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Randomized controlled trial of seminar-based training on accurate and general implementation of practical functional assessments

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General and long-term outcomes of functional analysis training have not yet been reported. Within a randomized control trial, we trained 18 behavior analytic practitioners to interview caregivers, design and then conduct a personalized analysis as a part of a practical functional assessment (PFA). Participants were randomly assigned to groups, and those who experienced the seminar prior to conducting PFA with a confederate demonstrated more component skills than those who were provided the same materials but did not experience the seminar (mean scores: 87%, 36% respectively). Participants who experienced the seminar considered the training valuable and reported greater confidence in their ability to achieve control in an analysis. Several participants then conducted a PFA with a client who engaged in SPB. Results showed that skills transferred to these authentic applications. Results suggest that a seminar-based training can increase practitioners' ability to functionally analyze problem behavior and leads to subsequent analytic activity.

Key words: functional analysis, IISCA, problem behavior, RCT, staff training

Children and adolescents who engage in severe problem behavior (SPB) often cause disruption to the classroom environment and pose safety risks to themselves, other students, and staff. When confronted with SPB, it is a behavior analyst's ethical responsibility to conduct a functional behavior assessment (FBA) prior to implementing intervention (Professional and Ethical Compliance Code 3.01; Behavior Analyst Certification Board, 2016). In addition, when a student's problem behavior causes significant disruption to his or her access to the educational environment, the Individuals with Disabilities Act (IDEA) requires an FBA in order to design effective interventions (IDEA, 2004). A variety of FBA methods exists, and each provides practitioners with various levels of confidence in their identification of the

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variables that evoke and maintain problem behavior.

Functional behavior assessments exist on a continuum of scientific rigor, which includes indirect assessments such as interviews and record reviews; descriptive assessments such as observations of the target behavior in the context in which it typically occurs; and functional analyses (FAs) during which the relevant establishing operations (EOs) and consequences suspected to be influencing the target behavior are manipulated (Kratochwill & Shapiro, 2000). Given that FA is the only method that experimentally manipulates variables suspected to influence behavior (see Beavers et al., 2013; Hanley et al., 2003; Hanley, 2012 for reviews), it is important for behavior analysts to conduct one when assessing SPB. However, practitioners report an almost exclusive reliance on indirect and descriptive assessments when conducting FBAs of SBP in school and residential settings (Ellingson et al., 1999; Oliver et al., 2015; Roscoe et al., 2015). Ellingson et al. (1999) found that despite the majority of respondents reporting that FAs are the most useful tool for identifying the relevant variables required for effective treatment, behavioral interviews were the most commonly reported FBA method. Roscoe et al. (2015) surveyed 205 behavior analysts and found that the majority of respondents (68%) considered FAs as the most informative type of FBA but that only 35% of respondents reported conducting FAs when assessing problem behavior. Oliver et al.'s (2015) respondents reported using indirect and descriptive assessments most often and FAs most infrequently.

The survey studies also asked behavior analysts why they relied more heavily on indirect and descriptive measures, rather than FAs. Respondents reported lack of time or suitable space/materials to conduct an analysis as reasons preventing them from conducting FAs with students who engaged in SPB (Oliver et al., 2015; Roscoe et al., 2015). Roscoe et al. (2015) also reported that concerns of social unacceptability influenced respondents' use of FAs. Additionally, some respondents reported a lack of training as a barrier.

Although training was cited as a barrier to conducting FAs, multiple studies have evaluated models for training people of varying employment and educational backgrounds to conduct FAs. Several studies used variations of behavioral skills training (BST) to teach participants to implement conditions commonly associated with those of a traditional FA (e.g., attention, play, demand, tangible; Iwata et al., 1982/1994) under simulated conditions (Alnemary et al., 2015; Chok et al., 2012; Iwata et al., 2000; Lambert, Bloom, et al., 2014; Moore et al., 2002; Moore & Fisher, 2007; Phillips & Mudford, 2008; Rispoli et al., 2016; Wallace et al., 2004; Ward-Horner & Sturmey, 2012). In general, these studies incorporated reading material, lecture, video models, role-plays, feedback, and written quizzes as components within a training package and participants demonstrated improved performance when implementing FA conditions with a confederate client. Erbas et al. (2006) also used BST to teach participants how to implement traditional FA conditions; however, they measured participants' performance with actual clients engaging in problem behavior prior to assessing their skills with confederates.

Several studies (Alnemary et al., 2017; Flynn & Lo, 2016; Griffith et al., 2019; Kunnavatana et al., 2013; Lambert, Lloyd et al., 2014; Rispoli, et al., 2015; Rispoli et al., 2016) have described training packages aimed at teaching people to conduct trial-based FAs (TBFAs; Bloom et al., 2011; Sigafoos & Saggers, 1995). Similar to the traditional FA training literature, these authors used components of BST to implement a TBFA with confederate clients. Lambert, et al. (2013) described training practitioners to conduct TBFAs with actual clients, forgoing the typical approach of training under low-stakes conditions with confederate clients.

Some noteworthy contributions exist in the FA training literature. For example, some studies described how the training with confederate clients was extended to FA conditions with actual clients (Kunnavatana et al., 2013; Moore et al., 2002; Moore & Fisher, 2007; Rispoli et al., 2015; Wallace et al., 2004). Chok et al. (2012) trained participants to interpret FA graphs, respond to undifferentiated data, and select interventions that were appropriate given the identified function, demonstrating that behavior analysts can be trained to complete several aspects of an FA beyond implementing its conditions.

Despite the contributions described above, there remain limitations within the FA training literature. For instance, apart from Flynn and Lo (2016), no published study reports the analysis data from confederate or authentic (i.e., with real client) experiences. Therefore, the extent to which participants were able to achieve functional control in their analyses is unknown. In addition, even though several studies demonstrated that participants' skills transferred from confederate to authentic experiences, they failed to demonstrate that their participants could design and conduct an FA independent of researcher support. That is, during participants' experiences, researchers either provided instructions regarding which conditions to implement or provided feedback during and/or between brief sessions. Given that Oliver et al. (2015) and Roscoe et al. (2015) discovered limited use of FA in practice, practitioners' ability to *independently* design and conduct analyses that yield differentiated outcomes is relevant. It may be the case that the surveys continue to reveal reliance on indirect and descriptive assessment methods because practitioners have not been trained to independently conduct FAs that produce meaningful results.

