,

Lambert et al. did not provide detail about the content of the training and assessment of fidelity of implementation to guide practitioners in their use of the tiered training model.

Thus, the purpose of this study was to partially replicate the study of Lambert et al. (2013) by utilizing a PTM in a behavioral agency that provides home-based services to individuals with developmental disabilities as well as to assess for generalization of therapists' ability to conduct TBFA across multiple behaviors in simulated analyses. Specifically, we aimed to evaluate the effectiveness of a PTM in training behavior consultants (BCs) and behavioral technicians (BTs) to (a)

Table 1 Implementation Fidelity Task Analysis Form

Mark $\checkmark$, X, or NA			
Trainee/subject:.....	Phase (circle) BL PT GP	Data point (circle) 1 2 3	Observer:.....
IGNORE-Steps		DEMAND – Steps	
1. Client has no access to leisure item		1. Client has no access to leisure item	
2. Set timer to 4 minutes		2. Set timer to 4 minutes	
3. Start condition and timer		3. Start condition and timer	
4. Stay in close proximity to client (5' max)		4. Stay in close proximity to client (5' max)	
5. Ignore both target and non-target behaviors		5. Ignore both target and non-target behaviors	
6. End trial when timer goes off		6. At the end of the first 2-min. or occurrence of target behavior start providing demands using three-step (tell-show-do)	
7. Record data accurately		7. Remove demand if client engages in target behavior	
<u>% of correct steps</u>		8. End trial when target behavior occurs or timer goes off	
ATTENTION – Steps		9. Record data accurately	
1. Client has access to moderately preferred item		<u>% of correct steps</u>	
2. Set timer to 4 minutes		TANGIBLE – Steps	
3. Start condition and timer		1. Client has access to highly preferred item	
4. Stay in close proximity with client (5 ft maximum)		2. Set timer to 4 min.	
5. Provide non-contingent attention (FT10 s) during the first 2 min [control].		3. Start condition and timer	
6. Ignore non-target behavior(s) in the first 2 min. [control]		4. Stay in close proximity with client (5' max)	
7. At the end of the first two min. or the occurrence of the target behavior, tell client "I have some work to do" and turn away		5. Ignore non-target behaviors	
8. Do not provide any interaction with client		6. If target behavior occurs or at the end of the first two min., remove item from client possession	
9. Provide statement of concern/disapproval when client engages in target behavior(s)		7. Gives item back when client engages in the target behavior	
10. End trial when timer goes off or after occurrence of target behavior		8. End trial when timer goes off or when targeted behavior occurs.	
11. Record data accurately		9. Record data accurately	
<u>% of correct steps</u>		<u>% of correct steps</u>	

conduct a TBFA and (b) collect data on occurrence of the target behavior. In addition, we evaluated BCs' ability to train BTs on the correct implementation and data collection during TBFA using the developed *TBFA Task-Analyzed Training Protocol* (See Table 2).

Method

Four BC-BT pairs employed at a behavioral agency participated. All participants were either working toward their masters' degree or accumulating course work to sit for the certification exam. None of the participants had received training or exposure to the TBFA; however, one had been exposed to the

multi-element FA. All sessions were conducted in the agency conference room.

The primary dependent variable was the correct implementation and data collection of TBFA procedures as specified in the Implementation Fidelity Task Analysis Form (Table 1). The experimenters used this form to record participants' responses in each condition as correct, incorrect, or not applicable (e.g., "Did the BC/BT ignore all client non-targeted behaviors during this segment?"). Percentage of correct responses was calculated by summing the total number of correct responses and dividing it by the total number of responses (as specified in the Implementation Fidelity Task Analysis) and multiplying by 100. In addition, data were collected on the correct implementation of the training by the BCs to a BT.

Fig. 1 Data for behavioral consultants (*left panel*) and behavioral technicians (*right panel*); percentage of correct implementation of TBFA during baseline (BL), post-training evaluation (PT), and generalization probe (GP)

Training was task-analyzed into 58 components (see TBFA Task-Analyzed Training Protocol).

