A PARAMETRIC ANALYSIS OF REHEARSAL OPPORTUNITIES DURING TRAINING OF FUNCTIONAL ANALYSIS CONDITIONS

By

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Abstract

The purpose of the current studies was to evaluate the use of rehearsal during training on the fidelity of functional analysis conditions. Study 1 used a parametric analysis of the number of rehearsal opportunities to examine the effects on the fidelity with which participants implemented three functional analysis conditions. One, three, and 10 rehearsals were examined, which were counterbalanced across three undergraduate participants. Next, participants experienced additional rehearsals until they met criterion. On average, participants met criterion after 7.6 rehearsals (4, 5.7, and 13 rehearsals for the one, three, and 10 rehearsal conditions, respectively). Study 2 incorporated a video model to evaluate the effects of the number of rehearsal opportunities with a behavioral skills training package with 18 undergraduate participants. Results indicate the addition of the video model decreased the average number of rehearsals (M = 6.3) necessary to meet criterion by just over one and a half rehearsals (3.5, 4.8, and 11.5 rehearsals for the one, three, and 10 rehearsal conditions, respectively) compared to Study 1. A training acceptability survey suggested rehearsal with feedback was more acceptable than instructions and the full behavioral skills training package was highly acceptable.

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A Parametric Analysis of Rehearsal Opportunities during Training of Functional Analysis Conditions

Organizational behavior management (OBM) is a subfield of applied behavior analysis that focuses on behavior change within many types of organizations including business, industry, mental health and social services, community, government, and others (Fredericksen & Lovett, 1980). Behavioral research and practice within organizations have been documented since the 1960s and continues to thrive today (Dickinson, 2000). Even before the disciplines of behavior analysis or OBM were formalized, Skinner (1953) emphasized the importance of arranging an environment that supports a "high level of relevant behavior" (p. 422; e.g., productivity, performance), in part, by providing sufficient reinforcement and resources (e.g., training, work materials) necessary to complete a task. The primary emphasis of OBM research and practice is to address socially significant target areas within organizations, such as employee completion of routine work tasks (Carr, Wilder, Majdalany, Mathisen, & Strain, 2013), employee safety (Hermann, Ibarra, & Hopkins, 2010), and staff training (Parsons & Reid, 1995). Another important emphasis is to measure and change observable behavior. Researchers and practitioners use the same principles and techniques (e.g., reinforcement, punishment, generalization) to effect behavior change in organizational settings that are used by behavior analysts in the laboratory (Bucklin, Alvero, Dickinson, Austin, & Jackson, 2000; Weatherly & Malott, 2008). Improvements in organizational behaviors have been cited in various settings, such as residential homes for individuals with disabilities (e.g., Ducharme & Feldman, 1992), stone quarries (e.g., Hickman & Geller, 2003), financial institutions (e.g., Crowell, Anderson, Abel, & Sergio, 1988), and many others. The purpose of OBM is to improve the efficiency, performance, and satisfaction of employees and the organization as a whole (Culig, Dickinson,

McGee, & Austin, 2005). Systems analysis, behavior-based safety, and performance management comprise the three sub-disciplines of OBM (Wilder, Austin, & Casella, 2009), each of which are described below.

Systems Analysis

Systems analysis is a sub-discipline of OBM that evaluates all of the components (departments) and processes that make up an organization (system) and how each component interacts with one another (Brethower & Dams, 1999; Diener, McGee, & Miguel, 2009). These components or subsystems may include hiring practices, management practices, contingencies, goals, employee performance, policies, procedures, and others (Diener et al., 2009; Hyten, 2009). Systems analysis, also known as performance engineering, aims to maintain the environmental variables responsible for high performance, improve or change the variables responsible for low performance, ensure the organization, as a whole, responds to ever-changing contingencies, and maintain and support the goals of the organization (Brethower & Wittkopp, 1988; Diener et al., 2009). Unfortunately, there is limited experimental research evaluating the effectiveness of behavioral systems analysis for improving organizational outcomes. In one study, Mihalic and Ludwig (2009) evaluated the weaknesses of a furniture company's measurement system and its impact on the company's overall performance. The authors used archival data to identify error patterns in a measurement system designed to provide feedback on customer service. The feedback provided by the measurement system was used within an incentive and disincentive program. Based on the analysis, the measurement system was inaccurate, resulting in the receipt of incorrect feedback by employees (e.g., employees were told they were performing correctly, customers always received high quality furniture). As a result, the incentive and disincentive program was ineffective due to the errors provided by the measurement system. Instead of

applying the disincentives for inadequate furniture delivery, the measurement system did not record the inadequacies as incorrect; therefore, the furniture delivery drivers never corrected the behavior. In order to address these failures, the authors provided suggestions for how the company could restructure many of its processes and components, within a systems analysis framework, in order to improve the quality of customer service. The authors hypothesized that the recommended changes would affect multiple areas within the company, and, consequently, the company's overall customer service may improve. In another study, Kriesen (2011) used systems analysis to identify the effects of revised processes and additional staff supports on company monetary outcomes and consumer and employee satisfaction. The analysis took place in a small privately owned organization that produced custom-learning tools. Interviews and surveys were conducted to evaluate the potential gaps between the company's goals and the processes used to accomplish these goals, company costs, and how employees completed their job tasks. The results of the interviews indicated the company failed to adapt to the shift in customers' needs and did not provide employees with effective tools to increase their knowledge on how to complete their duties. To address these deficits, interventions targeting organizational, process, and performer levels were created and implemented. These included training and job aids for employees, updating process maps to indicate the responsibilities of each job position, and assigning trained individuals to continually monitor and revise these processes as necessary. The results of these changes included an increase in company profit, a decrease in customer complaints, and an increase in employee satisfaction with the intervention. Despite the reported improvements and ways in which systems analysis can help organizations, methodologically rigorous research is needed to document the beneficial effects of systems analysis, which may be

difficult given the realties regarding the interdependent nature of the components that make up a system (organization), the type of data measured, and how data are collected.

Behavior-Based Safety

Behavior-based safety focuses on the development of procedures and support systems in order to promote safe work behavior and prevent injury in the workplace (Sulzer-Azaroff & Austin, 2000). Similar to behavior analytic approaches to behavior change, behavior-based safety procedures aim to (a) identify and define at-risk behaviors, (b) observe and collect data on these behaviors and the conditions under which these behaviors occur, (c) design and implement a safety intervention to decrease injury and unsafe behaviors, and (d) monitor and evaluate outcomes to ensure the procedures are effective (Geller, 2005). Grindle, Dickinson, and Boettcher (2000) conducted a systematic review of the behavior-based safety literature. Their review consisted of 18 behavior-based safety programs across four countries. Most of the interventions targeted a large number of workers (median of 78) with a wide variety of job positions targeted at and across each intervention site. Various experimental designs were used (e.g., multiple baseline, between groups, changing criterion) to evaluate safety interventions; however, as is common when conducting research within industry settings, experimental control was not always achieved. Across the studies reviewed, dependent measures included rate of injury, use of safety practices (e.g., wearing earplugs), and the conditions under which injury and illness occurred (e.g., slippery surfaces). Independent variables included single-component interventions (e.g., feedback, token economy), packaged programs (e.g., training, feedback, praise, goal-setting, and/or tangible incentives), and component analyses (e.g., training vs. training and feedback, training and feedback vs. goal setting, assigned goal setting vs. participatory goal setting). Overall, the intervention strategies were effective at improving target

behaviors or conditions; however, maintenance across time was not observed across all of the outcomes. It is also unknown which independent variables were most effective or necessary for behavior change in these settings.

Performance Management

Performance management is the analysis of employee behavior within workplace settings (Bailey & Austin, 2001). It involves the arrangement or design of contingencies within an environment that supports the occurrence of target behavior (Malott, 2001). That is, performance management interventions change the occurrence of behavior via antecedents or consequences within the environment. It involves identifying and defining a performance problem (using operational definitions), measuring baseline rates of behavior, graphing and analyzing these data, developing an intervention that addresses the performance deficit(s), evaluating how behavior change could impact the workplace (planned and unplanned effects), and implementing the intervention and measuring its effects (Bailey & Austin, 2001). Performance management interventions may include incentives (e.g., Helm, Holladay, & Tortorella, 2007; Peterson & Luthans, 2006), goal setting (e.g., see Kleingeld, van Mierlo, & Arends, 2011 for a review), staff training (e.g., de Leeuw & van den Berg, 2011; Loughrey, Marshall, Bellizzi, & Wilder, 2013), and other procedures. Moreover, performance management strategies have been used in numerous workplace settings such as hospitals (e.g., Cunningham & Austin, 2007), restaurants (e.g., Palmer & Johnson, 2013), and educational settings (e.g., McBride & Schwartz, 2003; Simonsen, Myers, & DeLuca, 2010).

Performance management in educational settings. Performance management in the form of training and follow-up support is implemented in a wide variety of educational and human service settings. A large body of research has documented the effectiveness of

performance management procedures when used with public and private school teachers (e.g., Duncan, Dufrene, Sterling, & Tingstrom, 2013; Jones & Eimers, 1975; LeBel, Kilgus, Briesch, & Chafouleas, 2010), paraprofessionals or direct-care staff (e.g., Love, Carr, LeBlanc, & Kisamore, 2013; Parsons & Reid, 1995; Schepis, Reid, Ownbey, Parsons, 2001;), and other educators (e.g., Cross, Seaburn, Gibbs, Schmeelk-Cone, White, & Caine, 2011) or clinicians (e.g., Barsuk, McGaghie, Cohen, O'Leary, & Wayne, 2009). For example, Bishop and Kenzer (2012) used a concurrent multiple probe design to evaluate a group training approach, consisting of didactic instruction, video modeling, rehearsal, and feedback on the effects of preference assessment implementation for 11 direct-care staff working with clients with autism. Results suggest group training effectively improved plan implementation for seven of 11 participants. When in-vivo feedback was provided, the remaining participants' implementation improved. During maintenance probes, implementation remained high for at least four of the participants.

Correct implementation of treatment or teaching plans (i.e., treatment integrity; Gresham, 1989; Yeaton & Sechrest, 1981) by educators has received increased focus in recent years. DiGennaro Reed and Codding (2014) conducted a cumulative analysis of the use of the term *treatment integrity* in the PsycINFO database and found an increasing trend throughout the last three decades (1982-2012) and especially from 2008 to 2012. The authors suggested the increase may be due to the emphasis researchers and practitioners are now placing on the importance of integrity related to educational and behavioral outcomes. This increase may also be partially due to research documenting the effects of poor treatment integrity on client outcomes. For example, Groskreutz, Groskreutz, and Higbee (2011) used a combined multi-element/multiple baseline design to evaluate the effects of varying integrity levels of a prompting procedure on appropriate toy play for two children with autism. Perfect implementation of the

prompting procedure involved providing physical guidance to complete a three-step play sequence to facilitate child play. Each of three toys was associated with one of three levels of integrity of the prompting procedure (10%, 50%, or 100% integrity). If appropriate toy play remained low, conditions associated with less than 100% integrity were changed until appropriate toy play improved. That is, if 10% integrity did not increase appropriate toy play, the integrity level was increased to 50%, and then to 100%. Increases in appropriate toy play were achieved when integrity levels were 50% and 100% for one participant; however, appropriate toy play increased for the other participant only during 100% integrity. These results highlight the importance of high integrity on client outcomes and demonstrate participant performance is negatively influenced by decrements in integrity. In another example, Wilder, Atwell, and Wine (2006) used a multi-element design to evaluate three integrity levels of a three-step prompting procedure on compliance for two typically developing children. During the study, a therapist implemented the prompting procedure at 0%, 50%, and 100% integrity, during which the three-step prompting procedure was implemented on zero, half, or all of the instructions the children did not complete, respectively. The results demonstrated decrements in integrity level negatively influenced compliance levels for the participating children. That is, when the three-step prompting procedure was implemented with errors, overall compliance levels decreased. DiGennaro Reed, Reed, Baez, and Maguire (2011) found similar results in their parametric analysis. In a combined multi-element / nonconcurrent multiple baseline across participants design, the authors evaluated the effects of commission errors (reinforcing incorrect responses) during discrete-trial training on the acquisition of nonsense shapes. Three children with autism were exposed to varying levels of integrity (0%, 50%, and 100%) during discrete-trial training sessions using a similar procedure as Wilder et al. (2006). Consistent with previous

research, lower integrity levels produced lower acquisition. Taken together, these collective results underscore the importance of *high* or *perfect* integrity when implementing procedures because behavioral interventions containing some or many errors resulted in degraded performance.

Despite the above findings, less-than-perfect integrity levels do not always result in negative outcomes. For example, St. Peter Pipkin, Vollmer, and Sloman (2010) showed that a differential reinforcement procedure remained effective even when integrity levels reduced to 40%. They also documented that decrements in treatment integrity did not negatively influence client outcomes so long as treatment errors occurred after a period of high integrity. In another example, Leon, Wilder, Majdalany, Myers, and Saini (2014) conducted a two-part study to replicate and extend the findings of St. Peter Pipkin et al. (2010). Leon et al. (2014) used a reversal design to evaluate the effects of three treatment integrity levels (100%, 60%, and 20%) and the sequence with which they were implemented on child compliance, in the form of relinquishing a preferred toy. Perfect integrity (100%) involved providing access to a toy for 1 min, instructing the child to give the toy to the experimenter, and delivering praise and an edible for compliance. Omission errors in the 60% and 20% conditions were defined as failing to deliver the edible when the child complied, on two of five trials and four of five trials, respectively. The sequence of the integrity levels was evaluated by comparing exposure to degraded integrity conditions (60% and 20%) with the baseline (0%) and perfect integrity conditions. Study 1 demonstrated perfect integrity produced consistently high compliance, regardless of the integrity of previous conditions. The baseline condition produced 0% compliance for both participants. Compliance levels during the 20% condition were low when that condition followed baseline and the 100% compliance conditions. Compliance was variable

during the 60% condition for both participants depending on the integrity condition that preceded it, which replicates some of the findings of St. Peter et al. (2010). That is, compliance was high during the 60% condition when it followed baseline, but was slightly lower when the 100% condition preceded the 60% condition. In Study 2, the authors evaluated varying integrity levels (0% and 100% integrity for two participants; 50% and 100% integrity for one participant) on compliance with relinquishing a preferred toy. The same compliance procedure from Study 1 was used; however, for this study, integrity levels were reduced by introducing errors of commission, defined as the delivery of an edible following noncompliance on all (0% integrity), half (50% integrity), or none (100% integrity) of the trials. The results of Study 2 supported previous research showing a functional relation between level of integrity and performance (i.e., high integrity produced high compliance, low integrity produced low compliance). However, compliance was low for both the 0% and 50% integrity conditions, even when exposed to 100% integrity in the preceding condition, which fails to support St. Peter Pipkin et al. (2010). The combined results of St. Peter Pipkin et al. (2010) and Leon et al. (2014) suggest exposure to integrity errors may not have a uniformly negative influence on client performance.

The degree to which an intervention or protocol is implemented as prescribed is referred to as treatment integrity (Gresham, 1989; Yeaton & Sechrest, 1981), though the terminology used among professionals varies across fields and studies. For example, the degree to which patients adhere to prescribed treatments is known as *treatment adherence* (Pai & Drotar, 2010) or *dietary adherence* (Burrowes, 2008) within the medical or nutrition fields, respectively. Researchers have used the terms *implementation integrity* (DiGennaro Reed, Martens, & Kleinmann et al., 2007), *program implementation* (Durlak, 1998), and *curriculum fidelity* (Vartuli & Rohs, 2009) synonymous with treatment integrity. Recently, DiGennaro Reed and

Codding (2014) advocated for adopting the term *procedural fidelity* given the myriad procedures educational professionals implement in schools and human service settings. For example, educators may be asked to carry out an assessment protocol and be required to do so with high accuracy in order to draw appropriate conclusions that inform treatment (e.g., functional analysis). Thus, the term *procedural fidelity,* referring to the degree to which trained educators implement all procedures (treatment, assessment, or teaching protocols) as designed (DiGennaro Reed & Codding, 2014), will be used for the remaining portion of this review. The findings of parametric analyses of fidelity levels summarized previously underscore the importance of providing staff training *before* staff implement a procedure independently with clients.

Important Considerations for Staff Training

Jahr (1998) suggested a successful staff training program is marked by (a) improvements in targeted client behaviors over baseline levels, (b) staff who are able to implement the same procedure with other clients and in various settings, (c) staff who implement other, similar procedures correctly, even if they are not formally trained, and (d) high procedural fidelity that is maintained over time. Reid and Parsons (1995) described features of quality staff training programs in human service settings and indicated efficiency, effectiveness, and acceptability are important aspects.

An *efficient* staff-training program is one that can be implemented with resources that are already at the company's disposal (e.g., time, personnel, materials). That is, the training program does not take staff away from their responsibilities for an extended period of time and is not cost prohibitive, both of which may impact the long-term adoption of the training program (Kissel, Whitman, & Reid, 1983). Ryan, Hemmes, Sturmey, Jacobs, and Grommet (2008) used a multiple baseline across participants design to evaluate the effects of various training packages

(individual vs. group instruction) on implementation of incidental teaching procedures. Although their goal was not to directly evaluate the efficiency of these training packages, the authors found that less-costly and more-efficient training produced similar (although not as robust) outcomes as costly and less-efficient training. In their study, individual participants were exposed to a training package consisting of instructions, modeling, role-play, and feedback. Although the results showed increases in teacher fidelity and student initiations, the authors reported that the training was too costly in terms of time and other resources. To address this issue, the effect of a more efficient 20-min training consisting of written and verbal instruction and a video model on teaching assistant implementation of an incidental teaching procedure was evaluated. In addition to improvements in teaching assistant and student performance, the authors documented performance improvements when they adapted the training slightly to train five groups of eight staff. These findings suggest brief, efficient training sessions may sufficiently teach staff how to implement teaching procedures and also produce student performance improvements.

An *effective* staff-training program not only produces changes in staff behavior, but also beneficial outcomes for clients. When staff implement a procedure or teaching plan with high fidelity, learner outcomes also improve (Jahr, 1998). For example, Schepis et al. (2001) used a multiple probe design to evaluate the effects of an embedded teaching training package on four paraprofessionals' implementation of the embedded teaching procedures and student learning outcomes, such as compliance with instructions and responses to initiations. Training included instructions, modeling, role-play, and feedback, which took place outside of the participants' classroom. Additional practice and feedback occurred within the participants' classrooms while the participants implemented the skill with a child. Training not only produced performance

improvements for all four paraprofessionals, but also resulted in increases in student compliance with instructions and responses to initiations.

According to Reid and Parsons (1995), the *acceptability* of the staff-training program is also important. Kazdin (1977) defined acceptability in three ways: (a) the importance of the target behaviors to individuals affected by those behaviors (e.g., client, family members, direct-care staff), (b) consumer approval or satisfaction with the procedures, and (c) the level of behavior is significantly different after exposure to the procedures, as measured by staff working with the client. Evaluating the acceptability of training may be accomplished by interviewing the consumers of the training (e.g., staff exposed to training, supervisors delivering the training) or by using questionnaires or surveys, in which the consumer answers open-ended questions or rates the degree to which they agree with a statement about training (Schwartz & Baer, 1991). When training methods are considered unacceptable, trainees may be less likely to actively participate in each component of the training, which could affect the training's overall effectiveness (Parsons, 1998). To date, no studies have experimentally evaluated the effects of training acceptability on the integrity of assessments or teaching strategies. Although there may be face validity to the notion that acceptable training procedures influence or produce high-integrity teaching or assessment procedures, research is warranted to support these claims.

When developing and delivering a staff-training program, trainers might also consider how the training will promote generalization of skills (Sturmey, 2011), which refers to the application of skills that were not directly trained (Stokes & Baer, 1977). Programming for generalization is important because it increases the likelihood that staff will be able to implement a procedure in more complex environments, outside of the controlled training environment (DiGennaro Reed, Hirst, & Howard, 2014). When training programs for generalization, trainees

are able to implement skills under novel situations (e.g., novel clients, teaching plans, materials), without needing direct training for each change in the environment (e.g., working with new clients, teaching a new target within a learning program). Stokes and Baer (1977) suggested nine ways in which generalization can be programmed, which are described next as they pertain to staff trainees as learners. First, the *train and hope* approach involves training a new skill to mastery and observing and measuring if the skills generalize thereafter. This approach does not specifically program for skill application outside of the training setting (but the trainer "hopes" that it occurs outside of training). Train and hope may include situations in which staff members attend an initial orientation upon hire, but do not receive any follow-up training due to time, personnel, or other resource constraints within the setting. Staff are expected to generalize skills to the work setting, despite a lack of additional or ongoing training. *Sequential modification* involves training a skill under every relevant condition in which generalization is desired until the trainee performs the skill in each condition (e.g., across novel conditions, settings, responses, and/or clients). Third, *introduce to natural maintaining contingencies* involves an approach in which trainees are taught a new skill under contrived conditions/contingencies and then behavioral control is transferred to the naturally occurring conditions/contingencies that maintain the occurrence of that behavior. For example, training staff how to implement a behavior management procedure may influence the degree to which they come in contact with problem behavior in the natural environment. After training the procedure in a contrived (training) setting, when the staff implement the procedure in the natural setting in which problem behavior occurs, a reduction in client problem behavior serves as a powerful contingency for continued implementation of the procedure. *Training sufficient exemplars* involves training with many (diverse) stimuli. When training a new skill, generalization might be enhanced if the trainee has

exposure to different conditions under which the skill can be used. An example might involve a trainer demonstrating how to implement a least-to-most prompting procedure using a variety of exemplars, such as different stimuli, programs, settings, and clients. Fifth, *training loosely* is an approach that restricts stimulus control of stimuli used in the training environment as well as the responses that are considered accurate (e.g., a variety of responses are evoked by a variety of stimuli inside and outside of the training environment). This generalization tactic is not commonly adopted within staff training procedures. Instead, staff training often teaches interventionists to perform specific behaviors under clearly described conditions. Sixth, when using *indiscriminable contingencies* to program for generalization, trainees are unable to detect when reinforcement or punishment is or is not available. Thus, the trainee cannot discriminate (1) the antecedents that indicate the presence or absence of reinforcement and punishment, or (2) the contingencies themselves. Seventh, *programming common stimuli* involves matching features found in the training environment with features in the generalization setting. This may be accomplished by training a teacher to use a timer to prompt delivery of praise to students who emit on-task behavior. In this instance, the timer would be used during training and also within the classroom as a way to prompt the delivery of reinforcement on a fixed- or variable-time/interval schedule. Eighth, *mediate generalization* involves teaching trainees how to self-record, self-monitor, or self-observe instances of generalization of a procedure they were trained to implement. Finally, *train to generalize* enhances generalization by reinforcing instances of trainee generalization of a procedure.

Behavioral Approaches to Staff Training

Staff training research suggests that knowledge of a treatment package, behavioral protocol, or teaching plan does not guarantee or result in high procedural fidelity during real-

world implementation (Reid & Parsons, 2000). It is insufficient for trainers to provide information *about* the procedures because knowledge rarely translates to perfect implementation. Therefore, trainees also need to be taught *how* to implement the procedure (Parsons, Rollyson, & Reid, 2012). This may be accomplished by incorporating more than one type of training procedure (DiGennaro Reed, Hirst, & Howard, 2013; van Oorsouw, Embregts, Bosman & Jahoda, 2009). Van Oorsouw and colleagues (2009) conducted a meta-analysis of the characteristics of staff training programs that result in improvements in staff behavior. They found that training programs containing more than one training technique were more effective than those that only used one technique. Performance- and competency-based training and behavioral skills training are two training packages that incorporate behavioral approaches to staff training, both of which are described next.

Performance- and competency-based training. According to Reid, O'Kane, and Macurik (2011), effective staff training requires performance- and competency-based components. That is, training requires that trainees demonstrate the skill being learned (i.e., performance-based) until the trainee can perform the skill competently (i.e., reaches a mastery criterion; competency-based). Reid, O'Kane, et al. (2011) recommend that trainers describe the behaviors required to perform a skill, establish a mastery criterion, and provide on-going training until performance meets criterion. This type of training often begins with an explanation of the steps necessary to perform the target skill. A written protocol (or checklist) may accompany this explanation and can be used for reference during or after training. Training also involves trainers demonstrating each step in the checklist and providing an opportunity for trainees to practice the skill (Reid, Parsons, & Green, 2011). Moreover, observation and performance feedback during practice sessions will help trainees meet criterion. Reid, Parsons, et al. (2011) also recommend

that feedback specify the steps performed correctly, steps implemented incorrectly, and how to improve future performance. Practice and feedback may take place in an applied setting or may be implemented during role-play scenarios in an analog setting.

Many staff-training researchers support the recommendations of Reid, Parsons, et al. (2011) to require trainees to continue with training until they meet a mastery criterion (Nigro-Bruzzi & Sturmey, 2010; Parsons et al., 2012). Several research studies have used a mastery criterion during role-play (also known as rehearsal), such that training is considered complete only when the mastery criterion has been met. However, these studies do not specify how many times practice is necessary in order to meet this mastery criterion (e.g., Iwata et al., 2000; Lambert, Bloom, Kunnavatana, Collins, & Clay, 2013; Philips & Mudford, 2008; Rosales, Stone, & Rehfeldt, 2009; Wallace, Doney, Mintz-Resudek, & Tarbox, 2004; Ward-Horner & Sturmey, 2012). Therefore, no guidelines are available for staff trainers when developing training programs that include practice opportunities.

Behavioral skills training. Behavioral skills training (BST) is a package of techniques used to teach skills (Miltenberger, 2007). It generally consists of instructions, modeling, rehearsal (also known as behavioral rehearsal, role-play, practice), and feedback (Sarokoff & Sturmey, 2004).

Instructions. Instructions involve specifying or describing the skills necessary to perform a skill and can include verbal instructions delivered by the trainer, a written task analysis, and/or a question and answer session (DiGennaro Reed et al., 2013). When using BST, the instructions typically occur at the beginning of the training and are the briefest component of the overall training package. Many researchers suggest instructions are a necessary component of BST, but not the active component responsible for acquisition of new skills (Reid, Parsons, et al., 2011;

Sturmey, 2011; Ward-Horner & Sturmey, 2012). For example, van Vonderen et al. (2012) used a nonconcurrent multiple baseline design across dyads to evaluate the effectiveness of instructions and video feedback on the performance (prompting) of five direct-care staff serving individuals with intellectual disabilities. Instructions consisting of a written description of the procedure with operational definitions of correct responding and a discussion of this content with the participants' supervisor for one did hour not produce robust improvements in performance compared to baseline. This finding is not novel; numerous studies have documented that written instructions alone are insufficient to produce consistent and durable changes in performance (e.g., Ducharme & Feldman, 1992; Gardner, 1972; van Vonderen, Diddnen, & Beeking, 2012; Ward-Horner & Sturmey, 2012).