In addition, fewer than half of the training studies reported on the social validity of their procedures or results. Furthermore, participants in Rispoli et al. (2015) commented that, although they considered the TBFA to be an acceptable form of behavioral assessment, they had concerns regarding the length of time required to conduct such an assessment. If participants credited the training packages for providing them with practical tools, they may be more likely to implement FAs when assessing problem behavior in the future. In the same regard, no previous FA training study reported on the extent to which participants use FA following their participation in the study.

Collectively, these training studies show that people of varying levels of experience can be trained to implement the conditions of a traditional FA or TBFA either with confederate clients or with actual clients given live and direct support from an experimenter. The BST methodology described in the literature provides a useful framework for teaching practitioners a variety of skills with respect to FA; however, conducting an FA as a part of a functional assessment is more complex than solely implementing conditions with integrity. Practitioners are required to gather relevant information, design conditions based on personalized EOs and reinforcers, and adjust the conditions based on the client's behavior, all while attempting to safely achieve functional control over problem behavior. Furthermore, BST can be time-intensive, particularly when implemented in a one-on-one training arrangement, which limits its scalability.

In this study, we describe a seminar-based approach for imparting capacity to practitioners to conduct practical functional assessment (PFA). Seminar-based approaches often involve teaching a set of skills or content to more than one person at a time and can be done using a variety of teaching methods such as lecture, video modeling, active responding among trainees, and role plays. Seminars can address the above shortcomings to individual BST by allowing the teacher to impart capacity to several trainees at once and they provide trainees the opportunity to learn from observing their peers practice new skills or receive feedback. In

addition, they are common when training large groups of practitioners. For instance, at the Association for Behavior Analysis International 45th Annual Convention in 2019, seventeen 7-hr and fifty-eight 3-hr instructional workshops (n = 75) were scheduled, resulting in a total of 293 continuing education units (CEUs) available for BCBAs (Association for Behavior Analysis International, 2020). At the 40th Annual Conference of the Berkshire Association for Behavior Analysis and Therapy in 2019, eighteen 3-hr and three 1.5-hr workshops (n = 21) were scheduled, resulting in a total of 63 available CEUs (Berkshire Association for Behavior Analysis and Therapy, 2020).

The PFA process includes an interview-informed synthesized contingency analysis (IISCA; Hanley et al., 2014), an FA in which multiple suspected reinforcers and their respective EOs are synthesized in a single test condition while the same reinforcers are simultaneously and continuously available in an otherwise matched control condition. This approach to functional assessment included an open-ended interview with caregivers to identify individualized contingencies of reinforcement suspected to be maintaining problem behavior.

We elected to train practitioners on the PFA process because practitioners responsible for behavioral programming should be skilled in all components of FA including information gathering, analysis design, and analysis implementation. We decided to train capacity with IISCAs primarily because of their reliable social validation (Beaulieu, et al., 2018; Hanley et al., 2014; Jessel et al., 2018; Santiago et al., 2016; Strand & Eldevik, 2017; Taylor et al., 2018) and because of their demonstrated treatment utility (Beaulieu et al., 2018; Chusid Rose & Beaulieu, 2019; Hanley et al., 2014; Herman et al., 2018; Jessel et al., 2018; Santiago et al., 2016; Slaton et al., 2017; Strand & Eldevik, 2017; Taylor et al., 2018).

It is possible that FAs are not being conducted either because they are not considered socially acceptable by BCBAs or their colleagues, because their conduct has not yielded socially meaningful outcomes for practicing BCBAs, or both. The purpose of the current project was to evaluate a model for training BCBAs, BCBA supervisees, ABA graduate students, and classroom staff to conduct functional assessments associated with strong social acceptability and treatment utility. PFAs may be more difficult to implement with integrity than traditional functional assessments and FAs because each IISCA is individualized from an open-ended interview. The integrity with which PFAs are implemented was evaluated and described in this study as well as the probability of a differentiated result. We considered the likelihood of our participants conducting FAs that yielded differential outcomes important, given the discrepancy between the FA training literature and the functional assessment survey studies. We report social validity data regarding the acceptability of the FA process with the practitioners who implemented the FAs in this study as well as data from FAs conducted following the completion of this study with students who engage in SPB. Finally, as an additional measure of social validity, we gathered reports regarding the extent to which analytic activity continued following the study.

Method

Participants

Eighteen staff from one specialized school for students with autism and other developmental disabilities who engage in problem behavior participated in this study. The school was selected as the research site because it was the first author's place of employment. Researchers were behavior analysis doctoral students and their advisor; none were compensated for their time. A total of 38 staff were nominated for participation by their clinical supervisors. Participation was voluntary, and 18 (47% of nominated staff) staff agreed to participate. They ranged in

experience with respect to designing and conducting FAs, their credentials regarding board-certification in behavior analysis, and employment duration (see Table 1 for participant details). Each participant signed an informed consent which outlined what they should expect to experience. Procedures were approved by a university institutional review board (IRB) as well as an internal research committee at the research site.

Prior to random assignment to the waitlist control or experimental group, participants were matched based on three criteria: their experience designing and conducting FAs (e.g., traditional, trial-based, IISCA); their credential (BCBA; BCBA candidate waiting to take exam; ABA graduate student; or none); and their duration as an employee providing ABA services to children, teenagers, or adults with disabilities. We assigned participants points for each matching criterion. Scoring was as follows: regarding FA experience, two or more analyses = 2, one = 1, zero = 0; regarding BCBA status, BCBA = 2, candidate or graduate student = 1, none = 0; regarding employment duration, 1+ years = 1, 0-1 years = 0. FA experience and BCBA status were variables that we considered more likely to influence performance positively. Therefore, we considered them primary matching criteria and weighted them more heavily than employment duration in our matching procedure. We ranked participants according to this combination of matching factors and each ranked dyad (e.g., 1 & 2, 3 & 4, 5 & 6…) was randomly assigned to groups (Table 1) using a randomizer application found at www.random.org. Going forward, we refer to participants based on their group and matched pair (e.g., W_1, E_1, W_2, E_2, and so on).