A non-concurrent multiple baseline design across eight participants was used to evaluate the effect of TBFA training protocol. Baseline and training sessions were conducted for all the BCs prior to baseline and training sessions for the BTs.

During baseline, each participant was given a written description of TBFA test conditions as described by Bloom, Lambert, Dayton, and Samaha (2013) to review. After reviewing the written description, each participant was instructed to act as a therapist, implementing at least one session with the actor who was engaging in body-hitting. Actors

Table 2 TBFA Task-Analyzed Training Protocol

Step	Slide	Content				
1	3	What is TB-FA? – Covers Content on Slide Accurately				
2	4	Why use TBFA? – Covers Content on Slide Accurately				
3	5	Explains that there are differences by condition				
4	6	Ignore – Explains Set-Up Accurately				
5	6	Ignore – Explains Control Condition Accurately				
6	6	Ignore – Explains Test Condition Accurately				
7	7	Ignore – Shows appropriate video and score together				
8	7	Ignore – Leads Role Play (Acting as Child confederate for BT to practice)				
9	7	Ignore – Provides praise for correct implementation of role play				
10	7	Ignore – Provides corrective feedback for incorrect implementation of role play				
11	7	Provides opportunity for questions and provides correct answers for questions				
12	8, 9	Explains symbols for data collection and data collection sheet				
13	10	Attention – Explains Set-Up Accurately				
14	10	Attention – Explains Control Condition Accurately				
15	10	Attention – Explains Test Condition Accurately				
16	11	Attention – Explains possible variations Accurately (all 4 must be accurate for +)				
17-18	12	Attention – Shows appropriate video and score together – 2 variations	V1	V2		
19-20	12	Attention – Leads Role Play (Acting as Child confederate for BT to practice) – 2 variations	V1	V2		
21-22	12	Attention – Provides praise for correct implementation of role play – 2 variations	V1	V2		
23-24	12	Attention – Provides corrective feedback for incorrect implementation of role play – 2 variations	V1	V2		
25	13	Demand – Explains Set-Up Accurately				
26	13	Demand – Explains Control Condition Accurately				
27	13	Demand – Explains Test Condition Accurately				
28	14	Demand – Explains possible variations Accurately (all 4 must be accurate for +)				
29-30	15	Demand – Shows appropriate video and score together – 2 variations	V1	V2		
31-32	15	Demand – Leads Role Play (Acting as Child confederate for BT to practice) – 2 variations	V1	V2		
33-34	15	Demand – Provides praise for correct implementation of role play – 2 variations	V1	V2		
35-36	15	Demand – Provides corrective feedback for incorrect implementation of role play – 2 variations	V1	V2		
37	16	Tangible – Explains Set-Up Accurately				
38	16	Tangible – Explains Control Condition Accurately				
39	16	Tangible – Explains Test Condition Accurately				
40	17	Tangible – Explains possible variations Accurately (all 4 must be accurate for +)				
41-42	18	Tangible – Shows appropriate video and score together – 2 variations	V1	V2		
43-44	18	Tangible – Leads Role Play (Acting as Child confederate for BT to practice) – 2 variations	V1	V2		
45-46	18	Tangible – Provides praise for correct implementation of role play - – 2 variations	V1	V2		
47-48	18	Tangible – Provides corrective feedback for incorrect implementation of role play - – 2 variations	V1	V2		
49	19	Reviews General Guidelines				
50-53	20	Explains what a failed trial is, and what it would look like for all conditions	I	A	D	T
54	21	Explains Data Collection Guidelines				
55	22	Conducts Practice for identifying function of the behavior and provides rationale for correct response				
56	23	Conducts Practice for identifying function of the behavior and provides rationale for correct response				
57	24	Conducts Practice for identifying function of the behavior and provides rationale for correct response				
58	25	Answers any questions correctly or refers BT to appropriate source of information				

were following a randomly selected script, which was developed to allow for all possible responses for each condition to be evaluated (i.e., two for ignore condition, four for attention, four for demand, and four for tangible).