Interestingly, a recent study showed that written instruction can effectively change performance when it incorporates certain features. Graff and Karsten (2012) used a multiple baseline design across assessment types to evaluate the effects of a self-instruction package on the implementation of stimulus preference assessments and scoring and interpreting the results of the assessments. Eleven teachers received various types of written instructions, including written instructions alone (baseline), enhanced instructions, and written instructions with a data sheet. The *written instructions alone* contained a description of the methods section from published stimulus preference assessment studies. The *enhanced written instructions* contained detailed, jargon-free step-by-step instructions, pictures, and diagrams for implementing the assessment. An assessment datasheet was also included during this training, which participants could use while implementing the assessments. The *written instructions with data sheet* condition consisted of a description of the methodology from published literature and an assessment datasheet. Results showed that written instructions alone did not improve performance;

however, when a datasheet was also provided with these instructions, performance improved for most participants. Moreover, when enhanced instructions and a datasheet were available, performance significantly improved across all participants. Although these results are promising for the use of instructions as a way to train staff in settings with time and resource constraints, additional research is needed to further evaluate how to maximize the effectiveness of instructions. Moreover, the collective findings to date suggest this form of training should be packaged with other training techniques to be most effective.

Modeling. Modeling involves the demonstration of a target skill and its primary goal is to provide exemplars of each behavior comprising the target skill (Reid & Parsons, 1995). Models may include live demonstrations (e.g., Bolton & Mayer, 2008; Gianoumis, Seiverling, & Sturmey, 2012; Sarokoff & Sturmey, 2004) or video-based exemplars of the target skill (e.g., Iwata et al., 2000; Madzharova, Sturmey, & Jones, 2012; Wallace et al., 2004). Research suggests acquisition of a target skill is facilitated through the use of multiple and a broad range of exemplars (Ducharme & Feldman, 1992; Moore & Fisher, 2007). That is, more than one exemplar for each type of skill required of the trainee is provided during training. Catania, Almeida, Liu-Constant, and DiGennaro Reed (2009) used a multiple baseline across participants design to evaluate the effects of video-based modeling on the accuracy with which direct-care staff implemented discrete-trial training. Participants viewed a video model of a simulated discrete-trial training session, which depicted correct and incorrect student responding and the corresponding teacher behavior. After viewing the video model, participants implemented discrete-trial training with the experimenter and a child. Performance improved for all participants after viewing the video model. Additionally, high performance was maintained during a follow-up session.

Rehearsal. Rehearsal involves practicing a target skill in the way it was intended to be implemented (DiGennaro Reed et al., 2013). The main objective of rehearsal is to create multiple opportunities for the trainee to practice the target skill and receive feedback on performance (Sturmey, 2011). There are several ways rehearsal can be implemented during training, including with a trained confederate or researcher (e.g., McGimsey, Greene, & Lutzker, 1995; Philips & Mudford, 2008; Sterling-Turner, Watson, Wildmon, Watkins, & Little, 2001), with other trainees who are learning the same skill (e.g., Palmen et al., 2010; Wallace et al. 2004), or with an actual client or student (e.g., Erbas, Tekin-Iftar, & Yucesoy, 2006; Ward-Horner & Sturmey, 2012).

The current staff-training literature does not prescribe the necessary behavioral rehearsal "dosage" to promote and sustain fidelity of a procedure. Only a handful of studies have programmed a specific number of rehearsal (practice) opportunities; however, the number of opportunities varies across studies making it challenging to draw conclusions about the most effective dosage. For example, Lerman, Vorndran, Addison, and Contrucci Kuhn (2004) used a multiple baseline across participants design to evaluate a workshop-training package on implementation of four teaching skills. In addition to didactic and written instruction, the training package included three role-plays and feedback for each target skill. The training package effectively improved performance across teaching skills and participants. In another study, direct-care staff role-played scenarios of daily living skills (i.e., eating, leisure, daily hygiene) four times each (two times for each skill with other trainees and with actual clients; McKnight & Kearney, 2001). Ward, Johnson, and Konukman (1998) also programmed for a specific number of rehearsal opportunities in their training. In a multiple baseline across teaching behaviors design, four undergraduate students were taught how to implement three

teaching behaviors (transition students throughout the lesson, introduce the lesson to the students, and present the task). During initial training, participants rehearsed each teaching behavior one time. Additional training was provided if participants did not meet mastery criterion for a particular teaching behavior and involved a *directed rehearsal procedure* in which participants were required to practice any teaching behavior implemented incorrectly, 10 times, before they were allowed to leave for the day. If teaching behaviors were implemented correctly, participants could avoid directed rehearsal and, thus, contact a putative negative reinforcement contingency. Performance improved to 100% for all participants during directed rehearsal. All four participants experienced directed rehearsal once for at least one teaching behavior during this phase, which resulted in rehearsing a particular teaching behavior up to 11 times (once during the initial training and 10 times during directed rehearsal). Additionally, participants reported that directed rehearsal was an acceptable training technique on a questionnaire. Although these are promising results, it is unclear if the directed rehearsals (practice) themselves were responsible for improvements in performance or if changes in performance were due to the putative negative reinforcement contingency. DiGennaro et al. (2005) and DiGennaro, Martens, and Kleinmann (2007) used a similar methodology as Ward et al. (1998), but effectively adopted three directed rehearsals (i.e., teachers practiced implementing any incorrectly implemented steps of a school-based intervention three times). Participants in one study (Matthews & Hagopian, 2014) were given 20 opportunities to practice before training was considered complete. In this study, the authors compared the effects of didactic instruction and a BST package on data analysis and decision making for nine teaching assistants. The results indicate participants who experienced BST performed better than those who only received didactic instruction and those that were in a control group, who did not receive training.

Researchers have evaluated various staff training packages on numerous skills; however, many of these studies lack methodological details regarding the number of and specific rehearsal/role-play procedures used during training. This lack of detail neither supports replication of procedures by future researchers nor guides use of this training practice in applied or laboratory settings.

Feedback. Feedback involves communicating qualitative or quantitative information about performance of target skills with trainees (Sturmey, 2011). The goal of feedback is to improve future performance of a target skill (Wilder et al., 2009). Feedback may be delivered in numerous ways, including orally (e.g., Pence, St. Peter, & Giles, 2013), graphically (Wood, Luiselli, & Harchik, 2007), or written via paper (DiGennaro et al., 2005; 2007) or electronic mail (Barton & Wolery, 2007; Hemmeter, Snyder, Kinder, & Artman, 2011). Feedback may also contain a variety of information including, but not limited to, performance against a standard (Alvero, Bucklin, & Austin, 2001) or a comparison of others performing a similar skill (Bachrach, Bendoly, & Podsakoff, 2001). Feedback can be used to shape and differentially reinforce correct implementation of the targeted skill. In order to provide effective feedback, it is necessary to measure performance of the target skill during training. Feedback would then specify the steps implemented correctly and incorrectly and how to improve performance in the future (DiGennaro Reed et al., 2013). When using feedback as a means to improve performance, it is important to consider *how* feedback will be used. That is, if and how feedback will be combined with antecedent- or consequence-based training strategies, the source of the feedback, and how often feedback will be delivered (Alvero et al., 2001).

Performance- and competency-based training and BST are similarly rooted within the principles of behavior analysis and require trainees to demonstrate knowledge of and correct

implementation of a target skill (Miltenberger, 2007; Parsons et al., 2012; Whitty & Willmott, 1991). Direct-training approaches, such as those that require a trainee to practice a target skill (rehearsal) until a criterion has been met, help ensure that the fidelity of that procedure is maintained (Sterling-Turner et al., 2001). As indicated previously, when a teaching plan or behavioral procedure is not implemented as prescribed, negative outcomes may result for the target client (e.g., DiGennaro et al., 2007, Groskreutz et al., 2011). Given the myriad teaching and assessment procedures implemented within settings serving dependent and vulnerable populations, it would be advantageous to systematically evaluate the efficacy or effectiveness of the procedures comprising direct-training approaches that are used by educators within these settings. Specifically, a worthwhile area of study is to evaluate the efficacy of the number of rehearsal opportunities used to train common teaching or assessment procedures (Beidas, Cross, & Dorsey, 2013; Ward-Horner & Sturmey, 2012).

Staff Training Methods Using Rehearsal in Educational and Clinical Settings

Throughout the last five decades, researchers have emphasized the need for and use of rehearsal to train a wide variety of teaching and assessment procedures, such as functional communication training, discrete-trial training, stimulus preference assessments, and functional analyses across many different types of staff or educators. Although the objective of providing trainees with an opportunity to practice a new skill is consistent across studies, the procedures comprising rehearsal vary.

Functional communication training. Functional communication training involves differential reinforcement for an appropriate communicative response (e.g., vocal words, gestures, signs, use of augmentive or alternative communication systems) and extinction for other, non-communicative responses or inappropriate behavior (Carr & Durand, 1985). Across

five studies, researchers used rehearsal as part of training to teach a variety of staff (e.g., staff members at a community habilitation organization, post-secondary education students, special education teachers, therapists, teaching assistants) to implement functional communication training procedures (Gianoumis et al., 2012; Madzharova et al., 2012; Nigro-Bruzzi & Sturmey, 2010; Rosales et al., 2009; Wood et al., 2007). Three studies incorporated rehearsal with confederates (Madzharova et al., 2012; Nigro-Bruzzi & Sturmey, 2010; Rosales et al., 2009) and two studies incorporated rehearsal with clients (Gianoumis et al., 2012; Wood et al., 2007). Of the three studies that required participants to rehearse with a confederate or experimenter, none of the authors indicated if a script was used to control for the number and type of practice opportunities presented to participants. Four of the five studies required participants to meet a mastery criterion. Madzharova et al. (2012) and Nigro-Bruzzi and Sturmey (2010) required participants to reach 90% or higher across three consecutive sessions. The participant in Madzharova et al. (2012) was able to meet this criterion after eight training sessions, which included eight exposures to the full set of training techniques (instructions, modeling, rehearsal, and feedback). It is unclear how many rehearsals were necessary for participants to reach mastery criterion in Nigro-Bruzzi and Sturmey (2010). After participants rehearsed with a client two times, Gianoumis et al. (2012) required participants to reach a mastery criterion of 90% or higher across two consecutive assessment probes. Participants were able to meet mastery after two to four probes. Rosales et al. (2009) also required participants to meet a mastery criterion, which was 80% or higher across two consecutive trials. Participant performance during training was not included; therefore, it is unclear how many rehearsals were necessary to meet mastery criterion. Wood et al. (2007) was the only study that did not adopt a mastery criterion during training.

Across the five studies that used rehearsal to teach functional communication training, two experimental designs were used to evaluate the effects of training on performance. One study used an ABC design (Madzharova et al., 2012) and the other four studies used a multiple baseline across participants design. Across all five studies, the fidelity of functional communication training improved post-training. Improvements in client behavior were also noted for three of the studies that measured these outcomes (Gianoumis et al., 2012; Madzharova et al., 2012; Nigro-Bruzzi & Sturmey, 2010).

Although these studies demonstrated marked improvements across participants and settings, the descriptions of the rehearsal procedures lacked sufficient detail. That is, three of five studies failed to specify the number of rehearsals required by participants to meet mastery criterion. For example, in a two-part study Madzharova et al. (2012) evaluated the effects of BST, which included rehearsal, on staff implementation and subsequent student learning outcomes of an intervention for increasing manding between peers with autism. Study 1 used an ABC design that consisted of baseline, training, and follow-up. During baseline, the participant received written instructions in the form of a task analysis of the functional communication training program. His fidelity was low and had a slight decreasing trend toward the end of this phase. After a training package consisting of instructions, video modeling, rehearsal (with the experimenter), and performance feedback, participant fidelity improved immediately and substantially across subsequent training sessions. The entire package of training continued until performance was 90% across three consecutive sessions. In addition to increases in participant fidelity, the authors reported an increase in mands for both students with autism. Performance of the teaching assistant and one of the target students remained high at a two-month follow-up session.

Discrete-trial training. Discrete-trial training is a highly structured teaching procedure that involves the sequential presentation of learning (discrete) trials comprised of a discriminative stimulus (instruction), the client's response, and a programmed consequence (Green, 1996). Research has shown that discrete-trial training is a successful method for teaching receptive and expressive language, imitation, socialization, and other skills (Smith, 2001). Depending on the setting, the interventionist may vary (e.g., teacher, paraprofessional, parent); however, all interventionists require training in order to implement the procedure with high fidelity (Severtson & Carr, 2012).

Ten studies evaluated the use of rehearsal within a training package to teach participants (e.g., undergraduates, teachers, direct-care staff) how to implement discrete-trial training (Arnal et al., 2007; Bolton & Mayer, 2008; Dib & Sturmey, 2007; Downs, Conley Downs, & Rau, 2008; Fazzio et al., 2009; McBride & Schwartz, 2003; Nosik et al., 2013; Sarokoff & Sturmey, 2004; Sarokoff & Sturmey, 2008; Severtson & Carr, 2012). A multiple baseline across participants design was used in all but two of these studies. One of the two studies replicated an AB design across all participants (Arnal et al., 2007) and the other used a multiple probe across participants design (McBride & Schwartz, 2003).

The training packages also varied across these studies, particularly the use of rehearsal. In five of the studies, rehearsal was conducted with a confederate or researcher (Arnal et al., 2007; Downs et al., 2008; Fazzio et al., 2009; Nosik et al., 2013; Severtson & Carr, 2012). Four studies incorporated rehearsal with a client (Dib & Sturmey, 2007; McBride & Schwartz, 2003; Sarokoff & Sturmey, 2004; Sarokoff & Sturmey, 2008) and only one arranged for participants to rehearse with other trainees (Bolton & Mayer, 2008). For the five studies that used confederates, three reported using scripts to control for the number and type of rehearsal opportunities

presented to participants (Arnal et al., 2007; Fazzio et al., 2009; Severtson & Carr, 2012). Failing to control for confederate behavior may be problematic because variations in the number and type of opportunities to rehearse a skill could influence the degree to which participants acquire the skill. Of these three studies, Severtson and Carr (2012) were the only researchers to specify the confederate behaviors emitted during the session (i.e., five correct responses and seven error responses).

Nine of the 10 studies used a mastery criterion during training. Participants in Bolton and Mayer (2008) were able to meet a mastery criterion of 98% or higher after implementing between two and four rehearsals. Those in Nosik et al. (2013) met a mastery criterion of 90% correct across three consecutive sessions after four to 12 rehearsals. Participants in Arnal et al. (2007), Downs et al. (2008), and Fazzio et al. (2009) were required to meet a mastery criterion of 90% or higher at least one time. Based on the data presented in Arnal et al. (2007), it is unclear how many rehearsals were implemented before mastery criterion were met. However, those in Downs et al. (2008) and Fazzio et al. (2009) were able to meet mastery criterion after one to two training sessions and one to three training sessions, respectively. Sarokoff and Sturmey (2004; 2008) and Severtson and Carr (2012) set a mastery criterion of 90% across three consecutive sessions and McBride and Schwartz (2003) used a mastery criterion of 80% or higher across three consecutive sessions. Participants in Sarokoff and Sturmey (2008) were able to reach the criterion of 90% or higher across three consecutive sessions after just three sessions. Data provided for Sarokoff and Sturmey (2004), Severtson and Carr (2012), and McBride and Schwartz (2003) do not indicate how many rehearsals were necessary to reach the mastery criterion. Dib and Sturmey (2007) was the only study that did not specify how the rehearsal component was conducted. They did not indicate if a mastery criterion was used, how many

times rehearsal was conducted, and/or if rehearsal was repeated alone or in combination with other training components. Without these details, it is difficult to estimate the minimum number of rehearsal opportunities necessary for trainees to implement the new skill with high fidelity. An underestimation may impact their fidelity; however, an overestimation may require too many resources (e.g., time, money, personnel).

Across the ten studies that incorporated the use of rehearsal within a package to teach discrete-trial training skills, several procedural variations of rehearsal were used. These variations included the person with whom the participants rehearsed the skill, whether or not the rehearsals were scripted, and if participants had to meet a mastery criterion. Despite the variations, improvements were observed across participants for all ten studies. Of the four studies that included rehearsal with clients, three studies measured client outcomes and all of the clients demonstrated gains in performance.

One study, in particular, reported the number of practice sessions necessary for each participant to reach mastery criterion. Bolton and Mayer (2008) used a delayed multiple baseline across participants design to evaluate a brief training program on the implementation of discrete-trial training by three paraprofessionals working with clients with autism. During baseline, participants implemented one trial from two learning programs with another trainee before receiving instructions. No feedback was provided during or after these sessions. During small-group training, participants rehearsed implementing one trial for each of 10 learning programs with other participants and received feedback from the trainer after each trial. Rehearsal and feedback sessions (10 trials) continued until participants were able to implement at least 90% of the steps correctly one time. Following training, the researchers assessed generalization by asking participants to teach clients in a clinical setting. The authors report improved fidelity

after training and sustained performance during generalization probes. Participants reached mastery criterion in two, three, and four rehearsal and feedback sessions. These data are helpful in demonstrating the importance of providing staff with more than one opportunity to practice a new skill. Moreover, the number of rehearsals required to reach criterion was less than the number reported in other studies, which suggests that acquisition may be achieved with careful consideration of training resources.

Stimulus preference assessments. Stimulus preference assessments are formal methods for identifying stimuli (e.g., toys, edibles, activities) that are likely to serve as reinforcers (Pace, Ivancic, Edwards, Iwata, & Page, 1985). Although several variations for conducting preference assessments exist (Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin, 1992), generally staff members present each stimulus (in isolation, paired with others, or with several in an array) to the client and record data on client selection or approach responses to each stimulus. Stimuli selected more often than others or earlier in the session may indicate a preference for those stimuli. Results of a preference assessment inform the development of treatment procedures and instruction incorporating reinforcement.

Three studies used rehearsal within a training program and evaluated the effects on staff implementation of stimulus preference assessments in a variety of settings and documented improvements in fidelity following training (e.g., Bishop & Kenzer, 2012; Lavie & Sturmey, 2002; Roscoe & Fisher, 2008). Training across the three studies included either group (Bishop & Kenzer, 2012) or individual instruction (Lavie & Sturmey, 2002; Roscoe & Fisher, 2008). Regardless of the format, training in all of the studies incorporated didactic instruction, rehearsal, and performance feedback. Rehearsal involved practice with an actual client (Lavie & Sturmey, 2002) or with a trained confederate (Bishop & Kenzer, 2012; Roscoe & Fisher, 2008). Of the

two studies that used confederates during rehearsal, Roscoe and Fisher (2008) were the only researchers to provide scripts to confederates in order to control for the number and type of practice opportunities presented to participants. During rehearsal, confederates in Roscoe and Fisher presented five standard responses and 11 distracter responses. The use of a mastery criterion during rehearsal also varied across the three studies. Bishop and Kenzer (2012) required participants to reach a mastery criterion of 75% or higher during a post-instruction observation; however, based on the data provided, it is unclear how many rehearsals were necessary to meet mastery criterion. Lavie and Sturmey's (2002) mastery criterion was 85% or higher across two consecutive sessions; however, it is unclear how many times rehearsal was repeated before participants met this criterion. Although Roscoe and Fisher (2008) did not use a mastery criterion, they indicated performance for all participants was high (80% or higher) after one training session. They used a multielement design to evaluate the effects of training on the implementation of a multiple stimulus without replacement and paired stimulus assessments. After participants were given written instructions from the method sections of published literature during baseline, participants received training consisting of feedback and rehearsal. Feedback was provided for performance during previous sessions and rehearsals were conducted with the experimenter to provide multiple opportunities to practice the target skill. Results indicated participants were able to implement both assessments at or above 80% after one training session. Although these results are promising, it is unclear how many times rehearsal was implemented during training. Although these studies demonstrate procedural variations of BST involving rehearsal effectively train staff to implement preference assessment procedures, all three studies failed to specify the number of rehearsals required by participants to meet

mastery criterion or a high level of performance, which impacts the replicability and generalizability of the procedures.

Functional behavior assessment. Functional behavior assessment involves identifying the environmental variables maintaining problem behavior in order to select an intervention designed to decrease problem behavior (Hagopian, Dozier, Rooker, & Jones, 2013). Various techniques comprise functional behavior assessment including indirect assessment, descriptive assessment, and functional analysis (Iwata & Dozier, 2008). Indirect assessment involves gathering information about the occurrence of problem behavior (e.g., topography, prevalence, environments in which problem behavior occurs) via interviews, rating scales, or questionnaires from individuals who work with or have regular contact with a client (Kelley, LaRue, Roane, & Gadaire, 2011). Descriptive assessment involves direct observation of clients in their natural environment and recording information about environmental variables (i.e., antecedents and consequences) surrounding problem behavior (Thompson & Borrero, 2011). Descriptive assessment does not involve experimental alteration of the environment to influence problem behavior occurrence; instead, direct observation yields correlations between problem behavior and events occurring naturally in the environment (Pence, Roscoe, Bourret, & Ahearn, 2009). Functional analysis adopts an experimental approach, in which the environment is altered to influence the occurrence of problem behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994; Neidert, Dozier, Iwata, & Hafen, 2010). Problem behavior is measured under highly controlled conditions during which reinforcement contingencies are manipulated in order to identify the variables that maintain problem behavior (Neidert, Rooker, Bayles, & Miller, 2013). Although conditions are individualized to the client, the manipulation of consequences commonly involves *attention* (verbal and light physical contact), *escape* (removal of task

materials), *tangible* (brief access to a preferred item), and *alone* (austere environment, no consequences provided) conditions (Iwata et al., 1994). The results obtained from functional analyses provide a direct cause and effect relation between problem behavior and sources of reinforcement, which is not possible with indirect or descriptive assessments. Therefore, functional analysis has become the standard for the identification of and subsequent development of function-based interventions to address the occurrence of problem behavior (Iwata & Dozier, 2008; Neidert et al., 2013). Given the important information that this method yields, it would be important to evaluate how individuals can be trained to implement functional analysis procedures with high fidelity.

Ten studies used rehearsal within a training package to teach participants how to implement functional analysis conditions. There was wide variation in the ways in which rehearsal was implemented across the 10 studies including the number of rehearsal opportunities presented, the use of a mastery criterion during rehearsal, and the individual with whom participants rehearsed. Even within this latter category, the procedures differed across studies. A particularly relevant procedural variation involves the degree to which the behavior of fellow staff members, clients, other trainees, or trained confederates was scripted or controlled during rehearsal. When behavior is not scripted, the number and type of rehearsal opportunities remains variable within and across participants. Although ecological validity may be higher in these situations, experimental control is compromised. To address this issue, researchers may adopt scripts or otherwise control the number and types of behavior emitted by fellow staff members, clients, other trainees, or trained confederates during rehearsal.

Training functional analysis skills using rehearsal with clients/trainees whose problem behavior is not scripted and/or not controlled by the researcher. Two studies incorporated

rehearsal with actual clients or other trainees during training and did not require them to follow a script specifying the topography of behavior to emit during rehearsal or when to emit it (Erbas et al., 2006; Wallace et al., 2004). Wallace et al. (2004) used a multiple baseline across participants design to evaluate a workshop training on functional analysis fidelity. During the workshop, participants (two teachers and a psychologist) received written information describing the attention, escape, and play conditions, viewed video exemplars of each condition, rehearsed the condition with other workshop attendees, and received feedback about performance from the experimenters. Feedback and rehearsal continued until participants implemented the conditions with at least 90% accuracy. After the workshop, all participants implemented the conditions with high fidelity. One participant even maintained high fidelity during a generalization probe in the participants' classroom with an actual student. However, it is unclear how many times rehearsal was implemented before mastery criterion was met. In another example, Erbas et al. (2006) used a multicomponent training package to train the play, tangible, escape, and attention functional analysis conditions. Participants (six educators) rehearsed each functional analysis condition with a client, reviewed video footage of the sessions, and received feedback about their performance from the experimenters. The authors did not indicate how many rehearsals were implemented or if a mastery criterion was used during training. Functional analysis fidelity increased following training. In addition, participant acceptability of the training techniques was high. Although both studies documented improvements in fidelity post-training, the lack of details about workshop attendee and client behavior during rehearsal decreases the replicability of the procedures. Moreover, failing to ensure that participants practiced the full range of functional analysis procedures within and across rehearsal opportunities may result in participant fidelity errors later.

Training functional analysis skills using rehearsal with confederates whose problem behavior is scripted and/or controlled by the researcher. To enhance experimental control, many researchers use confederates who follow scripted sequences during training. Doing so allows the researcher to ensure that participants practice all of the relevant functional analysis procedures. In eight studies, authors indicated the use of scripts during rehearsals to control for the number of instances of behavior emitted by the confederate; however, only four of the eight studies included specific details about the frequency and/or timing of the behaviors emitted by the confederate. Two of these studies used rehearsal within a peer-training approach (e.g., a supervisor teaches a staff member how to implement a procedure and, subsequently, that staff member trains several staff to implement the same procedure). One of the peer-training studies adopted a nonconcurrent multiple baseline across participants design (Lambert et al., 2013) and the other used a concurrent multiple baseline across participants design (Pence et al., 2013). Both studies included scripted rehearsal with a confederate and performance feedback. Scripted rehearsal for Pence et al. (2013) consisted of 10 instances of the target problem behavior, five instances of appropriate behavior, and five instances of non-targeted problem behavior. Although Lambert et al. (2013) reported using scripts during rehearsal, they do not specify the types and number of behaviors presented. Rehearsal and feedback for both studies continued until participants met a mastery criterion. Participants in Lambert et al. (2013) were required to meet a mastery criterion of 100% for each functional analysis condition; however, it is unclear how many times rehearsal with feedback was repeated before participants met criterion. Participants in Pence et al. (2013) met a mastery criterion of 90% or higher one time for each condition after one to two rehearsals with feedback. Results for both studies indicated the peer-training approaches were effective at improving performance. Half of the participants for Pence

et al. (2013) were able to maintain high fidelity when implementing the functional analysis conditions in a classroom setting. Although these studies demonstrated peer training can be used to train functional analysis methodology, this method is not often used.