Measurement

The PFA process was deconstructed into 22 component skills (see y-axis of Figure 2) and trained observers recorded data on each PFA component skill. The interviews and analyses were video recorded, and participant performance was evaluated using pencil and paper data collection post hoc. To evaluate participants' ability to design an analysis following an interview, each participants' analysis design was compared to an analysis design constructed by an expert (behavior analysis doctoral student with extensive experience designing, conducting, and interpreting FAs). The expert conducted an open-ended interview with the experimenter acting as a caregiver, and then

Table 1

Participant Characteristics

	Waitlist Group				Experimental Group			
Pairing	*Matching Score*	FAs Designed and/or Conducted	BCBA Status	Employment Duration (years)	*Matching Score*	FAs Designed and/or Conducted	BCBA Status	Employment Duration (years)
1	*5*	4	BCBA	1+	*5*	2	BCBA	1+
2	*4*	2	Candidate	1+	*4*	2	Candidate	1+
3	*3*	2	Grad student	0-1	*4**	2	Grad student	1+
4	*1*	0	Grad student	0-1	*1*	0	Grad student	0-1
5	*1*	0	Grad student	0-1	*2*	0	Grad student	1+
6	*2**	0	Grad student	1+	*2*	0	Grad student	1+
7	*2*	0	Grad student	1+	*1**	0	Grad student	0-1
8	*0*	0	None	0-1	*1*	0	None	1+
9	*0**	0	None	0-1	*1*	0	None	1+

Note: Participants displayed in order of ranked pairs.
* Conducted authentic PFA.

designed an analysis based on that interview. The resulting analysis design was used as a model against which to compare participants' designs. Participants' analysis designs were rated for generic reliability with the expert. In other words, if the participant identified major categories of reinforcement such as escape to tangibles or escape to mand compliance, the participant received full credit for that design. Specific reliability, such as escape from a particular task to a particular item or activity, was not required in order to receive full credit for the design.

Data Collection

Observers blind to the matching and random assignment of participants scored the interview and analysis videos. The first author trained data collectors on operational definitions of component skills. Observers recorded data on each component skill as each opportunity occurred. For example, an opportunity to *reinforce first instance of problem behavior* occurred if the confederate or client engaged in problem behavior. An opportunity to *progressively initiate establishing operations (EOs)* occurred if the confederate or client did not engage in problem behavior upon the presentation of the initial EO. Data collectors recorded whether each participant emitted the target component skill during each opportunity to do so. For each component that could occur more than once during the interview or analysis, such as reinforcing problem behavior during a test condition for 20-40 s or providing salient transitions between (EO) and reinforcement (SR) intervals, participants received a percentage of occurrence score. For component skills with binary measures (e.g., begins analysis with control condition), participants were provided full credit or no credit depending on their performance. Component skills that were not occasioned during the PFA process (e.g., ignoring problem behavior in the control condition could only be measured if problem behavior occurred in the control condition), were omitted from the total PFA percentage correct score.

Using the percentage of occurrence scores recorded by the data collectors, the first author assigned either full, partial, or no credit to each participant's component skills. For skills demonstrated in 80% or more of opportunities, participants were given full credit for that component; for skills demonstrated between 30% and 79% of opportunities, participants were given partial credit for that component; for skills demonstrated between 0% and 29% of opportunities, participants were not given credit for that component. The first author then calculated a total PFA percentage correct score by assigning a numerical value to full, partial, and no credit component scores (see Himle et al., 2004). Scoring was as follows: fully demonstrated skills = 1; partially demonstrated skills = 0.5; skills not demonstrated at all = 0. The total PFA percent correct score was calculated by adding the total component scores and dividing by the number of PFA component skills (with the exception of any skills not expected to occur).

Interobserver Agreement

Interobserver agreement (IOA) for interview and analysis component scores for confederate PFAs was assessed by having a second observer collect data on PFA component skills for two participants from the waitlist group and two participants from the experimental group and for one authentic PFA (22% of confederate PFAs; 25% of authentic PFAs). The second observer recorded whether each participant emitted the target component skill during each opportunity to do so, just as the primary data collector did. Agreement percentages were calculated by dividing the number of agreements by the total number of PFA skills multiplied by 100. IOA averaged 92% (range, 82% to 100%) across selected participants for the confederate PFAs (E_1, 100%; W_1, 95%; W_4, 91%; E_4, 82%). IOA was 82% for the authentic PFA. IOA for the authentic IISCA data was calculated for one of the four of analyses (25%). The agreement percentage was calculated by

dividing the total number of agreements regarding the occurrence or nonoccurrence of problem behavior multiplied by 100. IOA was 100%.

Design

A posttest-only group design (Campbell & Stanley, 1963, pp. 25-27) with preassignment matching then random assignment was used to evaluate the effects of the PFA training seminar on participants' implementation of the PFA process. The randomized, posttest-only design allows for detection of an effect of an independent variable while controlling for interactions between history and testing effects. This design was selected because we expected some learning to occur on behalf of the participants during baseline PFAs conducted with confederates. Therefore, a pretest may have affected performance during posttests. In addition, given the resources needed to conduct each confederate PFA (e.g., coming in before school, staying late after school, time away from other clinical responsibilities for both the participants and researchers), the posttest-only design allowed the researchers to collect the necessary data for each participant in half the time it would have taken to administer a pretest to each participant.

Procedures

Participant Shared Experiences

Prior to the start of this study, we provided all potential participants with a document that described all stages of the experiment. We informed them that they would be randomly assigned to either the experimental or waitlist group and that they would conduct a functional assessment with a confederate client. They were all made aware of the chance that they would conduct the assessment without attending the seminar but, if that was the case, that they would attend the seminar following their assessment. After reviewing that document and consenting, participants from both groups completed prematching questionnaires (5-10 min) and either attended a PFA seminar (3 hr) and conducted PFAs with confederate clients (10-40 min) or conducted PFAs with confederate clients (10-40 min) and then attended a PFA seminar (3 hr). Members of both groups received feedback on their performance (10-20 min) following their analysis implementation with confederate clients if they volunteered to implement a PFA with an actual client. Researchers followed identical interview and analysis scripts regardless of the group to which the participant was assigned. The PFA seminar was identical in content and duration for both groups, with some differences noted based on participants' questions as the seminars progressed. The experiences for participants in the experimental group differed from those in the waitlist group only with regard to when they attended the PFA seminar. Those in the experimental group attended the seminar prior to conducting a PFA with a confederate client and those in the waitlist group attended the seminar after conducting a PFA with a confederate client.