BCs were trained in a 2-h staff meeting using a group format ($N = 15$ BCs). BCs, without explicit instructions, then trained BTs individually for approximately 75 min (i.e., BC1 trained BT1, and so forth). BCs were given a copy of the TBFA Task-Analyzed Training Protocol and a laptop that had the training content in a PowerPoint presentation along with the videos of correct TBFA implementation. The training included an introduction, rationale of implementation, and description of the TBFA. The TBFA description included a task analysis of each condition, examples of possible occurrences of the target behavior during the control and test segment of each condition, and instructions for data collection and analysis. In addition, videos of correct implementation were shown (i.e., video modeling). Each participant was given an opportunity to practice all conditions, alternating between playing the role of the therapist and client.

Following the training, each participant conducted a simulated TBFA. Procedures were identical to baseline. Participants had access to the training materials but were not explicitly instructed to review them. Because of the time constraint and availability of participants, only one set of TBFA conditions was conducted. Feedback was provided during training and after post-training sessions, but participants did not re-implement TBFA sessions in which fidelity was less than 90%. During the generalization probe, most participants (i.e., not BC2) implemented one randomly selected condition of the TBFA for aggression. No feedback or programed consequences were provided.

Interobserver agreement (IOA) was calculated for correct implementation by comparing the percentage of steps correct for each session across two observers. Agreements were then divided by agreements plus disagreements and multiplied by 100. IOA was evaluated for 59% of sessions and averaged 85%. In addition, IOA was calculated for the adherence to the TBFA Task-Analyzed Training Protocol using a point-by-point method for 50% of the trainings and averaged 90% agreement (range, 85 to 100%).

Results and Discussion

Figure 1 shows the percentage of correct implementation of the TBFA during baseline, post-training evaluation, and generalization probes for all participants. During baseline, the mean percentage of correct implementation across all conditions and participants was 48.4% (range, 20–100%). Following the training, the mean percentage of correct implementation was 95.1% (range, 75–100%) for all

participants across all conditions. During the generalization probe, the mean performance was 94.4% (range, 75–100%). Data were also collected on each BC's adherence to the TBFA Task-Analyzed Training Protocol (see Table 2), which included 58 components coded dichotomously (yes/no), when training the BTs. Adherence to the training was high for all of the BCs ($M = 96\%$).

These findings are consistent with previous studies (e.g., Lambert et al., 2013; Kunnavatana et al., 2013) demonstrating the possibility of training individuals to conduct the TBFA. In addition, they demonstrate that the use of PTM is an efficient way to conduct such training. This study extends the literature by implementing the PTM methodology to train behavioral technicians how to conduct TBFA within a behavioral agency providing home-based services. In addition, participants (BCs) were able to successfully train BTs by following the TBFA Task-Analyzed Training Protocol. Moreover, participants generalized implementation and data collection skills to novel problem behavior. By providing such trainings, it may be possible to train all team members to assess the function of challenging behaviors in the field, resulting in the development of function-based interventions.

This study has two major limitations. First, the design of the study did not meet standards commonly accepted in behavioral research in terms of the number of replications to demonstrate experimental control and the brief nature of the baseline phase and the post-training evaluation phase. In addition, neither BCs nor BTs implemented TBFA with actual clients who engaged in problem behaviors during any phase of the study; thus, it is not clear whether additional training and support might be needed when conducting TBFA with actual clients. Therefore, future research should employ rigorous experimental designs with longer baselines and post-training evaluated phases and replications of experimental control. Finally, future research should focus on the development of best practice including the generalization of this training into non-simulated experiences, going beyond data collection to analyses of data, and evaluating if training on one FA methodology generalizes to other types of FA.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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

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

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