In addition to the two studies incorporating peer training, six studies incorporated rehearsal to train participants to implement functional analysis conditions. In a multiple baseline across participants design, Iwata et al. (2000) and Philips and Mudford (2008) used similar procedures involving undergraduate students and residential-care staff, respectively, as participants. Participants rehearsed functional analysis conditions with a confederate who followed a scripted behavioral sequence during training. The scripts used during rehearsal for both studies consisted of 15 instances of the target problem behavior, three instances of appropriate behavior, and two instances of non-targeted problem behavior. For both studies, rehearsal and feedback (in the form of reviewing video footage) continued until participants met a mastery criterion of 95% for each condition. Participants in Philips and Mudford (2008) met the mastery criterion within three to five rehearsal and feedback sessions. It is unclear from the data provided in Iwata et al. (2000) how many times rehearsal and feedback continued until criterion was met. Participants across both studies were successfully able to implement functional analysis conditions above baseline performances. Moreover, one of the participants in Philip and Mudford (2008) was able to generalize the skills and correctly implemented the conditions for a different topography of problem behavior.

Moore et al. (2002) sought to extend the findings of Iwata et al. (2000) and used a multiple baseline across participants (i.e., three teachers) design to evaluate the effects of training on the implementation of attention and escape conditions. Training consisted of written instruction, modeling, rehearsal, and feedback. During rehearsal, a confederate followed a

scripted series of behaviors for each condition. Although the authors indicated scripts contained the same frequency of target problem behavior and other non-targeted behavior, they did not describe the exact numbers of behaviors presented during rehearsal. It is also unclear if participants were required to rehearse the procedure a pre-specified frequency or until criterion was met. The results suggested training effectively improved fidelity, which remained high during classroom probes. As noted previously, these findings are promising; however, a lack of sufficient detail for implementing the rehearsal component makes it difficult to replicate the training methodology.

In a nonconcurrent multiple baseline design, McKenney et al. (2013) evaluated the effects of training using rehearsal on functional analysis implementation of three middle school teachers. Training consisted of a PowerPoint® presentation, discussion of key concepts and operational definitions, modeling, rehearsal with a confederate, and feedback. The confederate rehearsing with the participant was instructed to present appropriate and inappropriate behavior at least three times per minute and present each target problem behavior and appropriate behavior at least once per session. Although instructed to follow these guidelines, it is not clear if confederates were given specific scripts for each condition. Rehearsal and feedback continued until participants were able to implement each of four conditions at least twice with at least 80% accuracy, which was met after two to three rehearsal and feedback sessions. After training, participants were then observed in their classrooms as they implemented a functional analysis with a student, who was identified prior to the study to engage in disruptive behavior. The results indicated all participants showed improvements after training; however, only two of the participants were able to maintain high fidelity during classroom functional analysis sessions. In addition, all participants agreed that the training program was an acceptable way to train teachers

how to implement these procedures. Although improvements were observed across all participants, two participants had high fidelity during baseline sessions for at least one of the conditions. This finding impacts the degree to which the authors can claim that training was responsible for the improvements in fidelity.

In a multiple baseline across participants design, Kunnavatana, Bloom, Samaha, and Dayton (2013) evaluated the effects of a training program, consisting of an opportunity to practice, on the fidelity with which four participants (teachers) implemented trial-based functional analyses. Training included didactic instruction, which consisted of reviewing behavioral principles and functional analysis procedures, video models of the implementation of trial-based functional analyses, and how to collect, graph, and interpret data. Participants also practiced conducting trial-based functional analyses in small groups with a trained confederate who followed a script, following training, and in situ with students in their classrooms. First, each participant practiced the trial types (attention, escape, tangible, alone) during a breakout session in small groups. If participants made errors, the trained confederate stopped the trial and provided feedback. It is unclear if participants practiced each trial type more than once. Next, participants practiced trial types during analog post-training sessions where feedback was only provided at the end of a trial. Another practice opportunity was provided if participants did not implement the trial type with 100% fidelity. Finally, participants implemented the trial types in situ with students in their classroom. Feedback and additional sessions continued until participants implemented the trial types with 100% accuracy. The results indicated all participants showed improvements after training. Some participants required feedback to maintain these skills during the in situ follow-up sessions.

Ward-Horner and Sturmey (2012) used an alternating treatments design to conduct a component analysis of BST and evaluated the effects of individual and combined BST procedures on the fidelity with which three direct-care staff implemented four functional analysis conditions. In the baseline phase, the participants were given written instructions and a quiz on the content of the instructions. Performance was low for all three participants across the four conditions. In the first phase of the component analysis, individual BST procedures (instruction, modeling, rehearsal, and feedback) were each assigned to a functional analysis condition and were counterbalanced across participants and conditions. Participants were trained to implement a functional analysis procedure using the training procedure assigned to that condition. For example, if rehearsal was assigned to the attention condition, a participant was trained to implement the attention condition of the functional analysis with rehearsal only. During rehearsal sessions, confederates followed a scripted sequence of behaviors, similar to those described in Iwata et al. (2000) and Philips and Mudford (2008). Twenty instances of behavior were presented during each rehearsal session. The results of this phase of the study showed that feedback alone produced the greatest increases in fidelity relative to baseline and all three participants met the mastery criterion of 90% or higher across two consecutive sessions. Rehearsal alone did not have any substantial or appreciable effects on performance. The effects of modeling were not as robust as and were more inconsistent than the effects of feedback. In the next phase, training procedures were combined, but not all possible pair combinations were evaluated. Rehearsal and feedback were each paired with modeling, but rehearsal and feedback were never paired together in this phase. The results of this phase showed that rehearsal and modeling was not enough to produce mastery level performance for any of the participants. The only participant exposed to modeling and feedback met mastery criterion in the phase. An

additional phase of training was implemented for any functional analysis conditions in which mastery criterion was not met during the two previous training phases. In this phase, modeling, rehearsal, and feedback were implemented until the participants reached mastery criterion. Two participants experienced all three training components for one condition each and were able to meet mastery criterion during this phase. Based on these data, the authors concluded that feedback is a sufficient component of BST; whereas, rehearsal is neither a necessary nor sufficient component of BST. Although fidelity during the rehearsal condition was low, several limitations weaken the authors' claims. First, practice in the form of rehearsal as the *only* training technique is unlikely to improve performance. Participants were essentially asked to practice an untrained procedure. Next, all possible combinations of training were not evaluated in the second phase of the study. Specifically, rehearsal and feedback were never combined and evaluated, which does not reflect the way in which rehearsal is implemented in research and quite possibly in practice. Both of these limitations decrease the external validity of the study's findings. Thus, an important area of research is to conduct a parametric analysis of rehearsal on the fidelity with which functional analysis procedures are implemented.

Conclusion, Purpose, and Aims

Forty studies used rehearsal to train staff various procedures within educational and clinical settings. Appendix A lists each study alphabetically and includes brief procedural descriptions and results. These studies met a literature search criterion that included (1) using rehearsal within training, (2) training staff members within educational or clinical settings, and (3) training behavior analytic procedures. Appendix B provides a visual display of the identification, screening, eligibility, and inclusion process of the studies selected for review. Of the 40 studies, six evaluated training of general teaching and/or behavior management strategies

(e.g., prompting, reinforcement, providing feedback, data analysis; Matthews & Hagopian, 2014; McKnight & Kearney, 2001; Palmen et al. 2010; Parsons & Reid, 1995; Schepis et al., 2001; Ward et al., 1998), three evaluated training on fidelity of function-based or other types of behavioral protocols (DiGennaro et al. 2005; DiGennaro et al., 2007; Sterling-Turner et al., 2001), two studies evaluated training on multiple skills within the same training program (e.g., pivotal response training, incidental teaching, stimulus preference assessments; Hall et al., 2010; Lerman et al., 2004), one study trained participants to use behavior rating scales (Chafouleas et al, 2012); five studies evaluated training on the use of functional communication training (Gianoumis et al., 2012; Madzharova et al., 2012; Nigro-Bruzzi & Sturmey, 2010; Rosales et al., 2009; Wood et al., 2007), 10 evaluated the effects of training on the implementation of discrete-trial training (Arnal et al., 2007; Bolton & Mayer, 2008; Dib & Sturmey, 2007; Downs, Conley Downs, & Rau, 2008; Fazzio et al., 2009; McBride & Schwartz, 2003; Nosik et al., 2013; Sarokoff & Sturmey, 2004; Sarokoff & Sturmey, 2008; Severtson & Carr, 2012), three studies taught participants how to implement stimulus preference assessments (Bishop & Kenzer, 2012; Lavie & Sturmey, 2002; Roscoe & Fisher, 2008), and 10 studies evaluated the effects of training on the fidelity with which participants implemented functional analysis conditions (Erbas et al., 2006; Iwata et al., 2000; Kunnavatana et al., 2013; Lambert et al., 2013; McKenney et al., 2013; Moore et al., 2002; Pence et al., 2013; Phillips & Mudford, 2008; Wallace et al., 2004; Ward-Horner & Sturmey, 2012).

The number of rehearsal opportunities programmed or experienced varied across the 40 studies. Three studies used a mastery criterion *and* programmed a specific number of rehearsals during training. Twenty-eight studies used only a mastery criterion during training and 14 of these described the number of rehearsals required of participants to meet the mastery criterion.

Six studies programmed, *a priori*, a specific number of rehearsals during training. Thus, there was wide variability in the ways in which researchers adopted rehearsal within their training procedures.

Chafouleas, Kilgus, Riley-Tillman, Jaffery, and Harrison (2012) describe the only study, to date, that experimentally evaluated the effects of the number of rehearsal opportunities on skill acquisition. They evaluated a training package on the accuracy of raters using Direct Behavior Ratings, a functional assessment procedure that combines direct observation methods and the format of a behavior rating scale (Chafouleas, Christ, Rile-Tillman, Briesch, & Chanese, 2007). In a group design, 177 undergraduate participants received one of six training packages that varied along two dimensions: training style and rehearsal number. Three training styles (standard training, frame-of-reference training, or frame-of-reference with rater error training) were each assigned to either three or six opportunities to rehearse rating video clips. The video clips depicted contrived and actual footage of disruptive behavior and academic engagement in classrooms. Training generally consisted of written instructions, modeling, rehearsal, and feedback and varied slightly depending on the training package. The standard training condition consisted of written and didactic instruction, modeling, rehearsal, and feedback. Rehearsal in this condition consisted of watching and rating a novel video clip and reviewing the correct rating with the experimenter. Participants in the frame-of-reference training group received written and didactic instruction, modeling (discussion of salient behaviors important for assessment), rehearsal, and feedback. Rehearsal during this training package consisted of viewing and rating video clips and creating and discussing rationales for these ratings. The frame-of-reference with rater error training package used similar components as the frame-of-reference training, but also included additional discussions about common rater biases and

examples of raters committing each type of bias. The rehearsal and feedback components were consistent with those used during the frame-of-reference training. The researchers did not adopt a mastery criterion during rehearsal because the participants were assigned to either three or six rehearsal conditions. The results suggested that participants who were exposed to the most comprehensive training package (frame-of-reference with rater error training) and experienced the highest number of possible rehearsal opportunities (six) did not consistently outperform those exposed to standard training with only three rehearsal opportunities. Given the myriad rehearsal opportunities used in staff training research and the limitations of Ward-Horner and Sturmey (2012) who evaluated the effects of rehearsal without feedback, additional research is warranted. It would be worthwhile to document the differential effects of the number of rehearsal opportunities on fidelity in a way that better approximates the use of rehearsal in applied settings; that is, by incorporating feedback after rehearsal.

The current studies had several aims to address the limitations of and gaps in existing research. Study 1 was a pilot evaluation of the effects of a parametric analysis of rehearsal opportunities on participant fidelity of three functional analysis conditions. One, three, and 10 rehearsals were evaluated. Study 1 also assessed maintenance of participant fidelity and social validity. Study 2 evaluated the effects of a parametric analysis of rehearsal opportunities within a BST package on participant functional analysis fidelity. The BST package consisted of instructions, video modeling, rehearsal, and feedback. Maintenance of participant fidelity and social validity data were also assessed.

Study 1

Method

Participants

Three undergraduate students were recruited from applied behavioral science courses to participate in the study. Participants had the opportunity to earn 0.5% extra credit for each hour they completed of research, up to 3.5%. Extra credit throughout the study was based on the number of sessions completed by the participant and not based on performance.

Three participants (Amelia, Brynn, and Carrigan) completed the pilot study. All three were females with an average age of 20 years (range, 19 to 22 years). None of the participants reported having a disability or being familiar with functional analysis methodology prior to participating in the study.

Setting and Materials

All research activities took take place in a group training room measuring 4.78 m x 5.74 m. The room contained two elongated tables, chairs, and a video camera. The tables were arranged parallel to each other with 2.13 m of space between them. Each table had two chairs positioned behind it and a third positioned on the left side of the table. The camera was positioned in either corner of the room in order to capture the research activities taking place at either one of the elongated tables. See Appendix C for an aerial layout of the setting.

Participants were given written procedural instructions adapted from Iwata et al. (2000) for each functional analysis condition (Appendix D). In addition, condition-correlated stimuli were used for each functional analysis condition. That is, each functional analysis condition was associated with a red, purple, or yellow box of materials, which was located in the center of each table. The colors were counterbalanced across functional analysis conditions and participants. The three boxes contained identical materials that differed only in terms of color. Materials included appropriate and inappropriate items for the functional analysis conditions. Contents included a packet of addition and subtraction math worksheets, several blank sheets of colored

paper (red, purple, or yellow), a four-count box of crayons, a pencil (red, purple, or yellow), a stack of toy dollar bills, a small container of Play-Doh® (red, purple, or yellow), a science magazine, and a harmonica. Participants received a description of a client that described the client's skills, target behaviors, and preferences and provided informal guidance on what materials were inappropriate versus appropriate to use with the client (Appendix E). A stopwatch (Learning Resources Simple Stopwatch [LER0808]) was given to participants at the start of each experimental session and rehearsal. In addition, the confederate client (herein, "client") used headphones connected to an eight gigabyte iPod Touch®. The iPod Touch delivered audio statements to prompt the client to engage in particular topographies of behavior at specific times.

Dependent Variables and Data Analysis

Procedural fidelity. The primary dependent variable was the fidelity with which participants implemented three functional analysis conditions with a client. Fidelity was assessed during 5-min experimental sessions scheduled during 60-min laboratory visits, two to three times weekly. An example task analysis (datasheet) of the escape, attention, and tangible conditions are provided in Appendices F, G, H, respectively. These task analyses were informed by procedures described in Iwata et al. (2000). Procedural fidelity was calculated by dividing the number of steps implemented correctly (based on the condition's task analysis) by the total number of possible steps, and multiplying by 100.

Error analysis. An analysis of the errors made by participants was conducted for each functional analysis condition. An error of omission was scored when the participant failed to implement a step of the task analysis correctly. An error of commission was scored when the participant implemented a task analysis step out of order or added a step not described by the

task analysis. The percentage of omission and commission errors out of all errors was calculated for each functional analysis condition. The number of omission errors made throughout the study in each condition was divided by the total number of errors made during each condition, and multiplied by 100. The percentage of commission errors was calculated similarly to the percentage of errors of omission, such that the number of errors of commission (made within a condition) was divided by the total number of errors for that condition, and multiplied by 100.

Efficiency analysis. An efficiency analysis was conducted to identify the most efficient rehearsal condition. This was accomplished by calculating the cumulative number of seconds each participant spent in rehearsal and feedback. The cumulative number of rehearsal opportunities until criterion was met was also calculated. These totals are displayed graphically as a cumulative record and in tabular format.

Knowledge assessment. Participants completed a nine-item knowledge assessment that covered key components of each functional analysis condition (Appendix I). The knowledge assessment contained three multiple-choice questions about each functional analysis condition. Participants had as much time as needed to answer the questions, but did not have access to any of the study materials while completing the assessment. Knowledge assessment scores were calculated by dividing the number of items answered correctly by the total number of items, and multiplying by 100.

Training acceptability. At the conclusion of the study, participants completed a 20-item training survey (Appendix J). The survey asked participants to rate the acceptability of the various training procedures on 18 of the 20 items using a six-point Likert-type scale (1 = *strong disagreement*, 6 = *strong agreement)*. For one item, participants indicated the conditions that were the easiest and most difficult to implement. On another item, participants identified a

specific number of rehearsals that would be most effective for helping educators implement functional analysis conditions. The final survey item included an open-ended response for participants to provide comments.

Experimental Design and Procedures

Experimental sessions. During the experimental sessions, participants were asked to implement 5-min functional analysis conditions with a client. Three to nine sessions were implemented during each visit to the laboratory. Functional analysis conditions were informed by and adapted from Iwata et al. (1982/1994) and Iwata et al. (1994). Procedures for each functional analysis condition contained eight steps (See Table 1). During the attention condition, participants provided the client with access to preferred leisure activities and pretended to work (i.e., sat in a different chair other than right beside the client) while the client played with the activities. If the client engaged in the target problem behavior, the participant provided brief attention by walking over to the client, briefly touching the client's arm or back, and providing a disapproving statement (e.g., "Don't do that, you'll hurt yourself."). After the participant provided attention to the client, he or she returned to a work activity and only provided attention when the target problem behavior occurred again. All other appropriate and inappropriate behavior was ignored. During the escape condition, the participant provided the client with an academic activity to complete and delivered instructions on a fixed time 15-s schedule unless the target problem behavior occurred. Praise was provided for compliance with instructions and all other behavior was ignored. Occurrences of the target problem behavior resulted in the removal of task materials and the participant turned away from the client for 15 s. During the tangible condition, any occurrence of the target problem behavior resulted in 5-s access to a preferred

activity. The participant then removed access while saying, "It's my turn." All other behavior was ignored.

To prevent or reduce the effects of extraneous variables on fidelity, the order of the conditions was pseudo-randomized. The sequence of the functional analysis conditions was determined *a priori* by a random number generator (http://www.random.org), constrained to ensure the same condition was not implemented consecutively. At the start of each condition, the experimenter stated, "Next you will implement the [attention, escape, tangible] condition. You can use the materials in the box and use the stopwatch to keep time."

During the functional analysis conditions, the client engaged in simple play and academic activities and emitted target and non-target problem behavior. The client's behavior was prompted by audio scripts from headphones connected to an iPod Touch®. The scripts were recorded using the *voice memos* application, which is a factory-installed application. Three versions of the scripts were used for each functional analysis condition during experimental sessions. The sequence and the temporal occurrence of client behaviors varied for each script. The scripts were presented in a pseudo-random order to reduce the likelihood participants would memorize the order in which the client engaged in behavior within a session. The order of the scripts was determined using a random number generator (http://www.random.org) and the same script for a given condition was not used more than two times consecutively. See Appendix K for an example of scripted sequences for the experimental sessions.

The target problem behavior was self-slapping, defined as the client's open hand striking another part of her body with an audible sound. Fifteen instances of self-slapping occurred during each experimental session. Non-target problem was self-pinching, defined as the client using her index finger and thumb to squeeze skin on the arm. Two instances of self-pinching

occurred during each experimental session. The client also engaged in two instances of appropriate play during the attention and tangible condition and two instances of compliance with instructions during the escape condition. During all three conditions, the client also emitted one social initiation. Three scripts were created based on the procedures described in Iwata et al. (2000).

Experimental design. A multi-element design was used to evaluate the effects of rehearsal on the procedural fidelity of three functional analysis conditions (attention, escape, and tangible). The analysis consisted of four phases: (a) instructions, (b) rehearsal analysis, (c) cumulative analysis, and (d) follow-up.

Instructions. The purpose of this phase was to assess the effects of written instructions on participant fidelity. Participants reviewed procedural instructions, adapted from Iwata et al. (2000), of each of the functional analysis conditions before the first session in this phase (Appendix D). Next, participants completed the knowledge assessment (Appendix I). Participants did not receive feedback about their performance on the knowledge assessment (i.e., positive feedback was not be provided for correct answers, incorrect answers were not reviewed or corrected). Participants then reviewed a client description that specified and defined the target and non-target problem behaviors (e.g., self-slapping and self-pinching, respectively). In addition, the description specified the client's skill repertoire, preferred leisure activities, non-preferred activities, and appropriate work activities. See Appendix E for the client description.

After reviewing the client description, participants implemented functional analysis conditions during 5-min experimental sessions with the client. During this phase, participants were asked to implement each functional analysis condition at least once; however, the number of sessions was determined *a priori* so participants were not exposed to and continued to practice

errors in baseline for extended periods of time (Pence et al., 2013). The box of materials was placed in the center of the table and participants had the opportunity to select materials for the condition they were asked to implement.

Rehearsal analysis. The purpose of this phase was to evaluate the effects of the number of rehearsal opportunities on functional analysis fidelity. Following the instructions phase, participants had the opportunity to briefly rehearse each condition with the client and receive feedback from the experimenter. Functional analysis conditions were randomly assigned to a rehearsal analysis condition (one, three, or 10 practice opportunities), which was counterbalanced across participants.

Rehearsal took place in the same room as the experimental sessions, but at a different table. Each rehearsal opportunity consisted of a 1-min practice followed by feedback on performance. During rehearsal, the box of materials was placed on the table and the participant had the opportunity to select materials in order to implement the given condition. The client emitted each behavior (i.e., self-slapping, self-pinching, appropriate behavior, social initiations) two times according to a brief audio script while the participant implemented the relevant condition (See Appendix L for rehearsal scripts). Two versions of the scripts were created for each functional analysis condition, which was pseudo-randomized in order to prevent or reduce the effects of extraneous variables on fidelity. A random number generator (http://www.random.org) was used to determine the order in which the scripts were used *a priori* and scripts for any condition were not used twice consecutively. The sequence and temporal occurrence of client behaviors varied for each script. Following a 1-min rehearsal, the experimenter provided positive feedback to the participant for steps implemented correctly and corrective feedback for steps omitted or implemented incorrectly. The feedback consisted of an

estimate of the number of steps that were implemented correctly during rehearsal (i.e., zero, less than half, half, more than half, 100%) and how to improve performance for steps implemented incorrectly (See Appendix M for the feedback datasheet). Rehearsal and feedback continued until participants had conducted the specified number of rehearsal opportunities for that condition. For example, a participant rehearsed a procedure for 1 min and received feedback about performance 10 consecutive times during the condition containing 10 rehearsals. Following completion of the required number of rehearsals, experimental sessions continued as described in the instructions phase until participants met the criterion for mastery, set at two consecutive sessions with 100% fidelity, or until data were stable. The experimenter did not provide feedback about performance during or after experimental sessions.

Cumulative analysis. The purpose of this phase was to further evaluate the number of rehearsals necessary to reach mastery criterion. If participants did not meet the mastery criterion in the rehearsal analysis phase, participants had the opportunity to complete one rehearsal with feedback before each experimental session until they met the criterion of two consecutive sessions with 100% fidelity. Rehearsal was not provided for conditions that met mastery criterion in the previous or current phase unless fidelity decreased below 100%. If fidelity decreased below 100%, one rehearsal opportunity with feedback was provided before experimental sessions until criterion was again met. Experimental sessions in this phase continued until participants met mastery criterion for all three conditions.

Follow-up. The purpose of this phase was to evaluate participants' maintenance of skills. At least two weeks after the completion of the cumulative analysis phase, one experimental session for each functional analysis condition was conducted with each participant. During

follow-up sessions, participants implemented each 5-min functional analysis condition with the client in a random sequence. They then completed a training acceptability survey.

Interobserver Agreement and Procedural Fidelity

Two independent observers recorded data for at least 30% of sessions for each phase and participant to assess interobserver agreement (IOA). An agreement was scored when both observers recorded a participant's implementation of a task analysis step similarly (as either correct or incorrect). IOA was calculated using an adaptation of the trial-by-trial method, in which the sum of agreements was divided by the total number of agreements and disagreements, and multiplied by 100. IOA across all three participants was high for all conditions and phases and averaged 99.5%, 95.6%, and 94.9% (range, 87% to 100%) for the attention, tangible, and escape conditions, respectively.

An independent observer also collected procedural fidelity data for both the client and the experimenter. During a minimum of 30% of sessions in each phase, procedural fidelity was calculated for the client by summing the number of correct topographies of behaviors emitted at the correct time (in the correct order), based on the script, divided by the total number of behaviors, and multiplied by 100. Client fidelity was high during experimental sessions (M = 99.8%) and rehearsals (M = 100%). Procedural fidelity of the experimental procedures was assessed in two ways. First, during a minimum of 30% of rehearsal opportunities, the fidelity of two experimenter behaviors was measured: (1) accurate delivery of the quantitative feedback statement and (2) accurate delivery of corrective feedback (i.e., accurately specifying the missed or incorrectly implemented steps). Second, procedural fidelity of experimenter behavior was assessed for at least 30% of experimental sessions in each phase. Correct implementation included the completion of the five preparation steps on each checklist (e.g., ensuring three

chairs are positioned at each table, verifying the functional analysis boxes contain the correct materials), delivering the scripted statements about the order of events during that phase, following the sequence in which conditions were run, and/or not providing feedback after experimental sessions. See Appendix N for example checklists. Fidelity was calculated by dividing the number of steps implemented correctly, by the total number of steps, and multiplied by 100. Experimenter fidelity across phases averaged 100% and 96% during experimental sessions and rehearsals, respectively.

Results and Discussion

Fidelity and Knowledge Assessment

Figures 1 through 6 depict performances (fidelity and error analyses) for the three participants in Study 1.

Amelia. Amelia obtained 67% correct on the knowledge assessment. Her fidelity during the instructions probes was low for all three functional analysis conditions (Figure 1). After one rehearsal opportunity during the rehearsal analysis phase, Amelia's fidelity of the tangible condition increased only slightly and averaged 23.8% for this phase. After three rehearsals, her fidelity of the escape condition increased to 88% initially, but rapidly decreased and maintained at 10% for three consecutive sessions. Amelia's fidelity increased to 100% after experiencing 10 rehearsal opportunities for the attention condition; however, after two sessions her fidelity decreased to a mean of 6% for the remaining three sessions in this phase. Interestingly, after implementing the second experimental session for the attention condition with high fidelity, Amelia indicated she confused the three procedures (even though her fidelity for the first experimental sessions did not suggest she had). She then began to implement the attention condition as if it was the tangible condition, the tangible condition as if it was the escape

condition, and the escape condition as if it was the attention condition for the remainder of the rehearsal analysis phase. After Amelia's performance stabilized in this phase, single rehearsal opportunities were provided before each experimental session until all three conditions met criterion (100% correct implementation across two consecutive sessions) in the cumulative analysis phase. Clear and immediate changes in fidelity were observed after only one rehearsal for each condition. By the conclusion of the study, Amelia met criterion after six total rehearsals for the tangible condition, seven total rehearsals for the escape condition, and 12 total rehearsals for the attention condition. Performance remained high for all conditions at a two-week follow-up session.

Data from the error analysis are presented in Figure 2 and indicate a large majority of Amelia's errors involved omission errors. She made 69%, 71%, and 96% errors of omission for the tangible, escape, and attention conditions, respectively.