PFA Seminar

The independent variable in this study was a 3-hr seminar, with one 15-min break embedded, presented to participants in the experimental group prior to their confederate PFA experience. The seminar, developed by the first and second authors and presented by the first author, was designed to provide participants with the skills required to conduct the open-ended interview, use the information gathered in the interview to design a safe, efficient analysis, and conduct the analysis. Participants were provided with a workbook, a pen, and blank paper to use for note-taking if they chose to do so. Some sections of the workbook were prepopulated with information regarding how to conduct the IISCA and other sections were left blank to encourage participants to attend to the material being discussed (see Glodowski & Thompson, 2018, for a description of guided notes).

The seminar consisted of several components of BST including didactic instruction based on a PowerPoint presentation, video examples of trained experimenters implementing PFA component skills with real clients, active responding during which participants collaborated on mini-assessments throughout the presentation, and discussion of four cases among participants. The seminar progressed from general discussion regarding FA safety and efficiency to description of and rationale for the PFA process and examples of how to make adjustments that may result in a greater level of control over problem behavior during an analysis. For instance, the researcher discussed the importance of reinforcing nondangerous topographies of problem behavior that are likely members of the same response class as dangerous topographies (see Warner et al., 2020) to prevent the occurrence of dangerous behavior. In addition, participants were given a task analysis made up of each PFA component skill. Participants were encouraged, but not required, to take notes or ask questions throughout the seminar.

Confederate PFAs

All participants conducted a confederate PFA with an experimenter acting as a caregiver during the interview and as a child engaging in problem behavior during the analysis. All interviews and analyses were conducted on the same day; some were conducted back-to-back with 10-20 min allocated for the design and others were conducted with several hours in between (e.g., interview at 7:30 am and design/analysis at 3:00 pm). During the interview, we gave all participants a writing utensil, a folder with the open-ended interview (Hanley, 2012), and blank pieces of paper. The experimenter told each participant, "This is your chance to get some information to conduct a functional analysis. Here are some materials to do that—you can choose to use them or not. If you prefer to use this time differently, you may. You can stop at any time." Participants were free to use the time as they pleased and the experimenter was instructed to terminate any interview that exceeded 60 min; however, none did.

The experimenter was provided with a script that outlined several responses to each question on the interview. If the participant asked the question as written in the interview, the experimenter responded with answer A; if the participant asked a follow up question or inquired about additional detail, the experimenter responded with answer B; if the participant asked an additional question, the experimenter responded with answer C. In other words, each additional question asked by the participant resulted in more qualitatively rich detail regarding the child and/or the EOs and SRs influencing problem behavior. We chose to provide the researcher with a script with several response options so that participants would be required to ask additional questions to gather all the information they needed. The experimenters were provided with the expert's analysis design and instructed to reference that design when unsure how to answer a participant's question. For example, if a participant asked a question about EOs and/or reinforcers that were not in the script, the researcher referenced the expert's analysis design and provided information such that the participant could achieve generic reliability with the expert.

During the design process, we gave participants a writing utensil and a folder with an analysis design form (developed for the PFA seminar) and blank pieces of paper. The experimenter told the participant, "This is your time to design your conditions. Here are some materials to do that—you can choose to use them or not. Let me know when you are ready to proceed with the analysis." Participants were free to use the time as they pleased and the experimenter was instructed to terminate any design process that exceeded 20 min; however, none did.

During the analysis, all participants were provided with a writing utensil, a clipboard, a

data sheet, a timer, and a plastic storage bin with the following items: toy cars, crayons, coloring sheets, math worksheets, toothpaste, a toothbrush, puzzles, sight word flashcards, and math flashcards. The contents of the bin consisted of all SR and EO materials that the experimenters were instructed to divulge during the interview. In addition, there were several other reinforcers and EO materials included that were not suggested during the interview. The experimenter told the participant, "This is your time to conduct your analysis. Here are some materials to do that—you can choose to use them or not. You can terminate the analysis at any point. Please identify what you are doing by saying aloud the condition you are running. For example, you could say, 'Starting control condition,' before you start a control condition. Take 3-5 minutes to get set up and we will begin."

The researcher was provided with a description of how to behave during each condition depending on what the participant did. For example, if the participant refrained from implementing any EOs during the control condition, the researcher did not engage in any problem behavior. However, if the participant implemented any EO during the control condition, the researcher immediately engaged in the least dangerous topography of problem behavior reported to precede or co-occur with the dangerous topographies. If the participant reinforced that behavior, the researcher stopped. If the participant did not reinforce that response, the researcher engaged in the next least-dangerous topography and continued up the response-class hierarchy until the most concerning topography of behavior (i.e., self-injury) was simulated. Unlike previous FA training studies, confederates engaged in problem behavior contingent on the participant implementing an EO instead of on a time-based schedule to better emulate authentic FAs.

Social Validity

After completion of the confederate PFAs, we asked each participant to rank their confidence in their ability to conduct a safe and efficient functional analysis. Participants were asked to rank their confidence and/or ability in different components of conducting a PFA from 1 (not at all) to 7 (very much so). See Table 2 for specific social validity statements.

Authentic PFAs

We invited all participants to the authentic PFA portion of this study after they completed the confederate analysis portion and attended the seminar (waitlist group only). Two participants from the experimental group and two participants from the waitlist group conducted a PFA with a client. The primary author met with each participant via phone for 10-20 min to review the video of their confederate PFA and provided feedback on any component skill not implemented fully during the process. Clients were nominated for participation by their clinical teams. Caregivers for each client provided informed consent, which outlined what their child would experience during the PFA process. Client assent to participate was evaluated prior to and throughout every session by providing them with the option of coming to session or leaving at any time. If a client chose to opt out of session or leave during a session, that session would be terminated; however, this never occurred.