Brynn. Brynn obtained 44% correct on the knowledge assessment. Her fidelity during the instructions phase was low for all three functional analysis conditions (Figure 3). After one rehearsal opportunity, Brynn's fidelity of the attention condition increased only slightly and averaged 14.6% for this phase. After three rehearsals, her fidelity of the tangible condition increased to 97% for two consecutive sessions initially, but rapidly decreased and averaged 9% during the last three sessions. Brynn's fidelity increased to 73% after experiencing 10 rehearsal opportunities for the escape condition; however, her fidelity immediately decreased and remained at 17% across three consecutive sessions in this phase. After Brynn's fidelity stabilized in the rehearsal analysis phase, single rehearsal opportunities were provided before each experimental session until all three conditions met criterion in the cumulative analysis phase. Clear and immediate changes in fidelity were observed after only one rehearsal for each

condition; however, Brynn's fidelity for the tangible condition was not as high as the attention and escape conditions during the first experimental session. By the conclusion of the study, Brynn met criterion after three total rehearsals for the attention condition, seven total rehearsals for the tangible condition, and 17 total rehearsals for the escape condition. Fidelity remained high at a two-week follow-up session for the attention and tangible conditions; however, fidelity decreased to 79% during the escape condition.

Data from the error analysis are presented in Figure 3 and indicate a large majority of Brynn's errors involved omission errors. She made 92%, 85%, and 86% errors of omission for the attention, tangible, and escape conditions, respectively.

Carrigan. Carrigan obtained 56% correct on the knowledge assessment. Her fidelity during the instructions phase was low for all three functional analysis conditions, with an average of 17%, 9%, and 11% for the escape, attention, and tangible condition, respectively (Figure 5). After one rehearsal in the escape condition, Carrigan's fidelity showed a clear and immediate increase. Her performance continued to increase during this phase and stabilized at 89.8% fidelity during the last four sessions. After three rehearsals, her fidelity of the attention condition increased to 100% and remained stable for the remainder of the phase. Carrigan's fidelity increased to 95% after experiencing 10 rehearsal opportunities for the tangible condition. She maintained 100% fidelity across the last three sessions. Carrigan achieved criterion performance in the attention and tangible conditions during rehearsal analysis; as a result, single rehearsal opportunities were provided for the escape condition only during the cumulative analysis phase. After only two rehearsals in this phase, fidelity of the escape condition met mastery criterion. By the conclusion of the study, Carrigan met criterion after three total rehearsals for the attention and escape conditions and 10 total rehearsals for the tangible

condition. Fidelity remained high at a two-week follow-up session for the attention and tangible conditions; however, fidelity decreased to 60% during the escape condition. During this session, 15 of the 19 errors Carrigan made were because she did not turn away from the client after removing the materials when self-slapping occurred; Carrigan had not made this type of error since the instructions phase.

Data from Carrigan's error analysis are presented in Figure 6. The results show that a large majority of her errors involved omission errors. She made 97%, 97%, and 91% errors of omission in the escape, attention, and tangible condition, respectively.

Acceptability

The results from the training acceptability survey for the three participants are summarized in Table 2. Participants rated statements regarding the training techniques on a Likert-type scale (1 = *strong disagreement*, 6 = *strong agreement*). Participants disagreed with the statements that written instructions alone would be an acceptable way to help educators implement a functional analysis (M = 2.3) and they would suggest the use of written instruction alone for other educators (M = 2.3). They slightly disagreed written instructions alone would be effective in changing the accuracy with which educators implement a functional analysis (M = 3.0) and would be willing to use written instructions alone in the future (M = 3.0). Overall, participants indicated high agreement with the use of role-play during training. They reported role-play was an acceptable way to help educators implement a functional analysis (M = 5.0) and would be effective in changing the accuracy with which educators implement a functional analysis (M = 5.3). Participants also indicated they would suggest the use of role-play with other educators (M = 5.3) and would be willing to use role-play in the future (M = 5.3). Statements regarding the acceptability (M = 5.7), effectiveness (M = 5.7), and participants' willingness to

use rehearsal and feedback in the future (*M* = 5.7) were rated high, which indicates participants agreed with these statements. Participants also agreed they would suggest using rehearsal and feedback with other educators (*M* = 5.7). They agreed that one (*M* = 5.0), three (*M* = 5.3), and 10 (*M* = 5.3) rehearsal(s) and feedback were sufficient and necessary to implement the functional analysis condition well. Participants liked the overall training procedures (*M* = 5.7) and agreed the procedures would be beneficial for other educators (*M* = 5.7). When asked to indicate the number of rehearsals educators should have in order to implement functional analyses well, the average response was two rehearsals.

Efficiency Analysis

Figure 7 depicts the cumulative number of seconds the participants spent experiencing rehearsal plus feedback across rehearsal opportunities. The first data point in each condition includes the total time spent in rehearsal for the one, three, and 10 rehearsal conditions. Each subsequent data point represents a single rehearsal opportunity during the cumulative analysis. These data indicate the 10 rehearsal condition required the highest number of seconds in rehearsal and feedback to reach criterion, followed by the three rehearsal and one rehearsal conditions. Carrigan was the only participant whose data indicate a similar amount of time was required for two conditions (one rehearsal and three rehearsal conditions) to reach criterion performance. Visual inspection of this figure reveals a linear relation between the initial number of rehearsal opportunities (i.e., rehearsal condition) and the cumulative number of seconds required in rehearsal and feedback to reach mastery criterion. In addition, the total number of rehearsals required to reach criterion was the lowest for the one rehearsal condition, followed by the three and 10 rehearsal conditions.

The data in Figure 7 are supported by the results summarized in Table 3. The mean number of rehearsal opportunities required to meet criterion for conditions associated with one, three, and 10 rehearsals is 4, 5.7, and 13, respectively. All of the participants required additional rehearsals beyond the number prescribed in the rehearsal analysis condition, except for Carrigan (10 rehearsal condition). The mean amount of time spent in training to achieve criterion performance was 395.3 s, 686.7 s, and 1166 s for the conditions associated with one, three, and 10 rehearsals, respectively. These data suggest the one rehearsal condition required the fewest number of rehearsals (on average) to meet criterion and this criterion was met in a shorter duration than the other two conditions. Taken together, the one rehearsal condition was the most efficient for meeting criterion; however, participants required more than one rehearsal to achieve criterion performance ($M = 4$). Compared to this condition, the 10 rehearsal condition required almost triple the amount of time and the number of rehearsals to meet criterion; thus, it was the least efficient condition.

The results of this study demonstrate performance for all three participants immediately improved when the initial rehearsal(s) with feedback were introduced; however, this performance was not maintained for two of the participants (Amelia and Brynn). High performance was achieved and maintained; however, when additional rehearsal with feedback opportunities were provided. That is, rehearsal with feedback was more effective when implemented across time (i.e., distributed rehearsals) rather than combining several rehearsal with feedback opportunities (i.e., massed rehearsals [three or 10 rehearsal conditions]). Instructions and rehearsal (with feedback) were sufficient to produce criterion performance and promoted maintenance of the skill over time.

Limited conclusions can be made about the results of this pilot study, but several contributions are worthy of note. First, this study demonstrates rehearsal with feedback effectively increases fidelity, which addresses a major limitation in previous research (Ward-Horner & Sturmey, 2012). Next, participants successfully met criterion with relatively little training, suggesting the training procedures adopted were effective. Finally, participants rated the use of rehearsal with feedback as highly acceptable, suggesting these training components could be incorporated into training packages used within settings that more closely approximate real-world work environments, an area to explore for future research.

This study is not without its limitations. First, Amelia implemented additional experimental sessions in the cumulative analysis phase, despite having met criterion for all conditions at session 32. This was not the case for the other two participants. During the subsequent follow-up session, Amelia's performance was high across all conditions. It is unclear if the additional opportunities to implement the conditions, even without feedback, during the cumulative analysis phase were responsible for her performance during follow-up; however, it should be considered a contributing factor. Only allowing participants to implement conditions until criterion is met for all conditions can address this limitation in future studies. A second limitation of the study is the experimental design. Although the data show change when, and only when, rehearsal with feedback was introduced, embedding the multi-element design within a concurrent multiple baseline across participants design may more clearly, and more convincingly, demonstrate experimental control. Third, best practices (i.e., BST) were not used to train the functional analysis conditions. Several rehearsals with feedback were required for participants to meet criterion. This may indicate the training package was inefficient and resource (time) intensive. This limitation may be addressed by using a BST package to increase

the efficiency with which participants meet criterion. This may also help to promote sustained performance during follow-up sessions. The purpose of Study 2, then, was to evaluate the effects of a parametric analysis of rehearsal opportunities within a BST package consisting of instructions, video modeling, rehearsal, and feedback on participant fidelity of three functional analysis conditions. Maintenance of participant fidelity and social validity data were also assessed.

Study 2

Method

Participants

Eighteen undergraduate students were recruited to participate in Study 2. Participants earned 0.5% extra credit for each hour they completed of research, up to 4.0%. Extra credit was based on the number of sessions completed by the participants and was not based on their performance during sessions.

Seventeen females and one male participated in the study, with an average age of 19.6 years (range, 17 to 22 years). None of the participants reported having a disability and only five (Ingrid, Jubilee, Kambrosia, Sirolina, and Olive) indicated having knowledge of functional analyses. None of the participants implemented functional analysis procedures before the study.

Setting and Materials

The setting and materials were identical to those outlined for Study 1, with two additions. First, a 1-min video model was used to demonstrate correct implementation of each functional analysis condition. The video model was created by using a hand-held JVC GZ-E200BUS1080p HD Everio Digital Video Camera atop a tripod. The video models depicted behavior of a confederate client and a trained research assistant. Each video model contained two instances of all topographies of client behavior (self-slapping, self-pinching, appropriate play or compliance, and social initiations) and the correct participant behavior. On-screen text and narration did not

accompany the models. Participants viewed these models on a laptop computer. Second, Study 2 added four Likert-type questions to the training acceptability survey used in Study 1. These questions assessed participants' acceptability of the video models (see Appendix O).

Dependent Variables and Data collection

All dependent variables and data collection techniques were identical to Study 1.

Experimental Design and Procedures

Experimental Sessions. The experimental sessions were identical to those implemented in Study 1.

Experimental design. A multi-element design embedded within a multiple baseline across participants design was used to evaluate the effects of a parametric analysis of rehearsal opportunities within a BST package on the procedural fidelity of functional analysis conditions (attention, escape, and tangible). A concurrent multiple baseline design was used for 15 of 18 participants. The analysis consisted of five phases: (a) instructions; (b) video modeling; (c) rehearsal analysis; (d) cumulative analysis; and (d) follow-up.

Instructions. Procedures for this phase were identical to Study 1.

Video modeling. The purpose of this phase was to evaluate the effects of video modeling on functional analysis fidelity. At the start of this phase, participants viewed a 1-min video model of each functional analysis condition, in a random order using a random number generator (http://www.random.org). Immediately after viewing the models, participants implemented the conditions during 5-min experimental sessions with the client. No feedback was provided during or after these sessions.

Rehearsal analysis. This phase was identical to Study 1.

Cumulative analysis. This phase was identical to Study 1.

Follow-up. Procedures for this phase were identical to Study 1.

Interobserver Agreement (IOA) and Procedural Fidelity

IOA and procedural fidelity were calculated similar to Study 1. IOA across participants was high for all conditions and phases and averaged 98.8%, 97.1%, and 96.4% (range, 87% to 100%) for the attention, tangible, and escape conditions, respectively. Experimenter fidelity across phases averaged 98.7% and 99% during experimental sessions and rehearsals, respectively. Fidelity for the client averaged 99.5% and 99.6% during experimental sessions and rehearsals, respectively.

Results and Discussion

Fidelity

Figures 8 through 19 depict performances (fidelity and error analyses) for the eighteen participants. Each set of graphs represents a concurrent multiple baseline design, with one exception. The experimental design for Polly-Anna, Umera, and Trixie (Figure 18) was a nonconcurrent multiple baseline design.

Doris. Doris obtained 89% correct on the knowledge assessment. Figure 8 depicts her fidelity of the functional analysis conditions. Fidelity during the instructions probes was low for all three functional analysis conditions. During the video modeling phase, Doris' fidelity in the tangible condition showed an increase over baseline levels, but had a decreasing trend during the last three sessions in this phase, averaging 50.9%. Her fidelity showed a clear and immediate increase (with some variability) for the escape condition, which averaged 68.7%. During the attention condition, Doris met the mastery criterion (100% correct for two consecutive sessions). In the rehearsal analysis phase, undifferentiated performance occurred between all three conditions. After one rehearsal opportunity, Doris' fidelity of the tangible condition showed an immediate increase and met criterion. After three rehearsals, her fidelity of the escape condition

also met criterion. Because Doris met and maintained criterion for the attention condition in the video modeling phase, rehearsals were not implemented in the rehearsal analysis phase. Despite no additional training, Doris' fidelity for this condition remained 100%. By the conclusion of the study, Doris met criterion after viewing a 1-min video model for the attention condition and after one and three rehearsals for the tangible and escape conditions, respectively. Doris' fidelity during the follow-up session remained high for the attention condition, but decreased slightly for the tangible and escape conditions.

Data from the error analysis (Figure 9) indicate a majority of Doris' errors were errors of commission (69.7%). The most common error of commission for the tangible condition was giving and/or taking the materials away from the client at the wrong time (e.g., before self-slapping occurred, waiting longer than 5 s to take the item away). The most common error of commission for the escape condition was presenting the materials too soon (i.e., before 15 s had elapsed). Doris made slightly more errors of omission during the attention condition, the most common of which was not providing physical attention when self-slapping occurred and failing to return to a different work area. The most common error of commission was giving the client an item when self-slapping occurred.

Elsie. Elsie obtained 89% correct on the knowledge assessment. Figure 8 depicts her fidelity. During the instructions phase, her fidelity averaged 13.3%, 12.5%, and 41.8% for the tangible, escape, and attention condition, respectively. After the introduction of the video model in the next phase, Elsie's fidelity showed a clear and immediate change for all three conditions. In this phase, fidelity for the tangible condition averaged 60.7% and showed an increasing trend across the first four experimental sessions, but decreased slightly during the last experimental session. Fidelity during the escape condition showed a slight increasing trend across three

sessions; however, performance decreased during the last experimental session, averaging 76.6%. Criterion was met and maintained for the attention condition during this phase. In the rehearsal analysis phase, Elsie's performance showed differentiation between the attention condition and the other two conditions. After one rehearsal opportunity, Elsie's fidelity of the tangible condition showed a clear and immediate increase, but declined during the last two sessions of the phase, averaging 92.8%. After three rehearsals, her fidelity of the escape condition increased to 95.8%, but also decreased during the last sessions (M = 92.7%). Elsie's fidelity of the attention condition remained 100%; therefore, no rehearsals were implemented during this phase. In the cumulative analysis phase, single rehearsal opportunities were provided before each experimental session for the tangible and escape conditions until she met criterion. Improvements in fidelity were observed after only one rehearsal for the tangible and escape conditions, with criterion met in this phase after two and four rehearsals, respectively. Elsie's fidelity remained at criterion level for the attention condition in this phase. By the conclusion of the study, Elsie met criterion after viewing one video model for the attention condition, three total rehearsals for the tangible condition, and seven total rehearsals for the escape condition. During a two-week follow-up session, fidelity remained high across all three conditions.

Data from the error analysis (Figure 9) indicate a majority of Elsie's errors were errors of omission (68.5%). The most common error of omission for the tangible condition was failing to provide the materials to the client when self-slapping occurred. Elsie made more errors of commission than omission during this condition in which she allowed the client to have the item for too long before taking it away. The most common error of omission made during the escape condition was failing to provide an instruction when re-presenting materials to the client. During the attention condition, the most common error of omission was not walking over to the client

when self-slapping occurred and subsequently, not returning to a different chair (area) after providing attention.

Fran. Fran obtained 89% correct on the knowledge assessment. Figure 8 depicts her fidelity of the functional analysis conditions. Fidelity during the instructions phase showed little variability for the tangible condition (*M* = 13.4%). During the escape condition, fidelity averaged 39.8% and had a decreasing trend. Fran's fidelity of the attention condition showed little variability (*M* = 42.1%). After viewing the video models in the next phase, Fran's fidelity showed a clear and immediate increase across all three conditions. Fidelity during the tangible condition showed some variability, averaging 85.7%. During the escape condition, her performance was stable and averaged 84.5%. Despite initially reaching mastery criterion in this phase for the attention condition, Fran's fidelity decreased to baseline levels during the last three experimental sessions, averaging 65.4%. During the last three sessions, instead of moving to a different work area, as she had done previously, Fran moved her chair away from the client and did not walk over to her when the client engaged in the target behavior. Instead, Fran leaned over to provide attention. These changes in implementation accounted for all of the errors she made during the last three experimental sessions. In the rehearsal analysis phase, performance in the tangible and attention conditions were differentially higher than performance in the escape condition. After one rehearsal opportunity in the rehearsal analysis phase, Fran's fidelity of the tangible condition increased and maintained at 100% for the remainder of the phase. After three rehearsals, her fidelity of the escape condition increased slightly and had some variability (*M* = 90.8%). Fran's fidelity increased to 100% and maintained after experiencing 10 rehearsal opportunities for the attention condition. In the cumulative analysis phase, single (additional) rehearsal opportunities were provided before each experimental session until criterion was met.

During this phase, four additional rehearsals were required to meet mastery criterion for the escape condition. Additional rehearsals for the attention and tangible condition were not necessary because criterion performance was met and maintained during the previous phase. By the conclusion of the study, Fran met criterion after one rehearsal for the tangible condition, seven total rehearsals for the escape condition, and 10 rehearsals for the attention condition. During a two-week follow-up, Fran's fidelity was high across all three conditions.

Data from the error analysis (Figure 9) indicate a large majority of Fran's errors were errors of omission (83.8%). During the tangible condition, Fran made a similar percentage of errors of omission and commission. The most common error of omission was failing to provide the materials to the client when self-slapping occurred. The most common error of commission during this condition was allowing the client to have the item for too long before taking it away. The most common error of omission during the escape condition was failing to present task materials after 15 s had elapsed and subsequently failing to remove the materials when self-slapping occurred. During the attention condition, Fran did not walk over to the client when self-slapping occurred and subsequently, did not return to a different chair (area) after providing attention.

Gladessa. Gladessa obtained 33% correct on the knowledge assessment. Figure 10 depicts her fidelity. Fidelity during the instructions phase was low across all three conditions. After viewing the video models in the next phase, Gladessa's fidelity showed little to no change across the tangible (M = 8.8%), escape (M = 10.5%), and attention (M = 20.1%) conditions. After one rehearsal opportunity, Gladessa's fidelity of the tangible condition increased initially, but was not maintained, averaging 26.2%. After three rehearsals, her fidelity of the escape condition showed a similar pattern and averaged 44.7%. Her fidelity increased to 100% after 10

rehearsal opportunities for the attention condition; however, her performance was slightly variable and averaged 98%. Her fidelity in the attention condition was differentiated from her fidelity during the escape and tangible conditions. Single rehearsal opportunities were implemented in the cumulative analysis phase until criterion was met for all three conditions. The single rehearsals with feedback increased performance to criterion for all conditions; however, on two separate occasions, fidelity for the attention condition dropped below 100% after criterion had already been met. During these sessions, Gladessa stopped touching the client's arm/back while providing verbal attention and instead touched the client's chair during the last 30 s of both experimental sessions. Gladessa did not participate in additional rehearsals with feedback for the attention condition due to absences from research sessions. Additionally, an experimental session for the escape condition is not denoted on Figure 10. During this session, Gladessa communicated she had implemented the wrong condition immediately after completing the experimental session. Due to the errors during this session, Gladessa was given two additional rehearsals with feedback; however, criterion performance was maintained. Despite numerous absences, Gladessa was able to meet and maintain criterion after five rehearsals for the tangible condition, nine rehearsals for the escape condition, and 13 rehearsals for the attention condition. Her fidelity during a two-week follow-up was high across all three conditions. During the attention condition probe, Gladessa made the same error she made previously in which she stopped touching the client's arm while providing verbal attention. This occurred once during the second to last opportunity to respond.

Data from the error analysis (Figure 11) indicate Gladessa made slightly more errors of omission (56.6%) compared to errors of commission (44%). During the tangible condition, Gladessa made more errors of commission, in which she often provided attention while giving

the item to the client. During the escape condition, she made more errors of omission, in which she often failed to remove materials, turn away from the client, and re-present materials when self-slapping occurred. During the attention condition, Gladessa also made more errors of omission, in which she often did not provide physical attention (e.g., touching the client's arm) while providing verbal attention.

Humphrey. Humphrey obtained 44% correct on the knowledge assessment. Figure 10 depicts his fidelity of the functional analysis conditions. During the instructions phase, his fidelity was low across all three conditions, averaging 5.3%, 9.4%, and 5.7% for the tangible, escape, and attention conditions, respectively. After the introduction of the video model in the next phase, Humphrey's fidelity increased initially for the tangible and escape conditions, both of which had a decreasing trend toward the end of the phase and averaged 37% and 32.5%, respectively. Fidelity during the attention condition did not improve substantially above baseline levels; however, it was stable, averaging 12.7%. After one rehearsal opportunity, Humphrey's fidelity of the tangible condition showed a clear and immediate increase to 92.3%, but declined to an average of 36.9% during the last three experimental sessions in this phase. After three rehearsals, his fidelity of the escape condition increased to 85.1%, but had a decreasing trend during the sessions that followed, averaging 63.1%. After 10 rehearsals, Humphrey's fidelity of the attention condition increased to 100% and met criterion. Fidelity during the last three experimental sessions in this phase was differentiated across all three conditions. Additional rehearsal with feedback opportunities were provided for the tangible and escape conditions until criterion was met in the cumulative analysis phase. Criterion was met after two additional rehearsals for the tangible condition and five additional rehearsals for the escape condition. Humphrey's fidelity remained high for the attention condition in this phase. By the conclusion

of the study, Humphrey met criterion after three rehearsals for the tangible condition, eight total rehearsals for the escape condition, and 10 total rehearsals for the attention condition. Due to scheduling conflicts, Humphrey's follow-up session occurred three and a half weeks after he met the mastery criterion. His fidelity remained high across all three functional analysis conditions.

Data from the error analysis (Figure 11) indicate a majority of the Humphrey's errors were errors of omission (69.9%). Similar to Gladessa, the most common type of error during the tangible condition was one of commission, in which the item was already present before self-slapping occurred. The most common errors of omission during this condition were failing to take the item away from the client and/or failing to say "my turn" when the item was removed. During the escape condition, he often failed to turn away from the client and/or provide an instruction when re-presenting materials. During the attention condition, Humphrey's errors of omission included not touching the client's arm/back when providing attention (when self-slapping occurred) and not returning to a different work area.

Ingrid. Ingrid obtained 100% correct on the knowledge assessment. Figure 10 depicts her fidelity. During the instructions phase, fidelity during the tangible condition was slightly variable (M = 16%). Her fidelity of the escape and attention conditions showed little variability (M = 31.5% and 99.4%, respectively). Ingrid's fidelity during the attention condition is not representative of performance from other participants or performance described in the literature after exposure to instructions alone. Thus, Ingrid's performance during the attention condition may then be considered atypically high. After the introduction of the video model in the next phase, Ingrid's performance for the tangible condition showed a clear and immediate change; however, performance was variable across the last three experimental sessions and averaged 56.1% during this phase. During the escape condition, her performance was stable, but showed

little change from the previous phase (M = 42.4%). Ingrid's fidelity during the attention condition met criterion and she maintained across numerous sessions in this phase. Performance during the rehearsal analysis phase showed some differentiation across conditions. After one rehearsal, her fidelity of the tangible condition increased and met criterion during the last two experimental sessions. After three rehearsal opportunities, Ingrid's fidelity of the escape condition showed a clear and immediate increase to 95.6%, but declined to an average of 75% during the last experimental sessions in this phase. Criterion was met in the previous phase for the attention condition; therefore, rehearsals with feedback were not implemented. Although the first experimental session in this phase was not 100% for the attention condition, she met and maintained criterion performance during subsequent experimental sessions. Single rehearsal opportunities were provided before each experimental session for the escape condition only until criterion was met in the cumulative analysis phase, which occurred after four rehearsals. Ingrid's fidelity remained high for the tangible and attention conditions in this phase. By the conclusion of the study, Ingrid met criterion after viewing a video model for the attention condition, one rehearsal for the tangible condition, and seven total rehearsals for the escape condition. During a two-week follow-up session, fidelity remained high for the tangible and attention conditions; however, fidelity decreased slightly during the escape condition.

Data from the error analysis (Figure 11) indicate a majority of Ingrid's errors were errors of omission (60.6%). Similar to Gladessa and Humphrey, Ingrid made more errors of commission during the tangible condition, the most common of which was allowing the client to have the item for longer than 5 s before taking it away. The most common error of omission during this condition was failing to say "my turn" when taking the item away from the client. During the escape condition, Ingrid often failed to provide an instruction when re-presenting

materials to the client. During the attention condition, Ingrid did not make any errors of omission. In fact, Ingrid made only two errors (i.e., selecting incorrect materials) in this condition throughout the entire study.

Milly. Milly obtained 100% correct on the knowledge assessment. Figure 12 depicts her fidelity. During the instructions phase, Milly's fidelity was low across all three conditions. During the video modeling phase, Milly's fidelity during the escape condition showed a moderate increase and was stable by the end of the phase (M = 37.8%). Her fidelity for the attention condition showed a clear and immediate increase, but decreased slightly during the last session (M = 91.8%). Performance during the tangible condition decreased below baseline levels and was stable (M = 8.8%). After one rehearsal opportunity during the rehearsal analysis phase, Milly's fidelity of the escape condition showed a clear and immediate increase and averaged 81.1%. Her performance in this condition was differentially lower than her performance during the other two conditions. After three rehearsals, her fidelity of the attention condition met criterion. After exposure to 10 rehearsals, Milly's fidelity of the tangible condition met criterion. During the cumulative analysis phase, additional rehearsals were implemented only for the escape condition. Milly required two additional rehearsals in this phase to meet criterion for the escape condition. Her fidelity of the attention and tangible conditions maintained at 100%. By the conclusion of the study, Milly met criterion after three total rehearsals for the escape condition, three total rehearsals for the attention condition, and 10 total rehearsals for the tangible condition. During the follow-up session, Milly's fidelity was high across all three conditions.

Data from the error analysis (Figure 13) indicate a majority of Milly's errors were errors of omission (68.6%). The most common error of omission during the escape condition was not

turning away from the client after removing the materials when self-slapping occurred. Her most common error of omission during the attention condition included not providing physical attention while expressing concern when self-slapping occurred. Although Milly made slightly fewer errors of omission during the tangible condition, the most common error of omission was failing to say "my turn" when taking away the item from the client. Milly made slightly more errors of commission for the tangible condition than omission errors. The most common error of commission was giving the client the item before self-slapping occurred.

Olive. Olive obtained 100% correct on the knowledge assessment. Figure 12 depicts her fidelity. During the instructions probes, Olive's fidelity was low across all three conditions, averaging 31.3%, 17.95%, and 15.8% for the escape, attention and tangible conditions, respectively. During the video modeling phase, Olive's fidelity during the escape condition decreased initially (relative to the previous phase), but returned to baseline levels during the last two sessions, averaging 25.2%. Fidelity during the attention condition showed a clear and immediate change, averaging 96%. Olive's fidelity during the tangible condition was low and stable, averaging 34.2%. After one rehearsal opportunity during the rehearsal analysis phase, Olive's fidelity of the escape condition showed a clear and immediate increase; however, fidelity was not maintained and showed a decreasing trend (M = 87%). Differentiated performance occurred between this condition and the other two conditions. After three rehearsals, her fidelity of the attention condition met criterion. After exposure to 10 rehearsals, Olive's fidelity of the tangible condition met criterion. During the cumulative analysis phase, additional rehearsals were implemented for the escape condition only. Olive required two additional rehearsals in this phase for the escape condition to meet criterion. Her fidelity of the attention and tangible conditions maintained at 100%. By the conclusion of the study, Olive met criterion after three

total rehearsals for the escape condition, three total rehearsals for the attention condition, and 10 total rehearsals for the tangible condition. During the follow-up session, Olive's fidelity decreased slightly for all three conditions.

Data from the error analysis (Figure 13) indicate the most common type of error Olive made was errors of omission (54.8%). The most common error of omission during the escape condition was failing to remove the materials when self-slapping occurred. Olive also made numerous commission errors during this condition including allowing the task materials to remain present throughout experimental sessions. Within the attention condition, Olive only made errors of omission during the instructions phase, in which she did not return to a different work area after providing attention for self-slapping. The most common error of omission during the tangible condition was failing to say "my turn" when taking away the item from the client. Similar to other participants, Olive made more errors of commission than omission during the tangible condition, in which she gave the client the item before self-slapping occurred.

Nefeesa. Nefeesa obtained 88.9% correct on the knowledge assessment. Figure 12 depicts her fidelity of the functional analysis conditions. During the instructions phase, Nefeesa's fidelity showed a decreasing trend for the escape condition (M = 20.9%), was low and stable for the attention condition (M = 9.4%), and high and stable for the tangible condition (M = 82.5%). During the video modeling phase, Nefeesa's fidelity during the escape and attention condition was low and stable, averaging 10.5% and 5.7%, respectively. Her fidelity of the tangible condition remained high averaging 84.6%. After one rehearsal opportunity during the rehearsal analysis phase, Nefeesa's fidelity of the escape condition showed a clear and immediate increase and averaged 83.9%. Her performance in the escape condition was variable and differentially lower than the other two conditions. After three rehearsals, her fidelity of the

attention condition met criterion. After 10 rehearsals, Nefeesa's fidelity of the tangible condition increased slightly and was stable, averaging 94.8%. During the cumulative analysis phase, additional rehearsals were implemented for the escape and tangible conditions. Nefeesa required seven additional rehearsals in this phase for the escape condition to meet the mastery criterion. After two rehearsals for the tangible condition, Nefeesa met criterion; however, she made an error in the third experimental session, in this phase, requiring two additional rehearsals to meet and maintain criterion. Her performance for the attention condition maintained at 100%. By the conclusion of the study, Nefeesa met criterion after eight total rehearsals for the escape condition, three total rehearsals for the attention condition, and 14 total rehearsals for the tangible condition. During the follow-up session, Nefeesa's fidelity was high for the attention and tangible condition, but decreased slightly for the escape condition.

Data from the error analysis (Figure 13) indicate Nefeesa made more errors of omission (55%) than commission. Nefeesa made fewer errors of omission during the escape condition, in which she failed to re-present task materials and subsequently remove these materials when self-slapping occurred. The most common error of commission during this condition, was providing attention when self-slapping occurred. The most common error of omission during the attention condition was failing to walk over and provide attention to the client (when self-slapping occurred) and then returning to a different work area. Nefeesa made more errors of commission during the tangible condition, the most common of these errors was allowing the client to have the item for longer than 5 s when self-slapping occurred. The most common type of error of omission during this condition was failing to give the item to the client and then say "my turn" when taking the item away.

Quiliana. Quiliana obtained 89% correct on the knowledge assessment. Figure 14 depicts her fidelity. During the instructions phase, her fidelity was low across all three conditions. After the introduction of the video model in the next phase, Quiliana's fidelity improved initially for all three conditions. In this phase, fidelity of the escape condition decreased during the last experimental session, averaging 29.3%. Although her fidelity of the attention condition was initially high in this phase, during the last session her performance decreased below baseline levels (M = 61%). During the tangible condition, fidelity showed little variability and averaged 34.2%. After one rehearsal opportunity, Quiliana's fidelity of the escape condition improved; however, a decreasing trend occurred throughout the phase (M = 28.2%). After three rehearsals, her fidelity of the attention condition met criterion and remained differentially higher than the other two conditions. After exposure to 10 rehearsals, Quiliana's fidelity of the tangible condition showed a clear and immediate increase initially; however, performance decreased during the last two sessions in this phase (M = 36%). In the cumulative analysis phase, single rehearsal opportunities were provided before each experimental session for the escape and tangible conditions until she met criterion. Fidelity during the escape condition was variable, requiring seven rehearsals to meet criterion. Quiliana met criterion for the tangible condition after two rehearsals; however, she made an error during the third experimental session in this phase, which required two additional rehearsals to meet criterion again. Quiliana's fidelity remained at criterion level for the attention condition in this phase. By the conclusion of the study, Quiliana met criterion after eight total rehearsals for the escape condition, three total rehearsals for the attention condition, and 14 total rehearsals for the tangible condition. During a follow-up session, fidelity remained high across all three conditions.

Data from the error analysis (Figure 15) indicate Quiliana made more errors of omission (56.3%) than commission. The most common error of omission during the escape condition was not turning away from the client after removing the materials. Her most common error of omission during the attention condition included not providing physical attention while expressing concern when self-slapping occurred. Quiliana also made many errors of commission during the escape condition. The most common error of commission was giving the item to the client when self-slapping occurred. During the tangible condition the most common error of omission made was failing to say "my turn" when taking away the item from the client. She also made many errors of commission during the tangible condition. The most common error of commission was giving the item to the client before self-slapping occurred.

Raylene. Raylene obtained 78% correct on the knowledge assessment. Figure 14 depicts her fidelity. During the instructions phase, her fidelity averaged 25.3%, 9.4%, and 11.8% for the escape, attention, and tangible condition, respectively. After the introduction of the video model in the next phase, Raylene's fidelity improved for all three conditions. In this phase, fidelity of the escape condition averaged 58.2% and was slightly variable. Her fidelity of the attention condition averaged 96.2% and showed little variability. During the tangible condition, fidelity averaged 47.2% and decreased during the last three experimental sessions. After one rehearsal opportunity, Raylene's fidelity of the escape condition improved slightly; however, a decreasing trend occurred during the last three experimental sessions (M = 68.2%). After three rehearsals, her fidelity of the attention condition improved and met criterion initially, but was slightly variable during the last three experimental sessions (M = 97.7%). After 10 rehearsals, Raylene's fidelity of the tangible condition met and maintained criterion. In the cumulative analysis phase, fidelity during the escape condition showed some variability, requiring five

rehearsals to meet criterion. Raylene met criterion after two rehearsals for the attention condition. Her fidelity remained at criterion level for the tangible condition in this phase. By the conclusion of the study, Raylene met criterion after six total rehearsals for the escape condition, five total rehearsals for the attention condition, and 10 total rehearsals for the tangible condition. During a follow-up session, performance remained high across all three conditions.

Data from the error analysis (Figure 15) indicate a large majority of Raylene's errors were errors of omission (72.1%). Similar to other participants, the most common error of omission during the escape condition was not turning away from the client after removing the materials. During the attention condition, Raylene often failed to walk over and provide attention to the client (when self-slapping occurred) and then return to a different work area. During the tangible condition the most common error of omission made was failing to say "my turn" when taking away the item from the client. She also made many errors of commission during this condition. The most common error of commission was allowing the client to have the item more than 5 s when self-slapping occurred. The most common error of omission during the tangible condition was failing to say "my turn" when taking away the item from the client.

Sirolina. Sirolina obtained 33% correct on the knowledge assessment. Figure 14 depicts her fidelity. During the instructions phase, her fidelity averaged 7.6%, 9.4%, and 14.1% for the escape, attention, and tangible condition, respectively. After the introduction of the video model, Sirolina's fidelity remained unchanged across all three conditions and averaged 8.4%, 11.3%, and 18.4% for the escape, attention, and tangible conditions, respectively. After one rehearsal opportunity, Sirolina's fidelity of the escape condition increased (M = 61%), but was differentially lower than the other two conditions. After three rehearsals, her fidelity of the attention condition increased and met criterion. After 10 rehearsals, Sirolina's fidelity of the

tangible condition met criterion. In the cumulative analysis phase, single rehearsal opportunities were provided before each experimental session for the escape condition until she met criterion. Fidelity during the escape condition was variable, requiring five rehearsals to meet criterion. Sirolina's fidelity maintained at criterion level for the attention and tangible conditions. By the conclusion of the study, Sirolina met criterion after six total rehearsals for the escape condition, three total rehearsals for the attention condition, and 10 total rehearsals for the tangible condition. Follow-up data were not available for Sirolina.

Data from the error analysis (Figure 15) indicate the most common types of error Sirolina made were errors of omission (69%). During the escape condition, the most common error of omission was failing to remove the materials and turn away from the client when self-slapping occurred. Sirolina's errors during the attention condition were failing to walk over to the client, provide attention, and return to a different work area when self-slapping occurred. The most common error of omission during tangible condition was failing to say "my turn" when taking away the item from the client. Sirolina also made numerous errors of commission during the tangible condition. The most common error of commission was allowing the materials to remain in front of the client throughout sessions.

Jubilee. Jubilee obtained 67% correct on the knowledge assessment. Figure 16 depicts her fidelity of the functional analysis conditions. Jubilee's performance during the instructions probes was low for all three functional analysis conditions. During the video modeling phase, Jubilee's performance showed differentiation across all three conditions, with the highest fidelity occurring in the attention condition. Her performance showed little variability in the attention and escape conditions, averaging 98.7% and 11.2%, respectively and some variability for the tangible condition (M = 34.2%). Performance during the rehearsal analysis phase showed very

little differentiation between conditions. After one rehearsal opportunity, Jubilee's fidelity of the attention condition showed no change, averaging 97.1%. After three rehearsals, her fidelity of the tangible condition showed a clear and immediate increase and met criterion. After exposure to 10 rehearsals, Jubilee's fidelity of the escape condition showed a clear and immediate increase; however, a decreasing trend emerged during the last three sessions, averaging 92.1%. During the cumulative analysis phase, additional rehearsals were implemented until criterion was met for the attention and escape conditions. Jubilee required three and two additional rehearsals to meet criterion, in this phase, for the attention and escape conditions, respectively. By the conclusion of the study, Jubilee met criterion after four total rehearsals for the attention condition, three total rehearsals for the tangible condition, and 12 total rehearsals for the escape condition. During the follow-up session, Jubilee's performance was high across all three conditions.

Data from the error analysis (Figure 17) indicate a large majority of the total errors Jubilee made (64.3%) were errors of omission. For the attention condition, errors of omission only occurred during the instructions phase. During this phase, she failed to walk over to the client, provide physical and verbal attention, and return to a different work area. During the tangible condition, Jubilee often failed to give the client an item with which to play (when self-slapping occurred). The errors of omission made during the escape condition, included failing to re-present task materials after 15 s had elapsed and subsequently failing to remove the materials when self-slapping occurred again.

Kambrosia. Kambrosia obtained 89% correct on the knowledge assessment. Figure 16 depicts her fidelity of the functional analysis conditions. During the instructions phase, Kambrosia's performance was low for all three functional analysis conditions, averaging 25.5%,

10.6%, and 6.4% for the attention, tangible, and escape condition, respectively. Similar to Jubilee, during the video modeling phase, Kambrosia's performance showed differentiation across all three conditions. Her performance of the attention condition was stable during the last two experimental sessions, averaging 93.7%. During the tangible and escape condition, Kambrosia's performance showed variability, averaging 35.3% and 16.8%, respectively. After one rehearsal opportunity, during the rehearsal analysis phase, Kambrosia's fidelity of the attention condition improved and met criterion. After three rehearsals, her fidelity of the tangible condition also met criterion. After exposure to 10 rehearsals, Kambrosia's fidelity of the escape condition showed a clear and immediate increase; however, her performance showed an decreasing trend across the phase (M = 74.8%). Her performance of the escape condition was differentially lower than the other two conditions. During the cumulative analysis phase, additional rehearsals were implemented only for the escape condition. After the first rehearsal in this phase, Kambrosia's performance remained unchanged compared to her performance in the previous phase; however, after the second and third rehearsals, her performance improved and met criterion. By the conclusion of the study, Kambrosia met criterion after one rehearsal for the attention condition, three total rehearsals for the tangible condition, and 13 total rehearsals for the escape condition. During the follow-up session, Kambrosia's performance was high across all three conditions.

Data from the error analysis (Figure 17) indicate Kambrosia made more errors of commission (55%) than omission throughout the study. Although Kambrosia made fewer errors of commission, compared to errors of omission, during the attention condition, the most common error of commission made, during this condition, was providing instructions when self-slapping occurred (i.e., telling the client to play with her toys). The most common error of omission

during this condition was failing to walk over to the client, provide physical attention, and return to a different work area. During the tangible condition, the most common error of commission was providing attention when giving the item to the client. The most common error of commission during the escape condition involved presenting materials too soon (e.g., before 15s had elapsed).

Lola. Lola obtained 100% correct on the knowledge assessment. Figure 16 depicts her fidelity. Lola's performance during the instructions probes was stable across all three conditions, averaging 33.4%, 11.4%, and 2.8% for the attention, tangible, and escape conditions, respectively. During the video modeling phase, Lola's performance improved across all three conditions; however, little differentiation occurred across these conditions. Her performance averaged 71%, 61.7%, and 65.1% for the attention, tangible, and escape conditions, respectively. During the rehearsal analysis phase, Lola met criterion after one rehearsal for the attention condition, three rehearsals for the tangible condition, and 10 rehearsals for the escape condition. Lola did not require additional rehearsals to meet or maintain criterion for any of the conditions. During the follow-up session, Lola's performance was high for the attention and tangible conditions; however, performance decreased slightly during the escape condition.

Data from the error analysis (Figure 17) indicate a large majority of the total errors Lola made (69.3%) were errors of commission. The most common error of commission during the attention condition was providing instructions when self-slapping occurred (i.e., "you play while I work"). During the tangible condition, the most common error of commission was waiting too long to take away the item from the client. During the escape condition, Lola frequently re-presented task materials too soon (i.e., before 15 s had elapsed).

Polly-Anna. Polly-Anna obtained 33% correct on the knowledge assessment. Figure 18 depicts her fidelity of the functional analysis conditions. During the instructions phase, Polly-Anna's fidelity was low across all three conditions. After the introduction of the video models, her fidelity remained unchanged from baseline levels, with a slight decreasing trend for the attention condition (*M* = 20.1%) and a slight increasing trend for the tangible (*M* = 12.3%) and escape (*M* = 17.5%) conditions. After one rehearsal opportunity during the rehearsal analysis phase, Polly-Anna's fidelity of the attention condition met criterion. After three rehearsals, her fidelity of the tangible condition showed a clear and immediate increase during the first experimental session; however, her performance decreased dramatically during subsequent sessions and was differentially lower than the other two conditions (*M* = 28.9%). After 10 rehearsals, Polly-Anna's fidelity of the escape condition showed an increase with little variability, averaging 94.2%. During the cumulative analysis phase, additional rehearsals were implemented for the escape and tangible conditions. Polly-Anna required two and three additional rehearsals to meet criterion in the escape and tangible conditions, respectively. By the conclusion of the study, Polly-Anna met criterion after one rehearsal for the attention condition, six total rehearsals for the tangible condition, and 12 total rehearsals for the escape condition. During the follow-up session, Polly-Anna's performance was high for the attention and escape conditions; however, her performance decreased slightly during the tangible condition.

Data from the error analysis (Figure 19) indicate a large majority of Polly-Anna's errors were errors of omission (84%). The most common error of omission during the attention condition was failing to walk over to the client, provide attention for self-slapping, and return to a different work area. During the tangible condition, Polly-Anna often failed to say "my turn"

when taking the item away from the client. Her most common error of omission during the escape condition included failing to remove the materials when self-slapping occurred.

Umera. Umera obtained 56% correct on the knowledge assessment. Figure 18 depicts her fidelity. During the instructions phase, her fidelity averaged 14.1%, 9.4%, and 9.6%, for the attention, tangible, and escape condition, respectively. After the introduction of the video model in the next phase, Umera's performance showed little to no improvement across all three conditions. In this phase, fidelity was stable for the attention condition (M = 11.9%), slightly variable for the tangible condition (M = 21.9%), and decreased during the last experimental session in the escape condition (M = 18.2%). After one rehearsal opportunity, Umera's fidelity of the attention condition improved and was slightly variable (M = 92%). After three rehearsals, her fidelity of the tangible condition improved, but was highly variable (M = 59.9%). After 10 rehearsals, Umera's fidelity of the escape condition also improved and was stable during the last two experimental sessions in this phase (M = 80.6%). Fidelity during the rehearsal analysis phase was not well differentiated across the functional analysis conditions. In the cumulative analysis phase, single rehearsal opportunities were provided before each experimental session for all three conditions until she met criterion. Fidelity during the attention condition showed some variability initially, requiring four additional rehearsals to meet criterion. Umera's fidelity of the tangible and escape conditions was stable, requiring two additional rehearsals each. By the conclusion of the study, Umera met criterion after five total rehearsals for the attention condition, five total rehearsals for the tangible condition, and 12 total rehearsals for the escape condition. Follow-up data were not available for Umera.

Data from the error analysis (Figure 19) indicate a majority of Umera's errors were errors of omission (67.2%). Umera's performance during the attention condition indicated she

did not always walk over to the client, provide attention, and return to a different work area when self-slapping occurred. Umera, like many participants, made fewer errors of omission (compared to errors of commission) during the tangible condition. The most common error of omission during this condition was failing to say "my turn" when taking away the item from the client. The most common error of commission was giving the client the item before self-slapping occurred. During the escape condition, Umera also made fewer errors of omission, in which she failed to re-present the materials (after 15 s had elapsed) and subsequently failing to remove the materials when self-slapping occurred again. The most common error of commission was waiting too long before re-presenting the materials to the client.

Trixie. Trixie obtained 33% correct on the knowledge assessment. Figure 18 depicts her fidelity. During the instructions phase, her fidelity showed a decreasing trend across all three conditions throughout the phase and averaged 3.8%, 5.2%, and 4.9%, for the attention, tangible, and escape condition, respectively. After the introduction of the video model in the next phase, Trixie's fidelity showed some improvement initially across all three conditions. In this phase, fidelity decreased to baseline levels during the last two experimental sessions for the attention condition (M = 13.2%), was stable for the tangible condition (M = 28.9%), and was variable for the escape condition (M = 16%). Fidelity during the rehearsal analysis phase was variable for all three conditions and showed no differentiation across conditions. After one rehearsal opportunity, Trixie's fidelity of the attention condition averaged 80.4%. After three rehearsals, her fidelity of the tangible averaged 85.6%. After 10 rehearsals, Trixie's fidelity averaged 77.2%. In the cumulative analysis phase, single rehearsal opportunities were provided before each experimental session for all three conditions until she met criterion. Fidelity during the attention and tangible conditions was stable and required two (additional) rehearsals each. After

the first rehearsal for the escape condition, Trixie's fidelity did not improve from the previous phase. After the second and third rehearsals, however, she was able to meet criterion. By the conclusion of the study, Trixie met criterion after three total rehearsals for the attention condition, five total rehearsals for the tangible condition, and 13 total rehearsals for the escape condition. During a follow-up session, performance remained high across all three conditions.

Data from the error analysis (Figure 19) indicate Trixie made a similar percentage of errors of omission (49.8%) and errors of commission (50.1%) throughout the study. During the attention condition, Trixie made more errors of omission, in which she often failed to provide physical attention while providing verbal attention when self-slapping occurred. The most common error of commission was providing instructions when self-slapping occurred. Trixie's performance during the tangible condition indicated she made more errors of commission, in which she often gave the item to the client before self-slapping occurred and took away the item away when self-slapping occurred. The most common error of omission was failing to say "my turn" when taking the item away from the client. During the escape condition, she also made more errors of commission, in which she waited too long (more than 15 s) to re-present the materials. The most common error of omission was failing to turn away from the client after removing the materials.

Acceptability

The results from the training acceptability survey are summarized in Table 4. Participants rated statements regarding the training techniques on a Likert-type scale (1 = *strong disagreement,* 6 = *strong agreement*). Participants disagreed written instructions alone would be an acceptable way to help educators implement a functional analysis (M = 2.1), written instructions would be effective in changing the accuracy with which educators implement

functional analyses (*M* = 2.4), they would suggest the use of written instruction alone for other educators (*M* = 1.9), and they would be willing to use written instructions alone again in the future (*M* = 2.4). Participants slightly disagreed video modeling alone would be an acceptable way to help educators implement functional analyses (*M* = 3.4), video modeling alone would be effective in changing the accuracy with which educators implement functional analyses (*M* = 3.6), they would suggest the use of video modeling alone for use with educators (*M* = 3.4), and they would be willing to use video modeling alone again in the future (*M* = 3.5). When asked about role-play, participants agreed role-play would be (a) an acceptable way to help educators implement functional analyses (*M* = 4.9), (b) effective in changing the accuracy with which educators implement functional analyses (*M* = 4.9), (c) they would suggest the use of role-play for use with other educators (*M* = 4.9), and (d) would be willing to use role-play again in the future (*M* = 4.9). Rehearsal with feedback was rated as highly acceptable (*M* = 5.8) and participants strongly agreed rehearsal with feedback would be effective in changing the accuracy with which educators implement the procedures (*M* = 5.9). Statements were rated high for the use of rehearsal with feedback for other educators (*M* = 5.8) and participants' willingness to use rehearsal with feedback in the future (*M* = 5.8). Participants rated statements regarding the use of a video model and one (*M* = 5.4) and three (*M* = 5.0) rehearsals with feedback as being sufficient to implement the functional analyses conditions well. However, participants slightly agreed viewing a video model and experiencing 10 rehearsals with feedback was sufficient for them to implement the procedures well (*M* = 4.5). Participants liked the overall training procedures (*M* = 5.1) and agreed the training package would be beneficial for other educators (*M* = 5.6). When asked to indicate the number of rehearsals educators should have to implement functional analyses well, the average response was 4.1 rehearsals. Thirteen of 18 participants

indicated the easiest functional analysis condition to implement was the attention condition; whereas 13 out of 18 indicated the escape condition was the most difficult to implement.

Efficiency analysis

Figures 20-25 depict the cumulative number of seconds participants spent experiencing rehearsal plus feedback across rehearsal opportunities. The first data point in each condition includes the total time spent in rehearsal for the one, three, and 10 rehearsal conditions during the rehearsal analysis phase. Each subsequent data point represents a single (additional) rehearsal opportunity during the cumulative analysis. These data indicate the 10 rehearsal condition required the highest number of seconds in rehearsal and feedback to reach criterion, followed by the three rehearsal and one rehearsal conditions. In addition, the total number of rehearsals required to reach criterion was the lowest for the one rehearsal condition, followed by the three and 10 rehearsal conditions. Doris and Lola are the only participants whose data indicate initial rehearsal opportunities with feedback were sufficient to produce criterion performance for all three functional analysis conditions; however, eight out of 18 participants were able to meet criterion, for at least one condition, after the initial rehearsals (rehearsal analysis).

The data in Figures 20-25 are supported by the results summarized in Table 5. The mean number of rehearsal opportunities required to meet criterion for conditions associated with one, three, and 10 rehearsals is 3.5, 4.8, and 11.5, respectively. The mean amount of time spent in training to achieve criterion performance was 397.5 s, 431.8 s, and 1042.9 s for the conditions associated with one, three, and 10 rehearsals, respectively. Regardless of the functional analysis condition, these data suggest the one rehearsal condition required the least amount of time and rehearsals to produce criterion performance. When the attention, escape, and tangible conditions were assigned to the one rehearsal condition, on average, participants were able to meet criterion

after 2.5, 5.7, and 2.2 rehearsals with feedback, respectively. These data suggest the escape condition may be more difficult to implement, requiring more than double the amount of rehearsal (with feedback) to reach criterion.

The results of Study 2 demonstrate BST effectively produced criterion performance for all 18 participants. Three participants met criterion after reading instructions and viewing the 1-min video model for at least one condition. Two participants met criterion for the attention, tangible, and escape conditions during the rehearsal analysis phase. Nearly all participants required additional rehearsals to meet and maintain criterion performance. Once criterion was met, fidelity was maintained during a follow-up session for nearly all participants.

Study 2 had limitations worth noting. Five participants (Ingrid, Jubilee, Kambrosia, Sirolina, and Olive) reported having knowledge of functional analysis before the study, which may have influenced their responding during experimental sessions. Because their performance was similar to other participants who reported having no prior knowledge of the procedures, this history is unlikely to contribute to their performance. However, it cannot be ruled out as a possibility. Next, follow-up data for two participants (Sirolina and Umera) were unavailable. Omission of these data limits the conclusions that can be made about the effects of the training package on maintenance of performance.

General Discussion

The current studies evaluated the effects of rehearsal on the fidelity of three functional analysis conditions. Study 1 was a pilot evaluation of the effects of a parametric analysis of rehearsal opportunities on participant fidelity. Training consisted of instructions; one, three, and 10 rehearsals with feedback; and supplemental rehearsals with feedback until participants achieved criterion performance. The purpose of Study 2 was to evaluate the effects of a

parametric analysis of rehearsal opportunities within a BST package on the fidelity of 18 undergraduate participants. Across both studies, rehearsal with feedback effectively increased participant fidelity regardless of the rehearsal condition to which participants were assigned. The one rehearsal condition was the most efficient, requiring fewer total rehearsals and time to meet criterion than other rehearsal conditions. This finding suggests requiring participants to repeatedly rehearse the procedure three or 10 times during initial practice did not yield higher fidelity. That is, a direct linear relation between the number of initial rehearsal opportunities and fidelity level was not observed. The findings of Study 2 documented a slight reduction in the mean number of rehearsals required to meet criterion with the addition of a video model. The training procedures were rated as highly acceptable across both studies.