Participant E_7 conducted an authentic PFA with Hannah, an 8-year-old girl diagnosed with autism spectrum disorder who engaged in self-injury, property destruction, aggression, crying, and bolting. She communicated using an alternative and augmentative communication (AAC) device and liked to play with her iPad, music toys, and swings. Hannah was identified for participation in this study due to a recent increase in dangerous behavior resulting in the need for emergency physical restraint procedures to prevent injury to herself and her caregivers.

Participant E_3 conducted an authentic PFA with Cam, a 19-year-old man diagnosed with autism spectrum disorder who engaged in

aggression, property destruction, foot stomping, and yelling. He communicated vocally and enjoyed playing on his iPad while interacting with his teachers. Cam was identified for participation in this study because he had several inconclusive FAs and he continued to engage in dangerous problem behavior in his school and residence.

Participant W_6 conducted an authentic PFA with Daniel, a 16-year-old young man diagnosed with autism spectrum disorder, attention-deficit/hyperactive disorder, intellectual disability, cerebral palsy, and Blount disease who engaged in head-directed self-injury, aggression, property destruction, and swearing. He communicated vocally and enjoyed playing with his toys including blocks and electronics while interacting with teachers. Daniel was identified for participation in this study because the severity of his problem behavior had caused injury to himself and staff members.

Participant W_9 conducted an authentic PFA with Albert, a 15-year-old young man diagnosed with autism spectrum disorder who engaged in aggression, property destruction, swearing, and vocal protests. He communicated vocally and his preferences included playing keyboard, taking photos/videos and talking about them with his teachers, and playing with toy bugs. Albert was identified for participation in this study because the severity of his aggression had recently led to his school district placing him out of district at a private school for children with autism and severe problem behavior.

During all authentic IISCAs, a researcher was present to film the analysis and provide guidance to the participant only if it appeared likely that dangerous problem behavior might occur due to participant error (e.g., progressing the EO too quickly, not reinforcing nondangerous topographies). Researchers were instructed to monitor for participant error, or any other variable, that might result in dangerous behavior and intervene to ensure safety for everyone involved. For example, if a participant had progressed an EO too quickly (e.g., abruptly removing all tangibles and instructing the client to complete the most difficult task) or withheld some reinforcers contingent on problem behavior during a test condition, the researcher would have prompted the participant to follow the IISCA task analysis that she received during the PFA seminar. However, this did not occur for any other participants; these four participants conducted all steps of the PFA process independently.

Follow Up Questionnaire

Ten months after attending the PFA seminar, we surveyed all participants regarding their functional assessment practices since training. We asked participants if they were currently able to initiate or implement functional analyses in their settings. We also asked participants how many functional analyses they had designed or conducted since attending the PFA seminar (this same question was asked prior to the training in the screening process, allowing for a comparison of responses).

Results

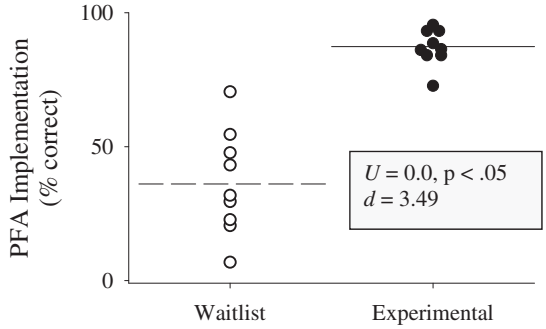
Confederate PFAs

Total PFA scores from each group are summarized in Figure 1. All PFA performance scores for those in the experimental group were higher than those in the waitlist group. A two-tailed Mann–Whitney U statistic revealed that the PFA seminar led to a statistically significant difference with respect to the target PFA skills ($U = 0.0$, $p < .05$) suggesting the seminar was responsible for the improved performance conducting IISCAs. The between-groups effect size statistic describes a relatively large effect ($d = 3.49$).

Randomization of the matched pairs resulted in no difference in BCBA status across groups; however, the number of FAs conducted favored the waitlist group and the number of years of employment favored the experimental group. Furthermore, Pearson correlations (r), calculated for each matching factor and performance

Figure 1

Total PFA Implementation Scores for Waitlist and Experimental Group Participants



Note. Mean lines, a two-tailed Mann–Whitney U statistic, and a between-groups effect size statistic (*d*) are reported.

both within and across groups, revealed statistically insignificant correlations.

Participants in the waitlist group demonstrated fewer overall component skills of the PFA process than participants in the experimental group (see Figure 2). The mean total PFA score for participants in the waitlist group was 36% correct. By contrast, the mean total PFA score for participants in the experimental group was 87% correct. Within the waitlist group, participant W_3 achieved the lowest overall PFA implementation score and participant W_6 achieved the highest (7% correct and 71% correct, respectively). In general, participants in the waitlist group demonstrated a majority of the interview component skills at least partially. Only two participants, W_1 and W_2, demonstrated each design component skill at least partially. The remaining participants omitted at least one design component skill. Performance during the analysis, however, varied among participants in the waitlist group. Participant W_6 demonstrated the most analysis component skills fully. A few participants, W_2, W_4, and W_5, demonstrated some skills to proficiency. Others, W_1, W_3, W_7, W_8, and W_9, demonstrated few or no skills to proficiency.

By contrast, participants in the experimental group demonstrated relatively high levels of PFA component skills. Participant E_2 achieved the lowest overall PFA implementation score and participant E_5 achieved the highest (73% correct and 96% correct, respectively). In general, participants in the experimental group demonstrated a majority of interview component skills fully, with one notable exception. Several participants received partial or no credit for asking follow-up questions; however, this did not appear to impact their ability to design and conduct their analysis. All participants in the experimental group demonstrated at least half of the design component skills fully, with four participants demonstrating all four design component skills fully.[1]

Performance during the analysis was consistent across participants in the experimental group. Consistent errors were observed across participants with two component skills in particular. For example, several participants failed to reinforce the first instance of problem behavior and instead waited to reinforce a more dangerous topography (e.g., withheld reinforcers for whining but delivered them for physical aggression). In addition, five participants failed to provide reinforcement for 20-40 s contingent on problem behavior in a test condition with some participants reinforcing for less than 20 s and others reinforcing for longer than 40 s. However, despite these errors and with the exception of participant B_E, all participants in the experimental group achieved total PFA implementation scores of 80% correct or higher.