The findings of both studies provide important information about the efficacy of individual training components and the full package of BST (Miltenberger, 2007; Sarokoff & Sturmey, 2004). Results indicate performance on a written knowledge assessment does not predict fidelity of functional analysis conditions. Moreover, the use of instructions alone was insufficient to produce criterion performance for all participants in both studies, which supports previous research (e.g., Ducharme & Feldman, 1992; Gardner, 1972; van Vonderen, Diddnen, & Beeking, 2012; Ward-Horner & Sturmey, 2012). Fidelity increased with the addition of a video model in Study 2 for some participants, but only three participants met criterion for the attention condition only. This finding also replicates previous research (e.g., Moore & Fisher, 2007; Severtson & Carr, 2012; Ward-Horner & Sturmey, 2012). For example, DiGennaro Reed, Codding, Catania, and Maguire (2010) showed video modeling increased fidelity relative to a baseline condition containing written instructions; however, fidelity varied and did not meet the mastery criterion. In the present study, the video model was brief and excluded relevant features

used in previous research (e.g., on-screen text and narration describing the procedures), which may have contributed to its lack of efficacy when used without rehearsal and feedback. Adding these features might produce an efficacious training without the need for resource-intensive procedures (Catania et al., 2009), which were necessary for mastery in the present studies. These findings also show the efficacy of rehearsal with feedback for the acquisition and maintenance of performance. Interestingly, fidelity following initial rehearsal with feedback (i.e., rehearsal analysis phase) reached 100% for several participants/conditions; however, fidelity did not reach criterion levels or decreased across the phase for most participants. Supplemental rehearsals (single rehearsals in the cumulative analysis phase) were necessary for criterion performance, which was maintained for nearly all participants.

The staff training literature describes two ways in which rehearsal is used. Some studies use "massed" rehearsal where participants experienced a pre-determined number of rehearsals in a repeated manner regardless of implementation fidelity of each individual rehearsal (e.g., DiGennaro Reed et al., 2005; Ward et al., 1998). Other studies use implementation fidelity to inform the continued use of rehearsal (e.g., Iwata et al, 2000; McKenney et al., 2013; Phillips & Mudford, 2008). That is, participants rehearsed the procedures until an a priori mastery criterion was reached. The findings of the present studies suggest the massed approach is not the most efficient procedure. Although performance reached criterion in all rehearsal conditions, supplemental rehearsals were almost always necessary. On average, participants completed more rehearsals in the three and 10 rehearsal conditions compared to the one rehearsal condition. However, the three and 10 rehearsal conditions did not result in higher levels of fidelity. These data suggest a "shot gun" (massed) approach to rehearsal may not be the most efficient way to train.

The most *efficacious* and *efficient* training package was BST involving single rehearsals until participants reached a mastery criterion (i.e., the one rehearsal condition in Study 2). This finding is consistent with best practices (Parsons et al., 2012). Although considered an evidence-based practice, applied settings do not consistently adopt BST in this manner. DiGennaro Reed and Henley (2015) surveyed Board Certified Behavior Analysts® (BCBA®) and BCBA® aspirants about the training practices offered by their employer. Only half of the respondents participated in an initial training and the most common training techniques were verbal and written instruction. Rehearsal and feedback were reported by less than half of the respondents who received an initial training. These survey results suggest best-practice training—BST—is not uniformly adopted in applied settings. It appears the common training procedures are those that require fewer upfront resources (i.e., instructions). Unfortunately, they are likely to be less effective, which may explain the finding that approximately one-third of survey respondents felt unprepared to perform job duties. To better address the needs of practitioners, future research must evaluate ways to maximize the efficiency of BST. The findings of the present studies indicate the most efficient and efficacious use of rehearsal within a BST model includes offering a single rehearsal with feedback until mastery criterion is met.

Contributions and Limitations

These studies make a number of contributions to the literature. First, only one other study has evaluated the effects of multiple rehearsal opportunities on fidelity (Chafouleas et al., 2012). Chafouleas et al. adopted massed rehearsal as part of a training package and showed a higher number of rehearsals did not yield better performance, similar to the outcomes in the present studies. Thus, a "shot gun" approach may not be the most efficacious or efficient way to train a skill. Second, the current studies support Reid and Parsons' (1995) guidelines, which

suggest trainers train to a criterion. Despite experiencing repeated rehearsals with feedback (e.g., 10 rehearsal condition), many participants did not meet criterion in the rehearsal analysis phase. Thus, selecting an arbitrary number of rehearsals without considering implementation fidelity is an ineffective approach. A better alternative is to individualize training by offering rehearsals with feedback until criterion is reached (similar to the cumulative analysis phase). Next, the experimental sessions during instructions could be viewed as rehearsal *without* feedback similar to the condition arranged in Ward-Horner and Sturmey (2012). Performance during these experimental sessions was low and replicates the results reported by Ward-Horner and Sturmey. That is, rehearsal in isolation is an ineffective way to increase fidelity and may simply create an opportunity for participants to practice errors. When feedback followed rehearsal in the present studies, fidelity increased. The use of rehearsal in this way better approximates the use of rehearsal in other published studies and in applied settings (when rehearsal is made available; DiGennaro Reed & Henley, 2015). Finally, these findings underscore the importance of using a full BST package, particularly when competency (criterion-level performance) is a desired outcome.

Despite these strengths, a number of limitations are worth noting. First, the criterion set for mastery—100% fidelity across two consecutive sessions—may have inflated the number of rehearsal with feedback opportunities reported. Performance below criterion during the cumulative analysis phase resulted in a minimum of two additional rehearsals with feedback. For example, if a participant implemented a condition with 99% fidelity after the first rehearsal in cumulative analysis, she would still receive two additional rehearsals with feedback, even if her performance was 100% after the second rehearsal with feedback. That is, the use of a stringent mastery criterion may slightly inflate the number of rehearsals with feedback necessary

to produce criterion performance. Second, a potential confound may exist between the difficulty level of each functional analysis condition and the fidelity with which participants implemented the conditions. That is, if one functional analysis condition is easier to implement, this may make it more difficult to draw comparisons between the numbers of rehearsals necessary to meet criterion for each condition. In Study 2, several participants met the mastery criterion for the attention condition after only viewing a video model, which suggests the attention condition may be easier to implement than the other two conditions. These findings are contrary to the results of Kunnavatana et al. (2013) who reported participants needed more feedback during the attention condition to improve implementation compared to the escape, tangible, and ignore conditions. If a condition is more difficult to implement it is reasonable to conclude more rehearsals would be necessary to meet the criterion. This limitation, however, may reflect the various skills staff must demonstrate in applied settings. Some skills may be easier and require fewer training hours; whereas, others may require more practice and feedback until high fidelity it achieved. In applied settings, the amount of time it takes for trainees to learn a simple skill (e.g., three-step prompting, DTT) could be compared to the time required to learn a more complex skill (e.g., compound reinforcement schedule). Third, the lack of rehearsal and feedback provided before experimental sessions in the cumulative analysis phase may have served as a form of (indirect) feedback. During this phase, participants were only provided an opportunity to rehearse and receive feedback on conditions for which criterion had not been met. If participants met criterion, they did not experience rehearsal with feedback which may indirectly serve as a form of feedback that their fidelity was 100%. Fourth, half of the participants worked with the same confederate client throughout the study; whereas, others worked with multiple confederate clients. Although all confederate clients were trained to emit

the same topography of behavior, the lack of a consistent confederate client with which to work may have impacted participants' fidelity. However, when comparing the data for participants who worked with the same confederate client to those who worked with different confederate clients throughout the study, performance appears to be similar across these groups. Moreover, working with multiple confederate clients could arguably enhance generalization, although this was not formally evaluated in the current study. This may be a focus for future research. Fifth, the analog setting of these studies decreases the external validity of the results. Future research may evaluate these procedures within a real-world context and may also evaluate the impact of BST (with massed and distributed rehearsal) with other procedures (e.g., DTT, preference assessments, prompting).

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Table 1

Steps to Conduct Functional Analysis Conditions

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Attention Condition	Select puzzle, book, or coloring	Give item to client. Say "[Name], play with items while I do work"	After initial instruction, sit in another chair and pretend to work	If self-slapping occurs, walk over to the client and vocally express concern and/or disapproval	Touch client's arm while expressing concern	Return to "work" activity	No praise for sitting nicely, using two-word sentences, playing appropriately	No comments or other consequences for self-pinching or disengagement with materials
Tangible Condition	Select puzzle, book, or coloring	Give item to client, no comments	Wait 5 s, no attention, no instructions	After time has elapsed, take the item away and say, "It's my turn now"	If self-slapping occurs, give item to client for 5 s, no attention, no instructions	Take the item away and say, "It's my turn now"	No praise for sitting nicely, using two-word sentences, playing appropriately	No comments or other consequences for self-pinching or disengagement with materials
Escape Condition	Select math worksheet	Give clear instruction as soon as task presented	Deliver praise when client has finished complying with specific instruction	If engages in self-slapping, immediately remove materials and turn away for 15 s	WHEN TURNED: Ignore all behaviors when turned (no attention, no additional programmed consequences)	WHEN TURNED: Present task and instruction after 15 s with no self-slapping	No praise for other appropriate behaviors (e.g., sitting nicely, using two-word sentences)	No comments or other consequences (e.g., turning away) for self-pinching or disengagement with materials

Table 2

Training Acceptability Survey Results

Statement	*M*
Written instructions (procedural descriptions) *alone* would be an acceptable way to help educators implement a functional analysis.	2.3
Written instructions *alone* would be effective in changing the accuracy with which educators implement a functional analysis.	3.0
I would suggest the use of written instructions alone for use with other educators.	2.3
I would be willing to use written instructions alone again in the future.	3.0
Role-play would be an acceptable way to help educators implement a functional analysis.	5.0
Role-play would be effective in changing the accuracy with which educators implement a functional analysis.	5.3
I would suggest the use of role-play for use with other educators.	5.3
I would be willing to use role-play again in the future.	5.3
Rehearsal (practice) + feedback would be an acceptable way to help educators implement a functional analysis.	5.7
Rehearsal (practice) + feedback would be effective in changing the accuracy with which educators implement a functional analysis.	5.7
I would suggest the use of rehearsal (practice) + feedback for use with other educators.	5.7
I would be willing to use rehearsal (practice) + feedback again in the future.	5.7
One rehearsal + feedback was sufficient for me to implement the functional analysis condition well.	5.0
Three rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	5.3
Ten rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	5.3
I like the procedures (i.e., written instructions and rehearsal + feedback) used to assist me in learning how to implement a functional analysis.	5.7
Overall, the procedures (i.e., written instructions and rehearsal + feedback) used would be beneficial for educators.	5.7
In order for educators to implement functional analyses well, they should have _____ (indicate number) rehearsal(s) + feedback.	2.0

Note: The statements are rated on a six-point Likert-type scale, in which a "1" indicates strong disagreement and a "6" indicates strong agreement.

Table 3

Total Number of Rehearsals and Time to Criterion

	Total Rehearsals			Total Time (sec)		
	Rehearsal Condition			Rehearsal Condition		
Participant	1	3	10	1	3	10
Amelia	6	7	12	659	910	1110
Brynn	3	7	17	267*	840*	1458*
Carrigan	3	3	10	260	310	930
Mean	4	5.7	13	395.3	686.7	1166

*Note: An * indicates the estimated time during rehearsals to meet mastery criterion.*

Table 4

Training Acceptability Survey Results (Study 2)

Statement	*M*
Written instructions (procedural descriptions) *alone* would be an acceptable way to help educators implement a functional analysis.	2.1
Written instructions *alone* would be effective in changing the accuracy with which educators implement a functional analysis.	2.4
I would suggest the use of written instructions alone for use with other educators.	1.9
I would be willing to use written instructions alone again in the future.	2.4
Video modeling alone would be an acceptable way to help educators implement a functional analysis.	3.4
Video modeling alone would be effective in changing the accuracy with which educators implement a functional analysis.	3.6
I would suggest the use of video modeling alone for use with other educators.	3.4
I would be willing to use video modeling alone again in the future.	3.5
Role-play would be an acceptable way to help educators implement a functional analysis.	4.9
Role-play would be effective in changing the accuracy with which educators implement a functional analysis.	4.9
I would suggest the use of role-play for use with other educators.	4.9
I would be willing to use role-play again in the future.	4.9
Rehearsal (practice) + feedback would be an acceptable way to help educators implement a functional analysis.	5.8
Rehearsal (practice) + feedback would be effective in changing the accuracy with which educators implement a functional analysis.	5.9
I would suggest the use of rehearsal (practice) + feedback for use with other educators.	5.8
I would be willing to use rehearsal (practice) + feedback again in the future.	5.8
One rehearsal + feedback was sufficient for me to implement the functional analysis condition well.	5.4
Three rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	5.0
Ten rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	4.5
I like the procedures (i.e., written instructions and rehearsal + feedback) used to assist me in	5.1

learning how to implement a functional analysis.	
Overall, the procedures (i.e., written instructions video modeling, and rehearsal + feedback) used would be beneficial for educators.	5.6
In order for educators to implement functional analyses well, they should have _____ (indicate number) rehearsal(s) + feedback.	4.1

Note: The statements are rated on a six-point Likert-type scale, in which a "1" indicates strong disagreement and a "6" indicates strong agreement.

Table 5

Total Number of Rehearsals and Time to Criterion

	Total Rehearsals			Total Time (sec)		
	Rehearsal Condition			Rehearsal Condition		
Participant	1	3	10	1	3	10
Doris	1	3	-	145	343	-
Elsie	3	7	-	319	641	-
Fran	1	7	10	113	553	720
Gladessa	5	9	13	648	113	1123
Humphrey	3	8	10	385	628	749
Ingrid	1	7	-	182	760	-
Milly	3	3	10	386	253	907
Olive	3	3	10	392	341	900
Nefeesa	8	3	14	837	252	1142
Quiliana	8	3	14	854	283	1153
Raylene	6	5	10	445	377	818
Sirolina	6	3	10	782	331	972
Jubilee	4	3	12	386	409	1164
Kambrosia	1	3	13	97	408	1389
Lola	1	3	10	143	267	906
Polly-Anna	1	6	12	132	680	1144
Umera	5	5	12	445	545	1319
Trixie	3	5	13	312	588	1237
Mean	3.5	4.8	11.5	397.5	431.8	1042.9

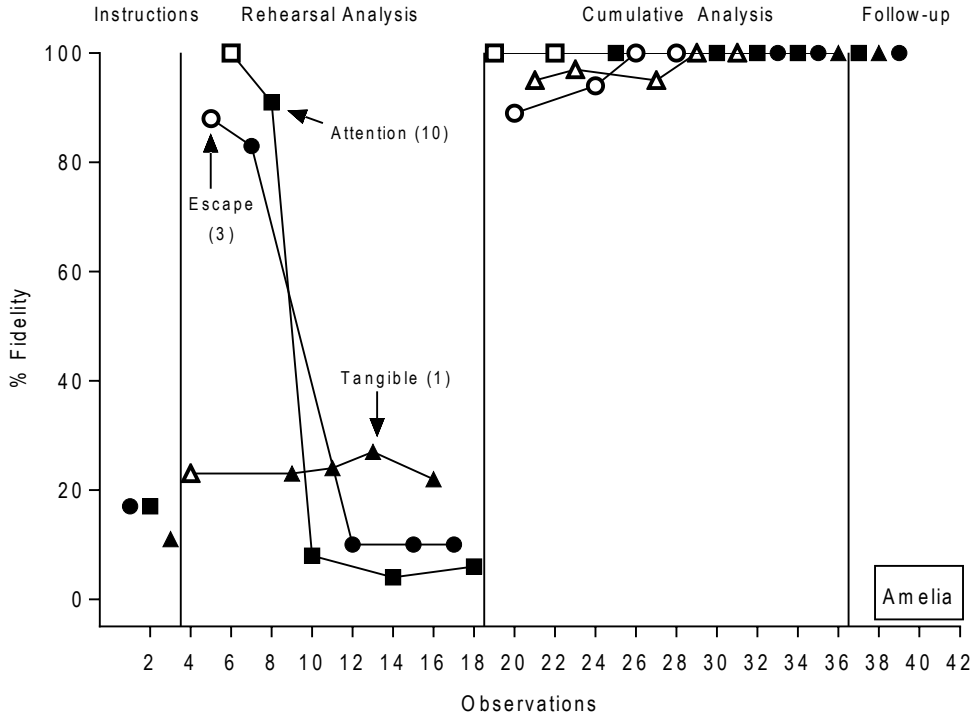


Figure 1. This figure depicts performance (% fidelity) for Amelia during experimental sessions across all four phases of the study. Fidelity during the escape condition is denoted by the closed circles, fidelity for the attention condition is denoted by the closed squares, and fidelity of the tangible condition is denoted by the closed triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. The numbers in parenthesis (next to the condition label) denote the rehearsal analysis condition assigned to the functional analysis condition.

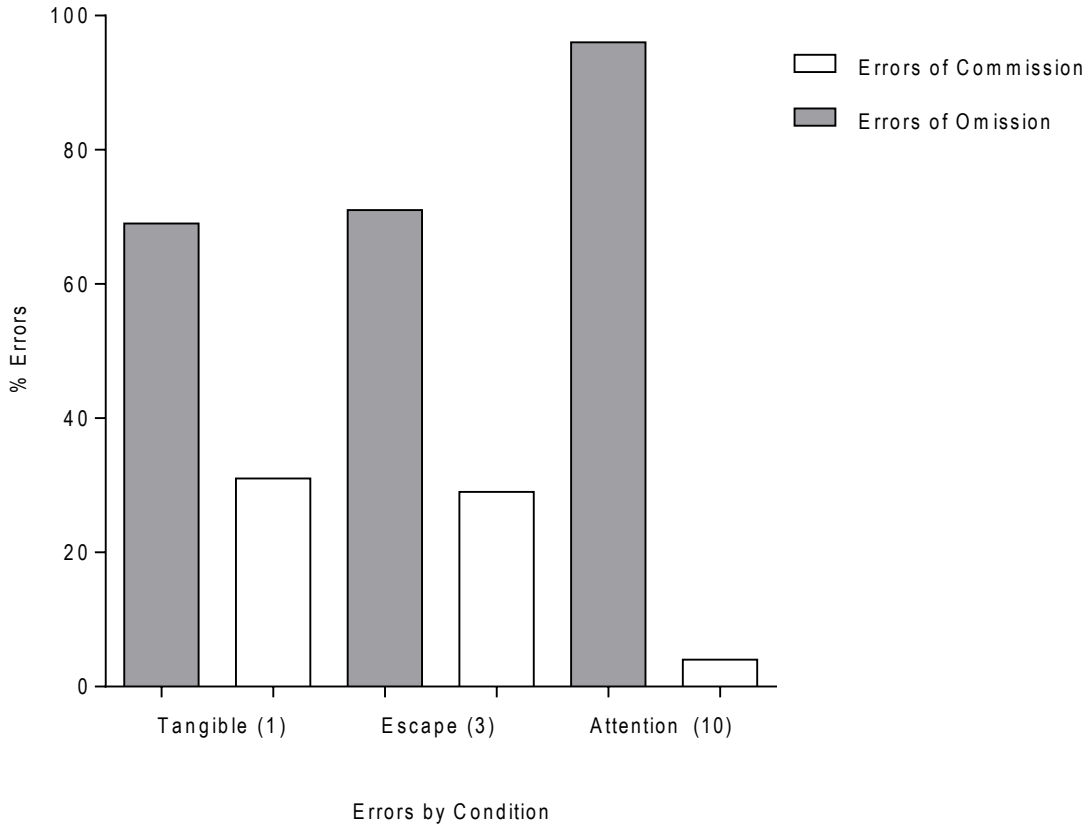


Figure 2. This figure depicts the percentage of errors of omission and commission Amelia made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission. The numbers in parenthesis (next to the condition label) denote the rehearsal analysis condition assigned to the functional analysis condition.

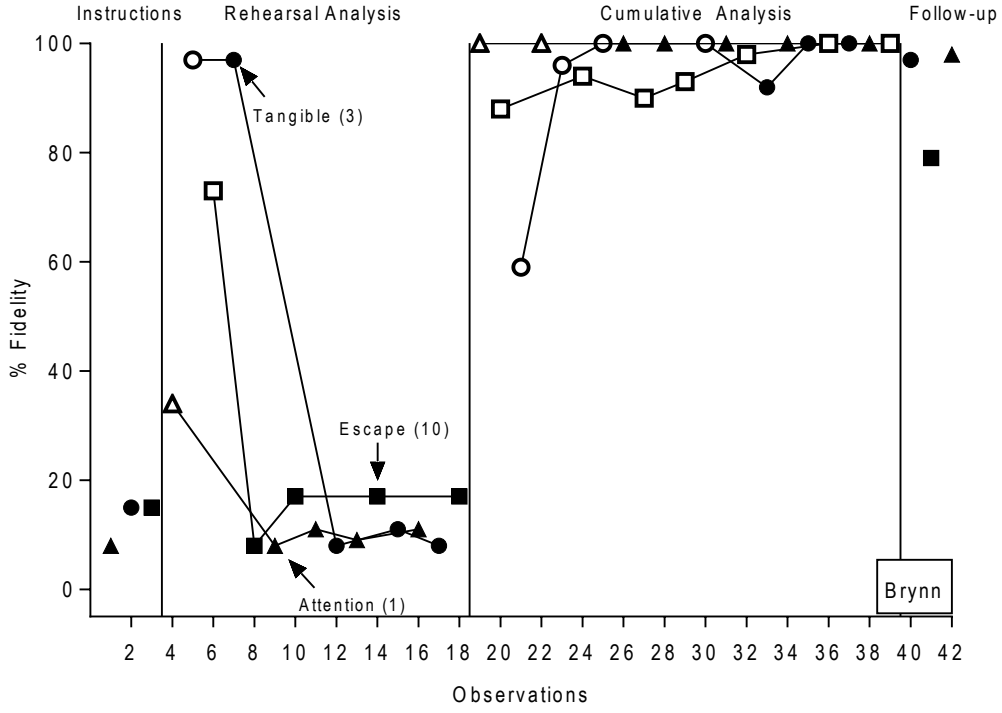


Figure 3. This figure depicts performance (% fidelity) for Brynn during experimental sessions across all four phases of the study. Fidelity during the tangible condition is denoted by the closed circles, fidelity for the escape condition is denoted by the closed squares, and fidelity of the attention condition is denoted by the closed triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. The numbers in parenthesis (next to the condition label) denote the rehearsal analysis condition assigned to the functional analysis condition.

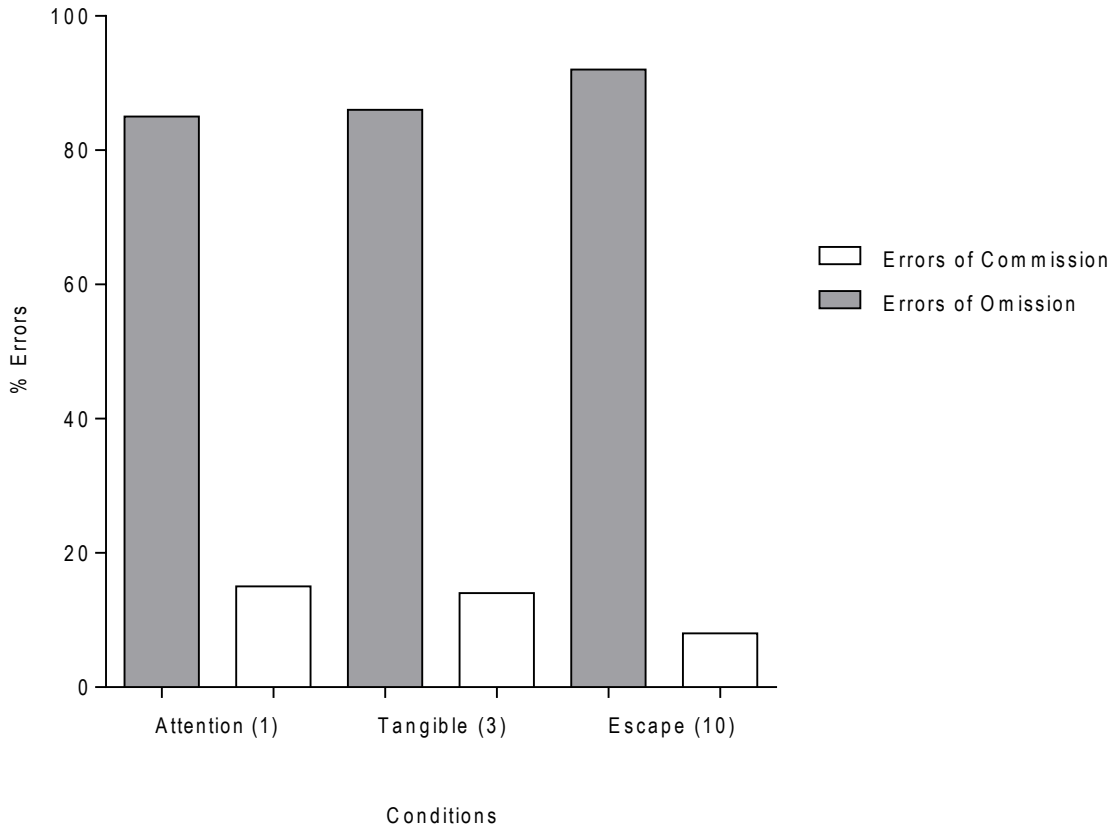


Figure 4. This figure depicts the percentage of errors of omission and commission Brynn made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission. The numbers in parenthesis (next to the condition label) denote the rehearsal analysis condition assigned to the functional analysis condition.