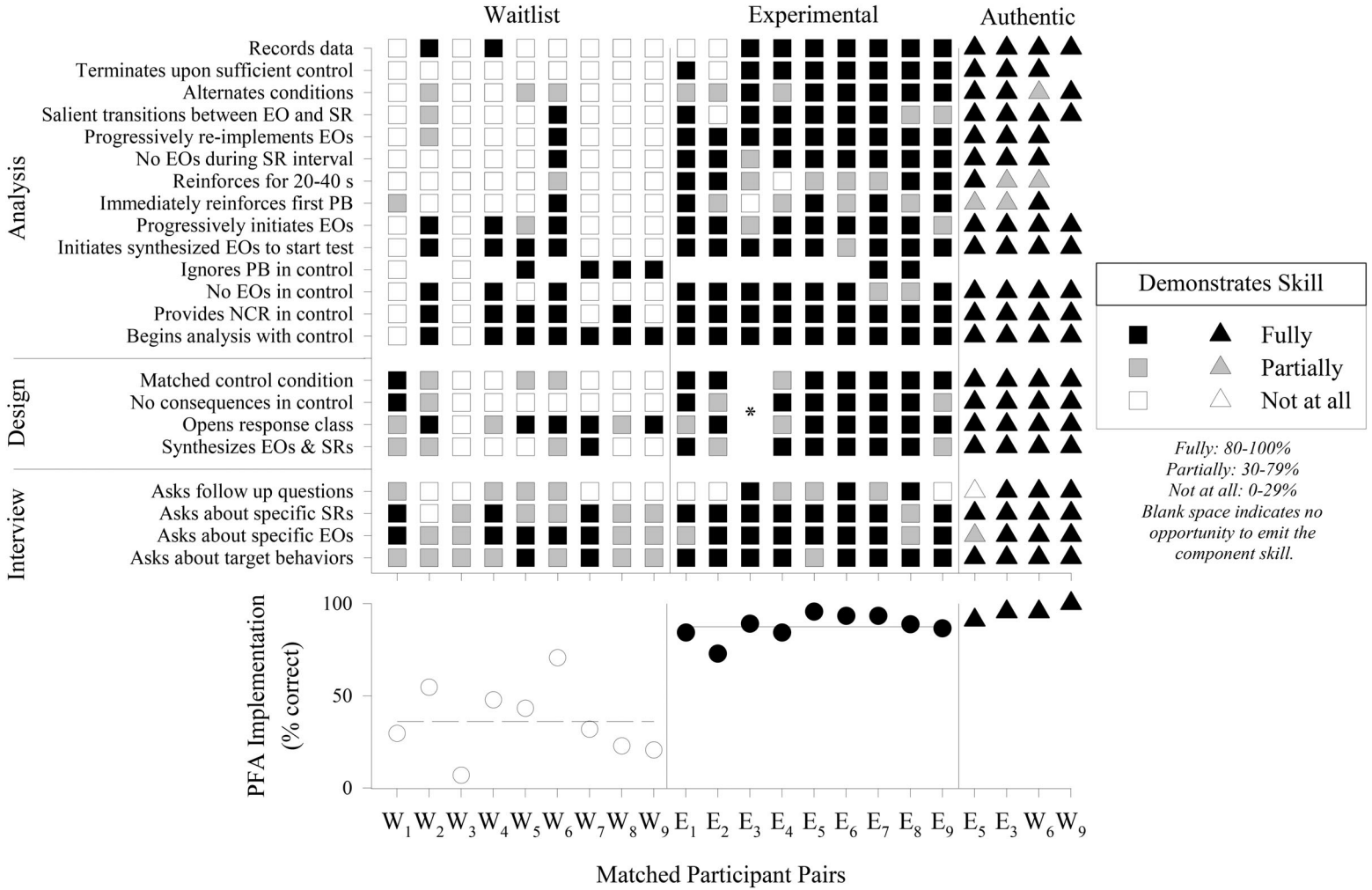
Social Validity

Immediately following their confederate PFA experiences, participants from both the waitlist and experimental group responded to a survey in which they ranked their confidence or ability to implement the PFA process on a scale from 1-7 (1 = not at all; 4 = unsure; 7 = very much so). This question was an attempt to

[1]Design data for C_E were misplaced and not available for inclusion in the analysis.

Figure 2

PFA Component and Total PFA Scores



Note: Waitlist (36.1%) and experimental means (87.4%) are represented by dashed and solid lines, respectively. Breaks in the data path represent no opportunity to observe the component skill. *Design data unavailable for participant E_3.

Table 2

Social Validity

Statement	Waitlist Group 1	2	3	4	5	6	7	8	9	Mode *range*	Experimental Group 1	2	3	4	5	6	7	8	9	Mode *range*	*U* statistic *Effect size*
I felt confident in my ability to gather relevant information to design an ecologically relevant FA.	6	6	5	6	4	6	6	6	3	6 *3-6*	7	6		7	6	6	6	3	7	6 *3-7*	U = 20.5 *d* = *0.62*
I felt confident that I could conduct an efficient FA that would yield sufficient functional control.	5	5	4	3	3	4	2	4	3	3, 4 *2-5*	6	6		5	6	5	5	2	6	6 *2-6*	U = 11.5 ***d* = 1.28**
I felt confident that I could conduct a safe FA that is socially acceptable to the client and his/her caregivers.	5	7	5.5	3	3	6	6	5	6	6 *3-7*	7	6		7	7	6	4	3	6	6, 7 *3-7*	U = 24 *d* = 0.41
The training I received regarding conducting PFAs enhanced my ability to design, conduct, and interpret an FA.			5	4	3	4	1	5		4, 5 *1-5*	7	7		7	7	7	6	7	6	7 *6-7*	**U = 0.0 *d* = 2.76**

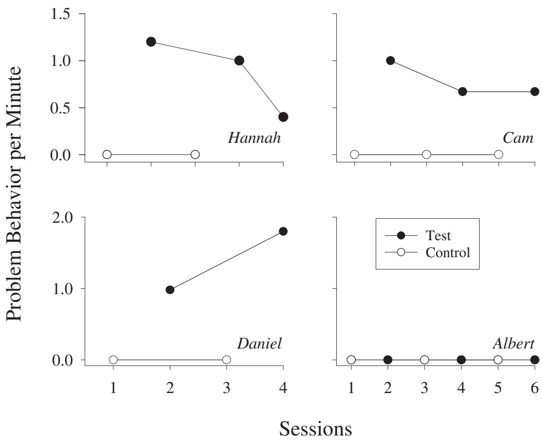
Note: 1 = not at all; 4 = unsure; 7 = very much so; no text = no response. A two-tailed Mann–Whitney *U* statistic, and a between-groups effect size statistic (*d*) are reported. Statistically significant effects are in bold.

measure the meaningfulness of the outcomes (Wolf, 1978). Results from that survey are displayed in Table 2. Participants in both the waitlist and experimental groups felt confident in their ability to gather information to design an ecologically relevant, safe, and socially acceptable FA. Participants in the waitlist group felt less confident in their ability to efficiently demonstrate control over problem behavior than participants in the experimental group. Most participants from the waitlist group did not respond to the question regarding the training they received regarding the PFA process. By contrast, the majority of participants in the experimental group reported that the training they received regarding the PFA process enhanced their ability to design, conduct, and interpret an FA.

A two-tailed Mann–Whitney *U* statistic, and a between-groups effect size statistic (*d*) are reported for the social validity measures. There was no statistically significant difference between participants' confidence in gathering relevant information to conduct an FA nor in their confidence in conducting an FA that would be safe and socially acceptable to the

Figure 3

Results from Authentic IISCAs



Note: Data from final iterations presented for Daniel and Albert.

client's caregivers. The between-groups effect size statistic describes a relatively large effect in regard to participants' confidence in their ability to implement an efficient FA that yielded differential outcomes and their interpretation of how their training enhanced their ability to design, conduct, and interpret an FA ($d = 1.3$ and 2.8, respectively).

Authentic PFAs

Participants' performances during their authentic PFAs are depicted in the final column in Figure 2. Their performance during the authentic PFA process was evaluated identically as it was during the confederate PFA experience. All participants demonstrated the majority of component PFA scores to proficiency; Participant E_7's total PFA score during her authentic PFA experience was 91%; Participant E_3's total PFA score was 96%; Participant W_6's total PFA score was 96%; Participant W_9's total PFA score was 100%.

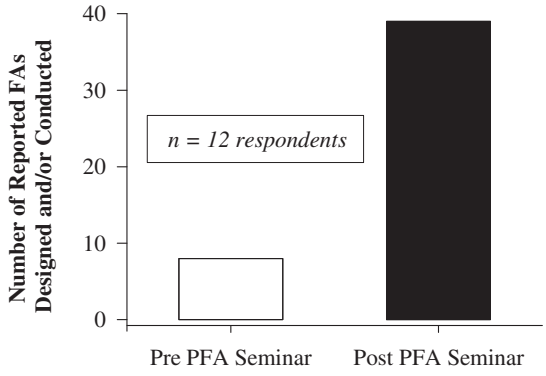
The results from the authentic IISCAs are depicted in Figure 3. Hannah's caregiver reported that problem behavior was most likely to occur when her preferred toys and attention were removed and she was instructed to go to her table to engage in academic demand. During the control condition, Hannah was given continuous access to her preferred toys, attention from Participant E_7, and no demands were presented. During the test condition, Participant E_7 terminated access to the preferred toys, removed her attention other than providing instructions, and instructed Hannah to transition to the worktable. Contingent on the occurrence of any problem behavior, Participant E_7 removed all EOs and delivered access to the synthesized reinforcers. During the analysis, elevated rates of problem behavior were observed during the test condition and zero problem behavior was observed during the control conditions.

Cam's caregiver reported that problem behavior was most likely to occur when Cam had to relinquish his iPad, attention from his staff diminished, staff did not comply with his mands, and staff presented academic demands. During the control condition, Cam was given continuous access to his iPad, attention from Participant E_3 in the form of mand compliance and discussion about his videos, and no demands were presented. During the test condition, Participant E_3 removed the iPad, did not comply with Cam's mands, and provided instructions to complete an academic task. Contingent on the occurrence of any problem behavior reported to co-occur, Participant E_3 removed all EOs and delivered access to the synthesized reinforcers. During the analysis, elevated rates of problem behavior were observed during the test condition and no problem behavior was observed during the control conditions.

Daniel's caregiver reported that problem behavior was most likely to occur when Daniel was instructed to stop playing with his toys without warning of the upcoming transition to a less-preferred activity. During the control condition, Daniel was allowed continuous access to his preferred toys and conversation about his favorite videos without any instruction to terminate playing and start a new task. During the test condition, Participant W_6 removed the preferred items from Daniel and prompted him to complete an academic task without any warning of the transition. Contingent on any problem behavior reported to co-occur, Participant W_6 terminated all EOs and delivered access to the synthesized reinforcers. Participant W_6 decided to conduct two iterations of the IISCA due to no responding in the first iteration. In the second iteration, Participant W_6 placed Daniel's preferred toys out of view during the test conditions. This change in EO presentation resulted in elevated rates of problem behavior in the test condition and no problem behavior in the control condition.

Albert's caregiver reported that problem behavior was most likely to occur when a

Figure 4
Follow-up Survey Results



teacher interrupted him playing with preferred toys, stopped providing him with attention relevant to those toys/activities, and instructed him to complete a difficult academic task. During the control condition, Albert was allowed to play with a variety of preferred toys including the keyboard, plastic bugs, and an iPad to use for taking pictures and videos. Participant W_9 provided him with continuous attention related to those ongoing activities. During the test condition, Participant I_W instructed Albert to stop playing, relinquish his positive reinforcers, and complete a difficult academic task. In the first iteration, Participant W_9 provided prompting to complete the task (data not shown). Despite designing these conditions based on caregiver report, the EOs were not strong enough to evoke problem behavior. Participant W_9 independently altered the conditions and instructed Albert to relinquish his positive reinforcers and complete a difficult academic task independently. Despite this change, Albert did not engage in any problem behavior during the analysis.