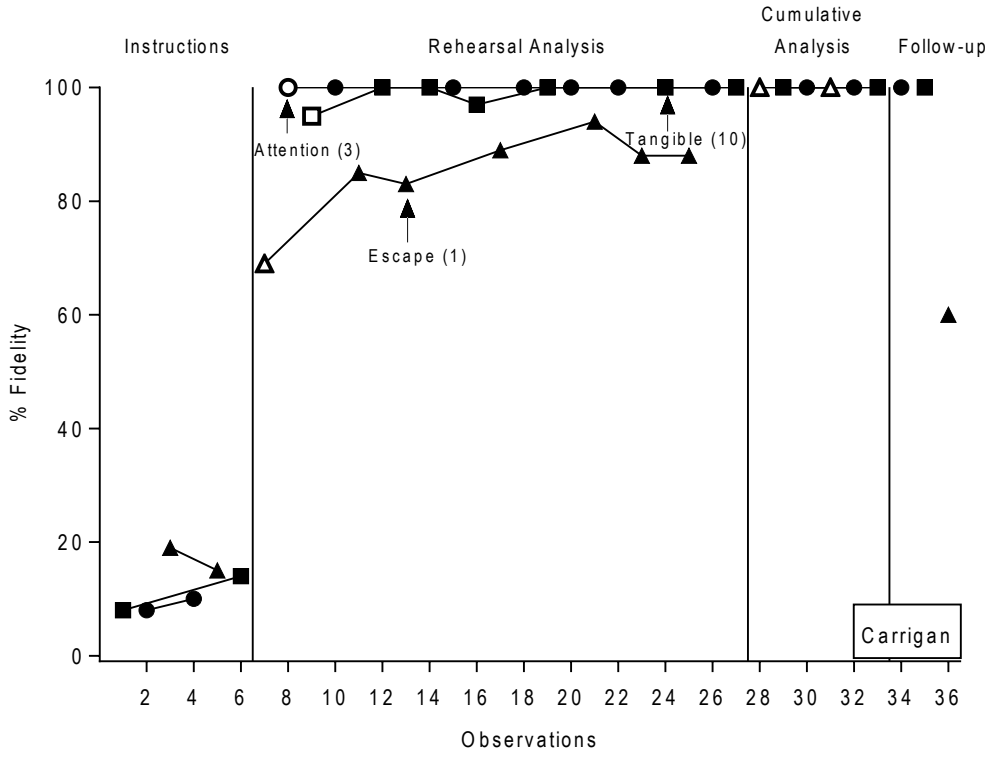


Figure 5. This figure depicts performance (% fidelity) for Carrigan during experimental sessions across all four phases of the study. Fidelity during the attention condition is denoted by the closed circles, fidelity for the tangible condition is denoted by the closed squares, and fidelity of the escape condition is denoted by the closed triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. The numbers in parenthesis (next to the condition label) denote the rehearsal analysis condition assigned to the functional analysis condition.

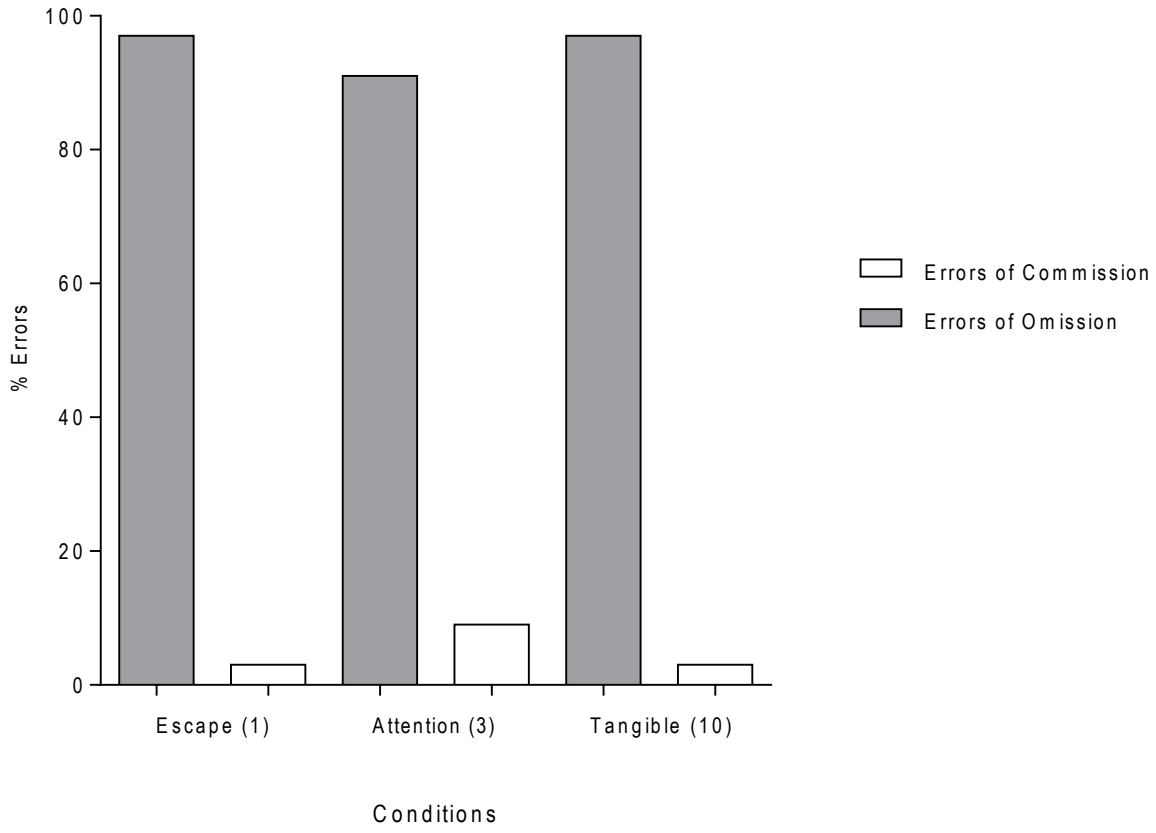


Figure 6. This figure depicts the percentage of errors of omission and commission Carrigan made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission. The numbers in parenthesis (next to the condition label) denote the rehearsal analysis condition assigned to the functional analysis condition.

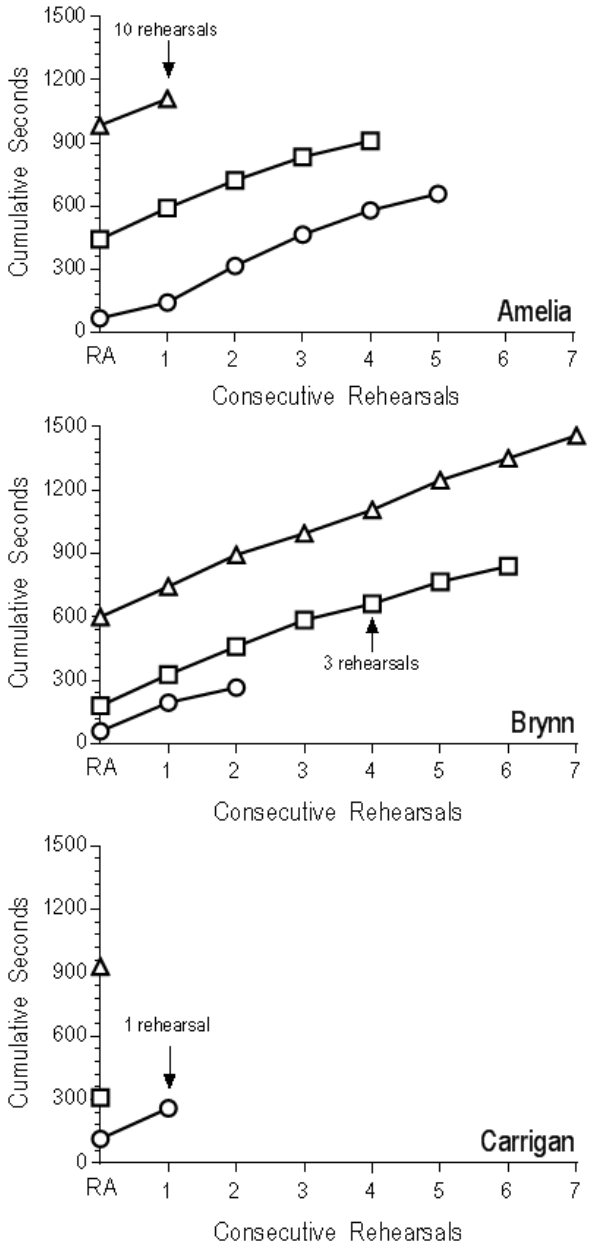


Figure 7. This figure depicts the cumulative seconds spent in rehearsal during the initial rehearsal analysis (RA) and the consecutive rehearsals for Amelia (top panel), Brynn (middle panel), and Carrigan (bottom panel). The open circles depict the one rehearsal condition, the open squares depict the three rehearsal condition, and the open triangles depict the 10 rehearsal condition.

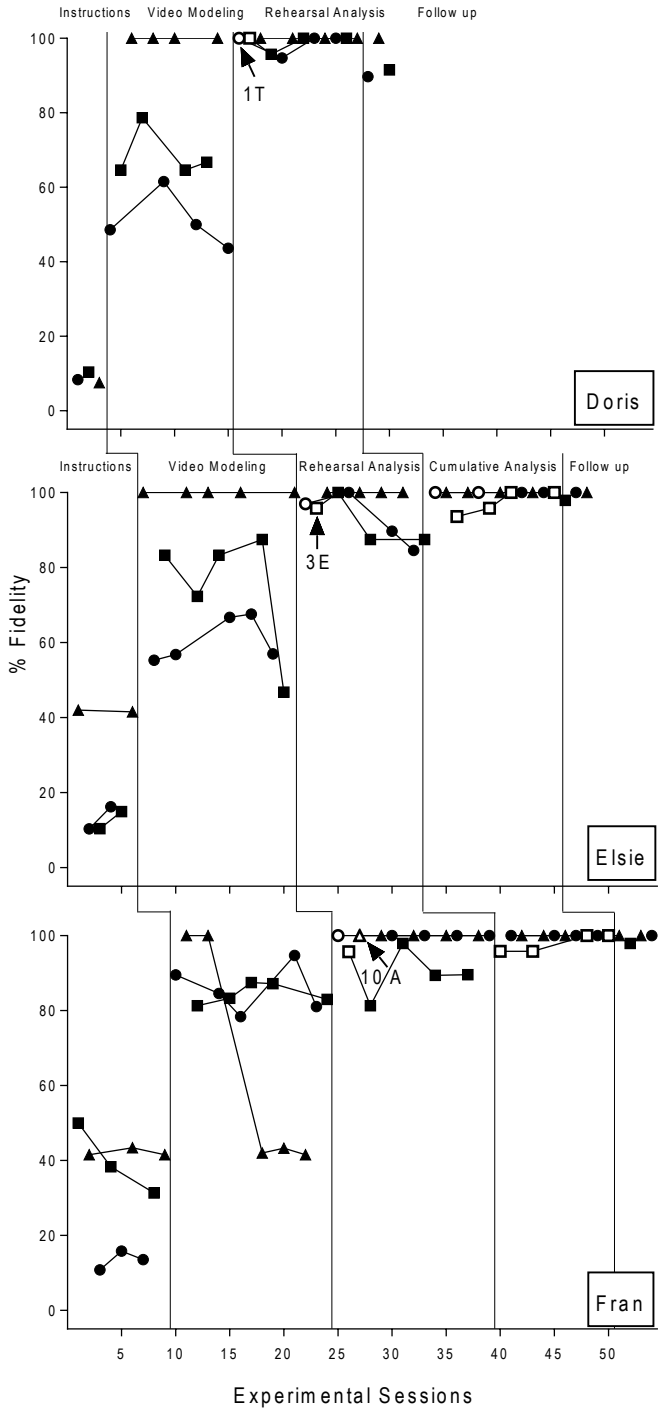


Figure 8. This figure depicts performance (% fidelity) for Doris, Elsie, and Fran during experimental sessions across all phases of the study. Fidelity during the tangible condition is denoted by the open and closed circles, fidelity for the escape condition is denoted by the open

and closed squares, and fidelity of the attention condition is denoted by the open and closed triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. "1T" denotes the tangible condition was assigned one rehearsal during the rehearsal analysis condition. "3E" denotes the escape condition was assigned three rehearsals during the rehearsal analysis condition. "10A" denotes the attention condition was assigned 10 rehearsals during the rehearsal analysis condition.

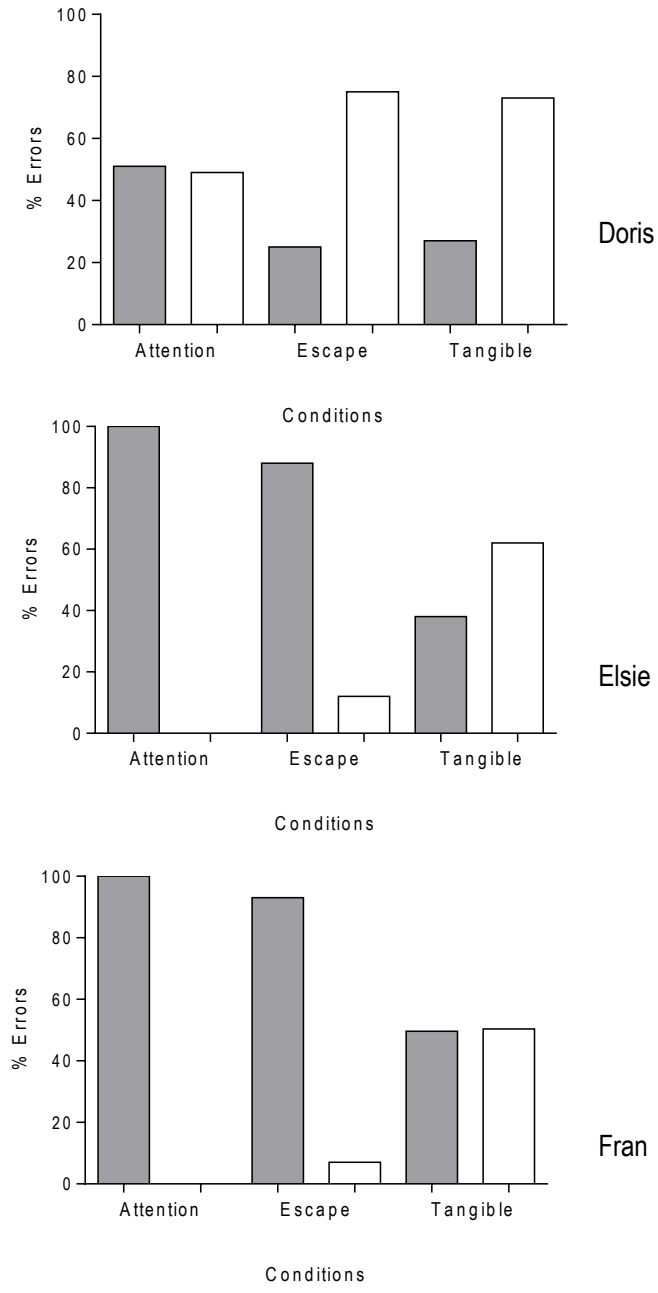


Figure 9. This figure depicts the percentage of errors of omission and commission Doris, Elsie, and Fran made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission during the attention, escape and tangible condition.

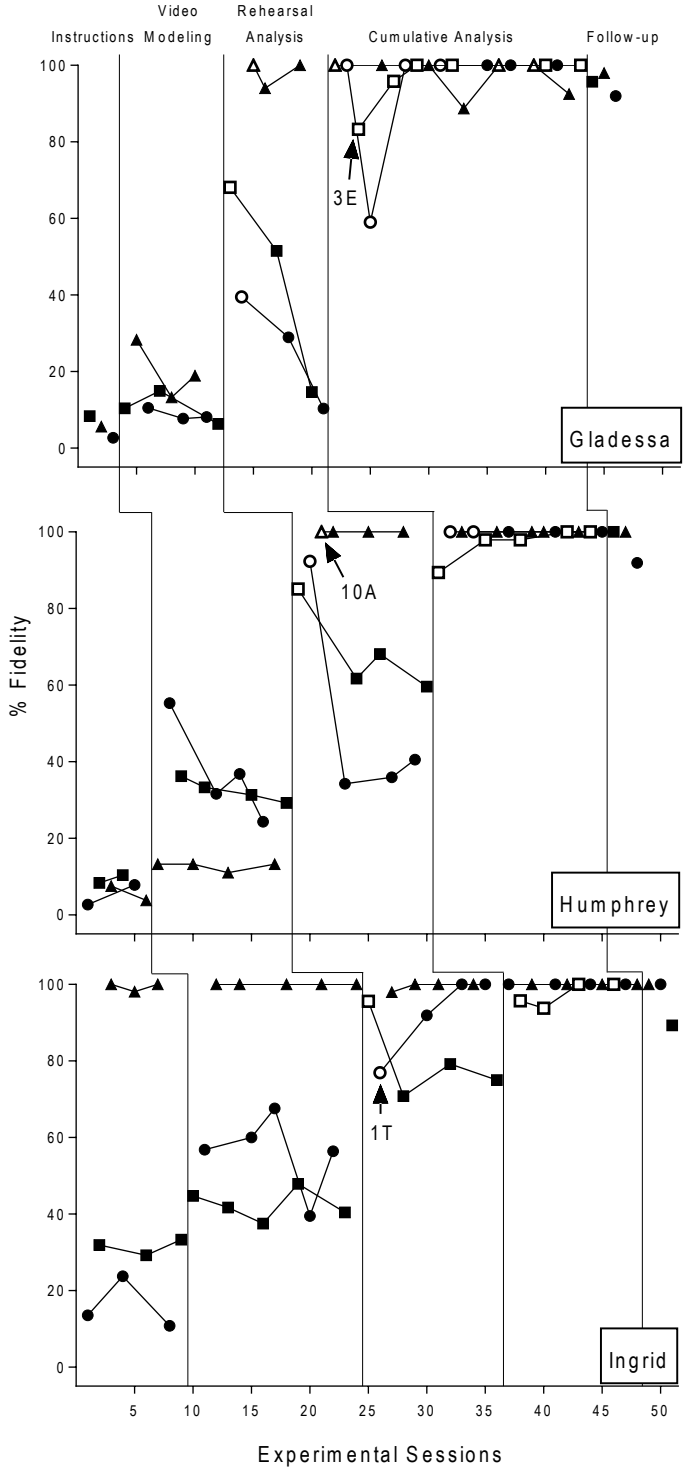


Figure 10. This figure depicts performance (% fidelity) for Gladessa, Humphrey, and Ingrid during experimental sessions across all phases of the study. Fidelity during the tangible

condition is denoted by the open and closed circles, fidelity for the escape condition is denoted by the open and closed squares, and fidelity of the attention condition is denoted by the open and closed triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. "1T" denotes the tangible condition was assigned one rehearsal during the rehearsal analysis condition. "3E" denotes the escape condition was assigned three rehearsals during the rehearsal analysis condition. "10A" denotes the attention condition was assigned 10 rehearsals during the rehearsal analysis condition.

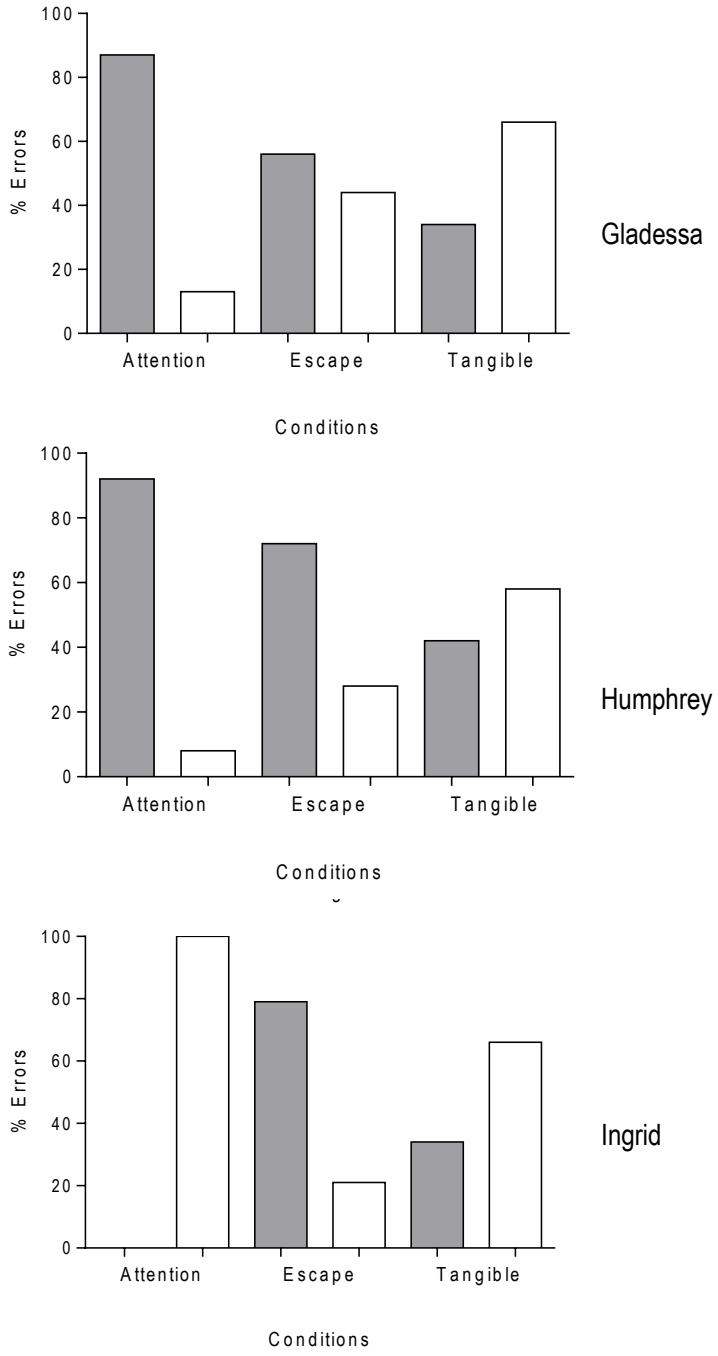


Figure 11. This figure depicts the percentage of errors of omission and commission Gladessa, Humphrey, and Ingrid made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission during the attention, escape, and tangible condition.

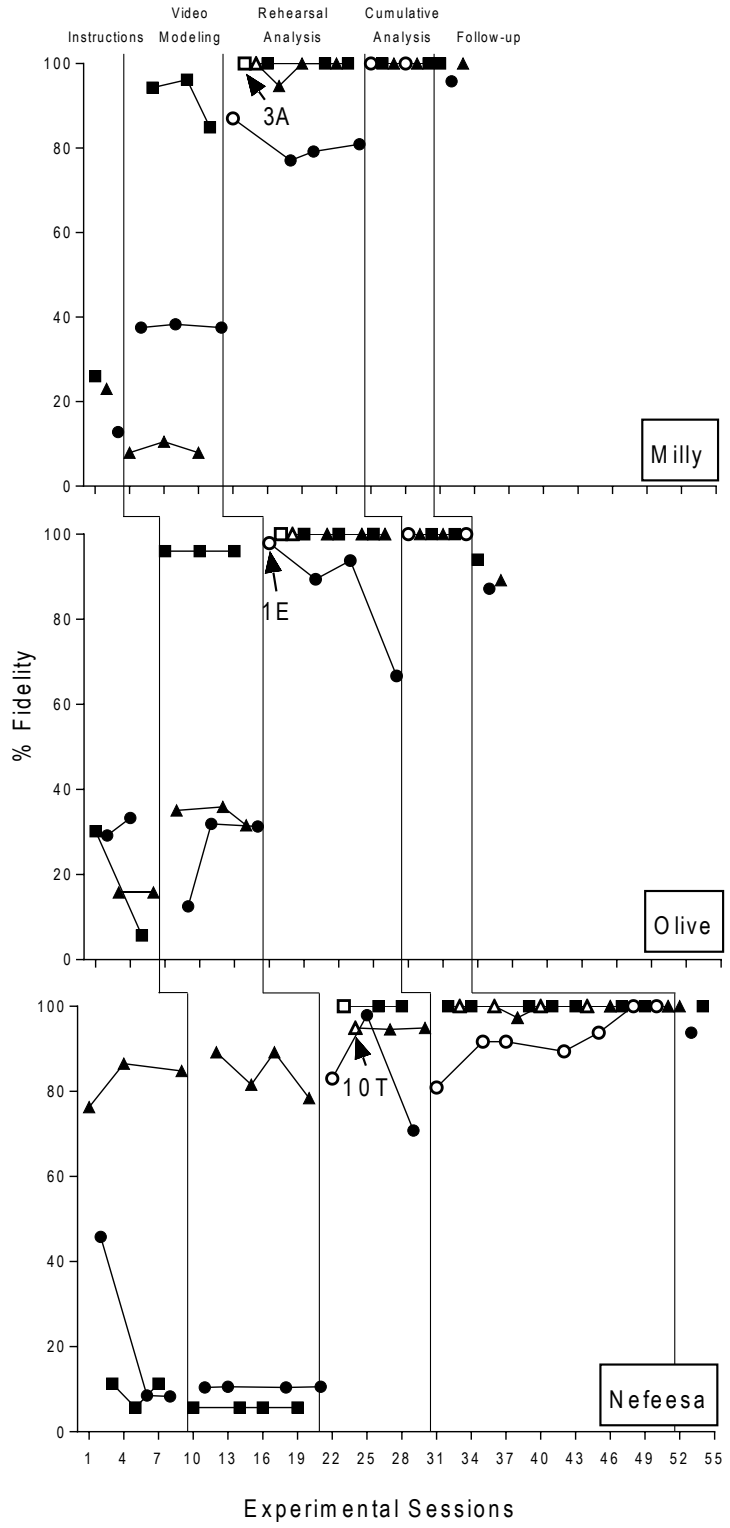


Figure 12. This figure depicts performance (% fidelity) for Milly, Olive, and Nefeesa during experimental sessions across all phases of the study. Fidelity during the escape condition is

denoted by the open and closed circles, fidelity for the attention condition is denoted by the open and closed squares, and fidelity of the tangible condition is denoted by the open and closed triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. "1E" denotes the escape condition was assigned one rehearsal during the rehearsal analysis condition. "3A" denotes the attention condition was assigned three rehearsals during the rehearsal analysis condition. "10T" denotes the tangible condition was assigned 10 rehearsals during the rehearsal analysis condition.