Follow-up Questionnaire

Of 18 participants, 12—six from the experimental group and six from the waitlist group—returned the survey (67% return rate). All 12 respondents were working in positions in which they were able to initiate functional assessments either during clinical review or team meetings. Prior to attending the PFA seminar, 33% of respondents (n = 4) had reported that they designed and/or conducted a total of eight FAs in their work history. Ten months after attending the PFA seminar, 100% of respondents (n = 12) had reported designing and/or conducting a total of 39 FAs representing almost a five-fold increase in the use of functional analysis among respondents (see Figure 4).

Discussion

The PFA seminar proved to be an effective and socially validated method for training behavior-analytic practitioners to conduct a practical functional assessment process with confederate and some actual clients. In this study, we addressed several barriers preventing practitioners from using FA as identified by Oliver et al. (2015) and Roscoe et al., (2015). Survey respondents cited inadequate training, lack of time, and social acceptability of FA procedures as barriers to conducting FAs. The participants in the current study were adequately trained via seminar to conduct FAs efficiently (range, 10 to 40 min) and safely (e.g., minimal dangerous problem behavior occurred).

After attending the seminar, participants demonstrated the ability to gather information regarding a response class of problematic behaviors as well as the EOs and reinforcers suspected to be influencing problem behavior. They synthesized the information gathered during the interview to design an ecologically relevant analysis with all members of the response class eligible for reinforcement during the test condition and all suspected reinforcers freely available during the control condition. Participants then conducted their confederate IISCAs and demonstrated control over problem behavior. The PFA seminar resulted in all but one participant in the

experimental group demonstrating proficiency (i.e., at least 80% correct implementation) with the PFA process.

Several components of the PFA seminar likely contributed to its positive effects. The emphasis on role plays and active responding, for example, provided participants with multiple opportunities to practice and receive feedback. It may have been the case that participants' performance was influenced by receiving direct feedback and by observing others receive feedback as the training was provided to a group. In addition, the video examples may have provided effective models of how to perform during a PFA. The effects of video modeling on staff skill acquisition is well documented (see Bovi et al., 2017 and Deliperi et al., 2015 for recent examples) and is likely to have contributed to participants' performances. A seminar-based approach to training staff to conduct FAs might not be as efficacious without all or some of these components.

This training, in addition to feedback following implementation with a confederate, also led to successful implementation of the PFA process with clients who engage in SPB. The interaction between the effects of the seminar and feedback in this study are unknown. Identifying the effects of a seminar experience on PFA implementation without any feedback would be important as many professionals who attend workshops may not have the opportunity for feedback prior to implementation. Therefore, at this time, our recommendation is for professionals to arrange for observation and feedback on their PFA implementation following workshop experiences.

Four of 18 participants (22%) conducted authentic PFAs with clients. There are several reasons why more participants did not conduct the authentic PFA. First, it may be the case that only four participants had a client who was due for an updated behavioral assessment. It may also be the case that participants were not ultimately responsible for behavioral assessment for the clients they served and, therefore, felt uncomfortable nominating them for participation. A final consideration may be that, despite wanting to conduct an authentic PFA with a client on their caseload, participants were prevented from doing so because the client was already undergoing some other behavioral assessment. Despite a limited number of authentic PFAs, we encourage future researchers to more systematically evaluate generalized applications of FA methodology.

During the authentic IISCAs, three out of four participants successfully evoked and reinforced nondangerous topographies of problem behavior, preventing the occurrence of dangerous behaviors that were reported to be members of the same response class. This seems to be an important emphasis for PFA trainings given the strong support for this tactic shown in Warner et al. (2020). Given the variability of this tactic being implemented with confederate clients, this aspect of the seminar-based training probably should be strengthened in future applications.

Despite a wide variety of expertise and experience among participants in the experimental group, the PFA training resulted in greater reported confidence in conducting analyses that yield differential outcomes. In fact, participants in both the experimental and waitlist groups reported using FAs more often in their practice following the seminar. More specifically, all 12 participants who responded to the follow-up survey reported conducting FAs within 10 months of completing the study. This is contrasted with only one third of participants reporting FA activity prior to the PFA seminar. A limitation of the current study is that we did not demonstrate experimental control over the 39 future applications of FA reported by our survey respondents. Future research should push out the scheduling of the waitlist group's seminar experience by several months from that of the experimental group so that a more experimentally rigorous understanding of the general impact of the PFA seminar can be realized.

Future researchers might also consider how to augment the effects of the seminar for participants who do not demonstrate proficiency. Griffith et al. (2019) provided individualized instructions to participants who did not demonstrate proficiency following a self-instruction package and small group training. It is possible that similar, individualized teaching would enhance participants' PFA skills. Future researchers might also consider using video modeling, similar to Moore and Fisher (2007), as a method for improving performance following the seminar. Participants who failed to meet criteria with a confederate might also benefit from more support during application with a client. Supported application with a real client would allow for the expert to provide coaching and feedback on all component skills. This support could be provided on-site or at a distance given the advances in telehealth technology (Peterson et al., 2017; Wacker et al., 2013).

Another limitation of the current study was that we did not teach participants how to engage in the iterative process that is sometimes involved in PFAs. Three out of four authentic IISCAs were differentiated, which is consistent with previous studies replicating IISCAs in clinical settings (Jessel et al., 2016; 2018). However, it is possible that Participant W_9 would have achieved control over problem behavior with Albert had we spent more time discussing what to do when the first iteration does not result in a differentiated outcome. A refinement of the PFA component skills might include problem solving such that control over problem behavior is achieved.

Another next step for future research would be to evaluate the effects of a similar seminar on designing and implementing treatment based on the results of a PFA. A seminar might be a useful way to disseminate basic information about function-based treatments. Future researchers should consider evaluating the extent to which such a training might augment a collaborative implementation process in which experts consult to practitioners learning to implement interventions. Given the complex decision-making skills required to implement treatment protocols that result in meaningful reductions in problem behavior, a seminar without supported application would likely not be an effective training method.

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