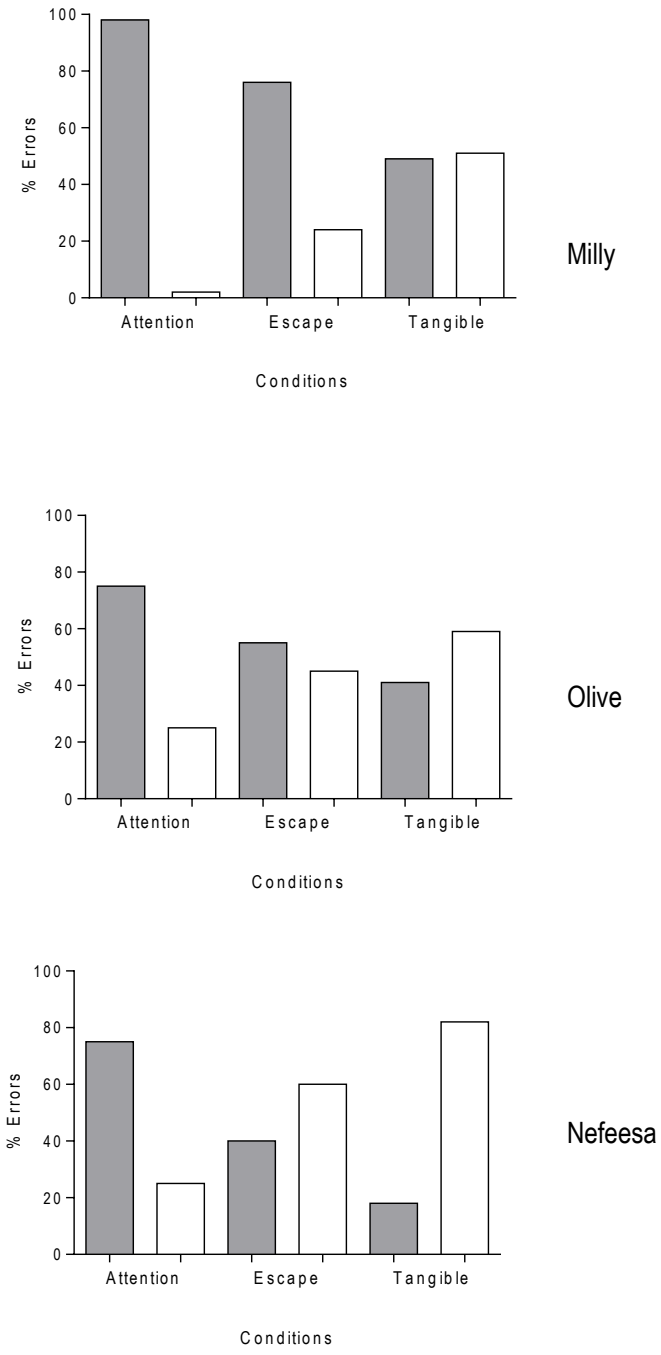


Figure 13. This figure depicts the percentage of errors of omission and commission Milly, Olive, and Nefeesa made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission during the attention, escape, and tangible condition.

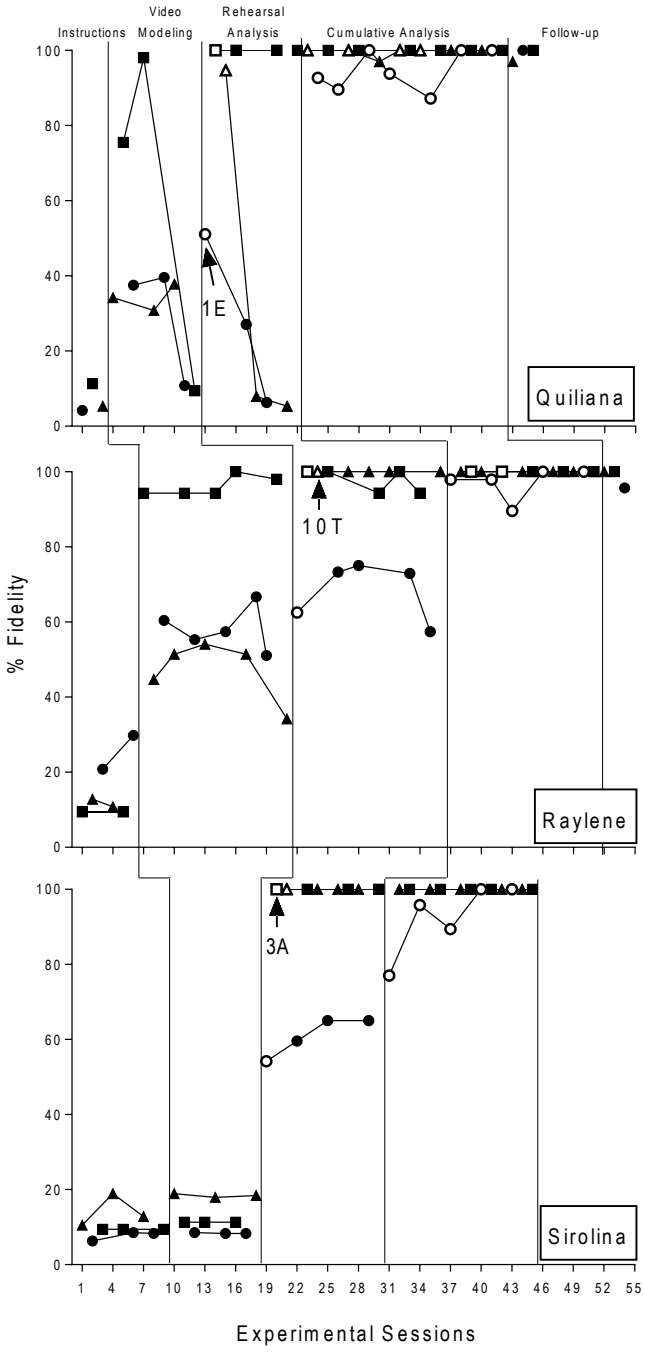


Figure 14. This figure depicts performance (% fidelity) for Quiliana, Raylene, and Sirolina during experimental sessions across all phases of the study. Fidelity during the escape condition is denoted by the open and closed circles, fidelity for the attention condition is denoted by the open and closed squares, and fidelity of the tangible condition is denoted by the open and closed

triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. "1E" denotes the escape condition was assigned one rehearsal during the rehearsal analysis condition. "3A" denotes the attention condition was assigned three rehearsals during the rehearsal analysis condition. "10T" denotes the tangible condition was assigned 10 rehearsals during the rehearsal analysis condition.

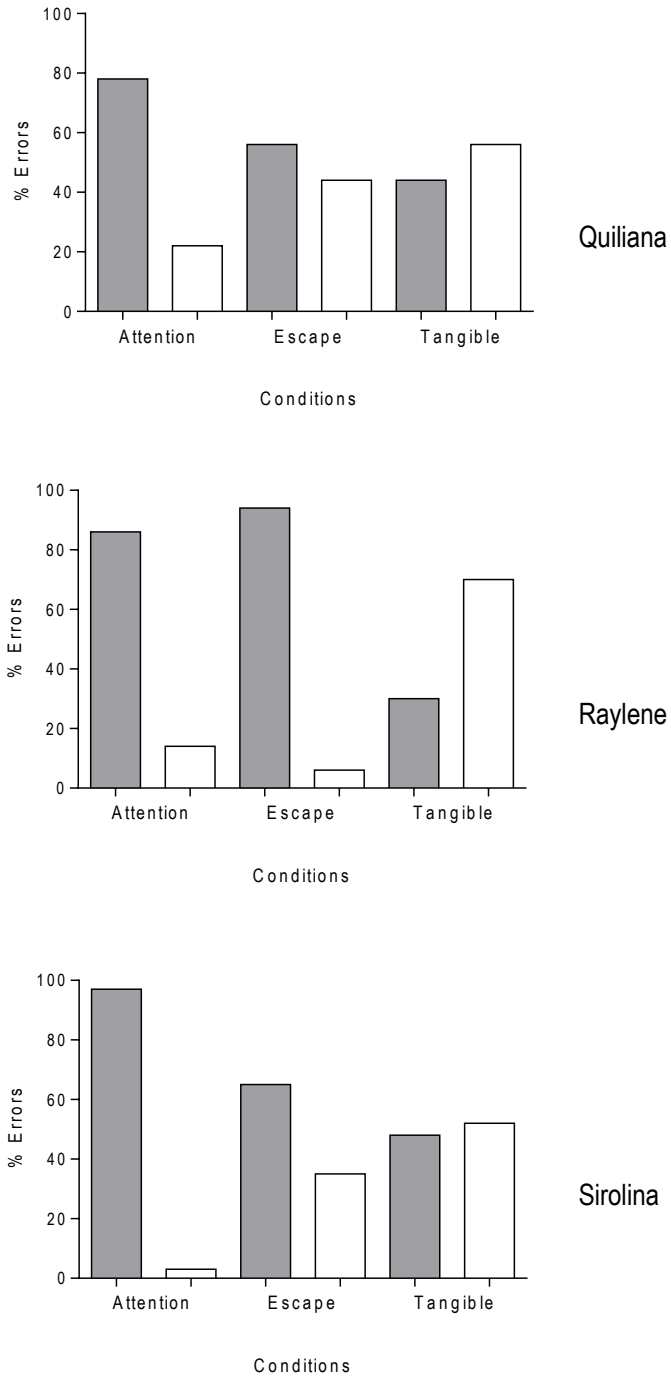


Figure 15. This figure depicts the percentage of errors of omission and commission Quiliana, Raylene, and Sirolina made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission during the attention, escape, and tangible condition.

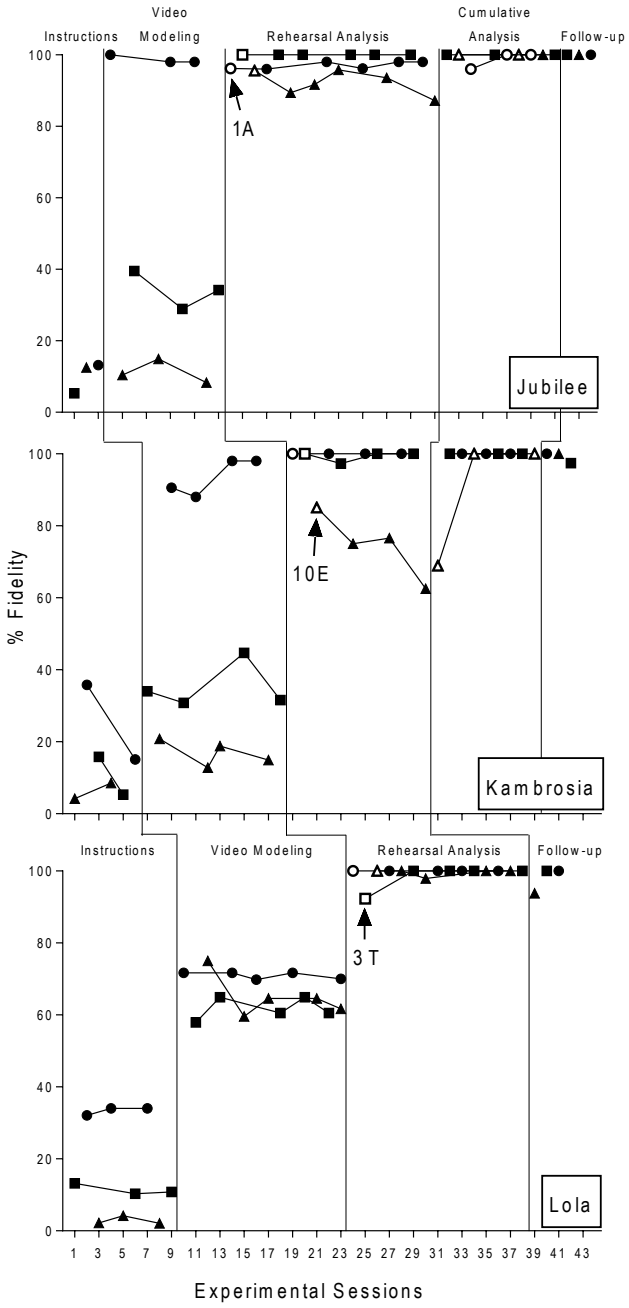


Figure 16. This figure depicts performance (% fidelity) for Jubilee, Kambrosia, and Lola during experimental sessions across all phases of the study. Fidelity during the attention condition is denoted by the open and closed circles, fidelity for the tangible condition is denoted by the open and closed squares, and fidelity of the escape condition is denoted by the open and closed

triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. "1A" denotes the attention condition was assigned one rehearsal during the rehearsal analysis condition. "3T" denotes the tangible condition was assigned three rehearsals during the rehearsal analysis condition. "10E" denotes the escape condition was assigned 10 rehearsals during the rehearsal analysis condition.

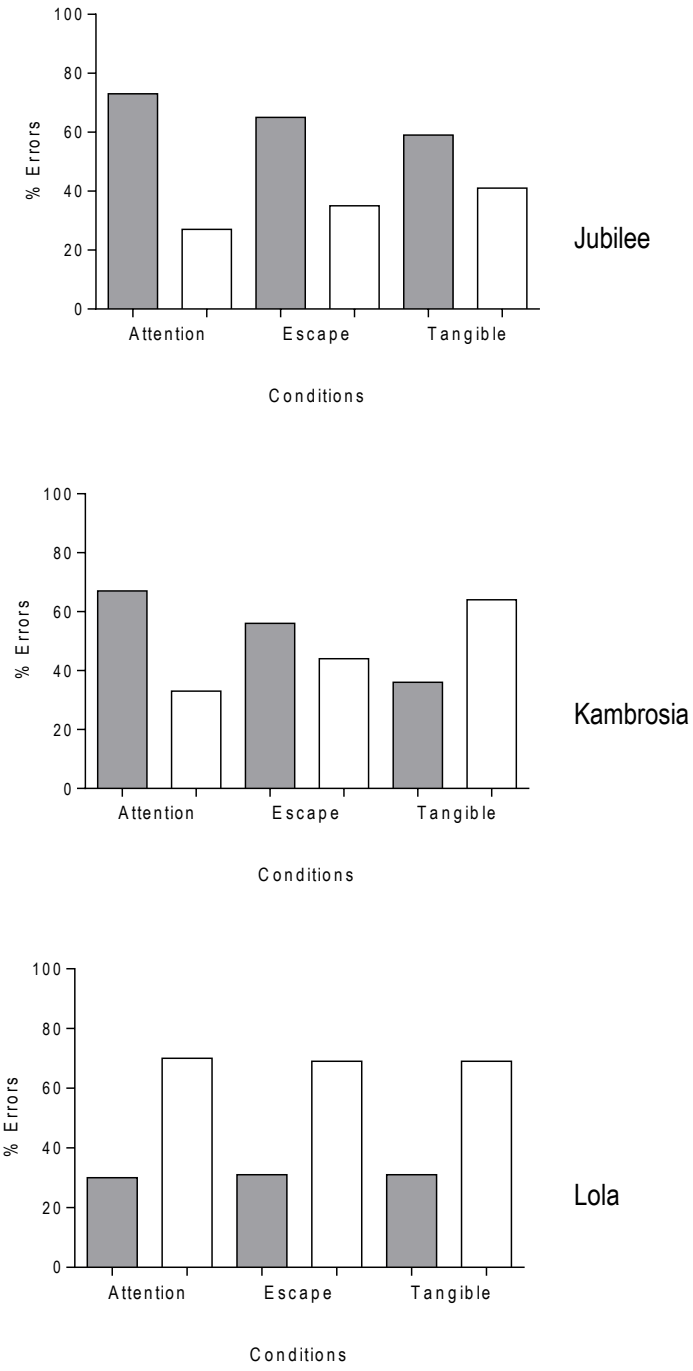


Figure 17. This figure depicts the percentage of errors of omission and commission Jubilee, Kambrosia, and Lola made throughout the study for each condition. Shaded bars denote errors of omission and white bars denote errors of commission during the attention, escape, and tangible condition.

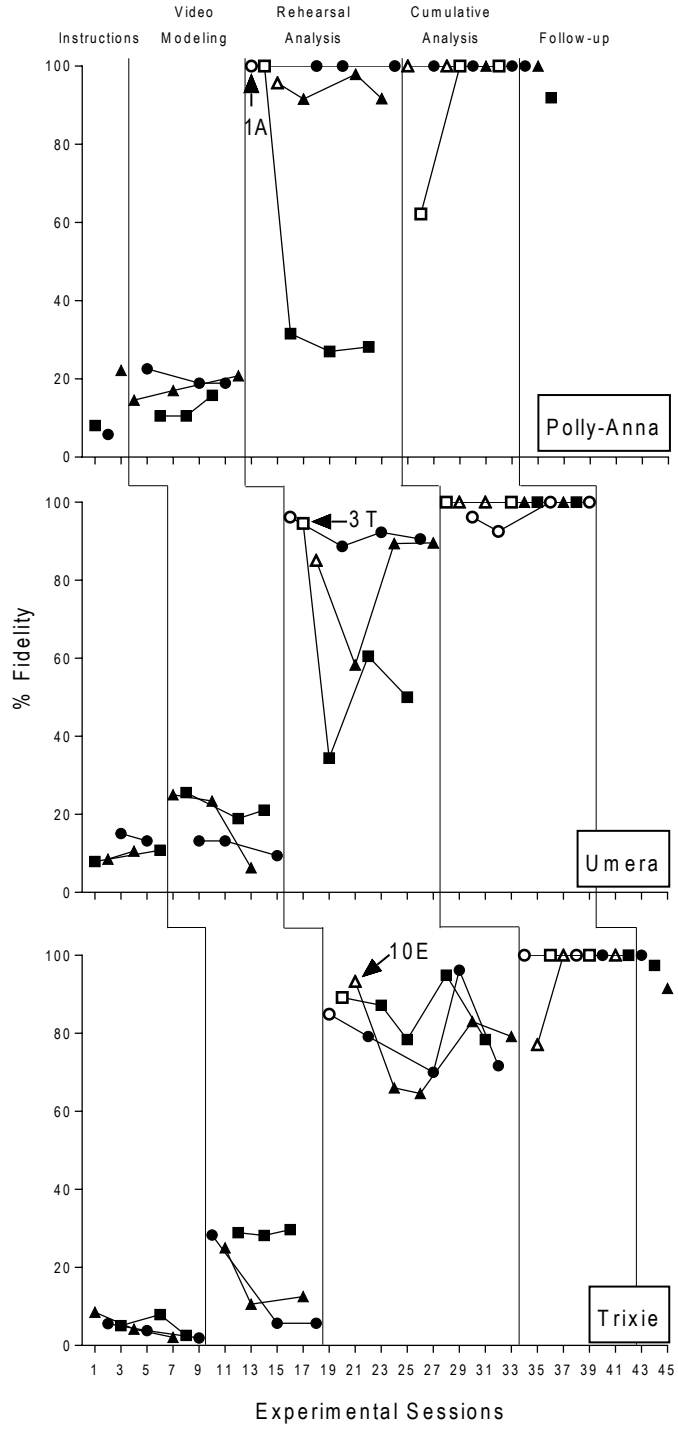


Figure 18. This figure depicts performance (% fidelity) for Polly-Anna, Umera, and Trixie during experimental sessions across all phases of the study. Fidelity during the attention

condition is denoted by the open and closed circles, fidelity for the tangible condition is denoted by the open and closed squares, and fidelity of the escape condition is denoted by the open and closed triangles. The open data points represent fidelity during experimental sessions that were immediately preceded by rehearsal. "1A" denotes the attention condition was assigned one rehearsal during the rehearsal analysis condition. "3T" denotes the tangible condition was assigned three rehearsals during the rehearsal analysis condition. "10E" denotes the escape condition was assigned 10 rehearsals during the rehearsal analysis condition.

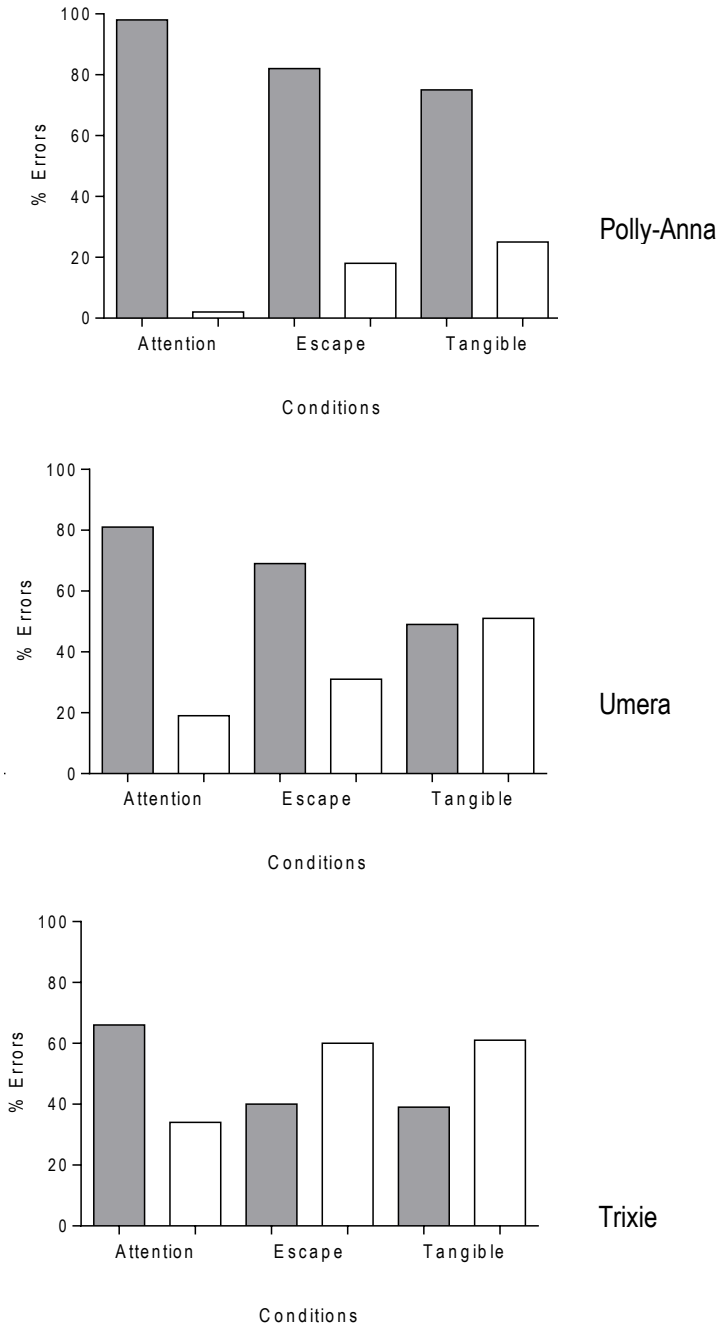


Figure 19. This figure depicts the percentage of errors of omission and commission Polly-Anna, Umera, and Trixie made throughout the study for each condition. Shaded bars denote errors of

omission and white bars denote errors of commission during the attention, escape, and tangible condition.

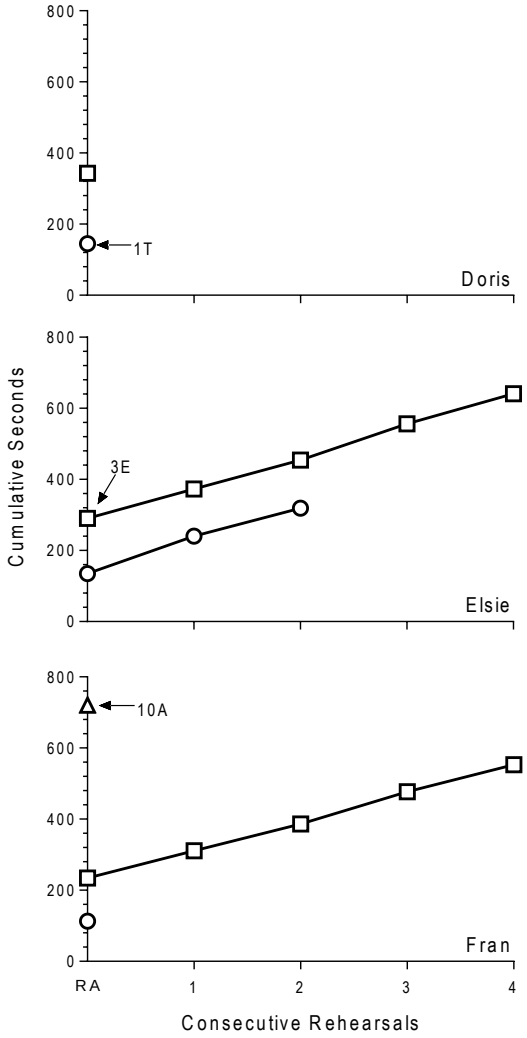


Figure 20. This figure depicts the cumulative seconds spent in rehearsal during the initial rehearsal analysis (RA) and the consecutive rehearsals for Doris (top panel), Elsie (middle panel), and Fran (bottom panel). The open circles depict the one rehearsal condition (tangible), the open squares depict the three rehearsal condition (escape), and the open triangles depict the 10 rehearsal condition (attention).

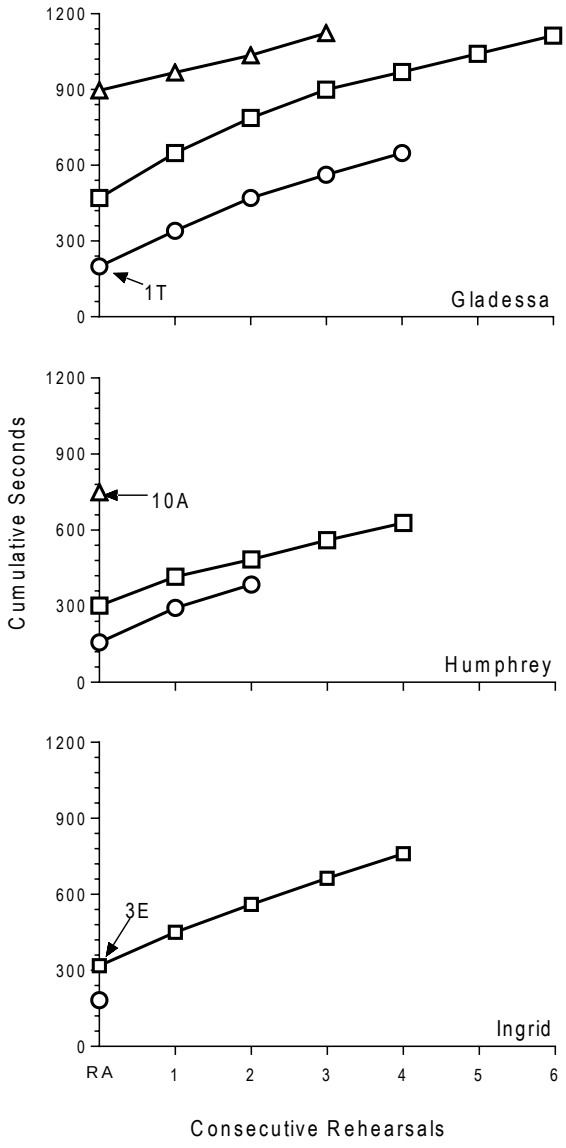


Figure 21. This figure depicts the cumulative seconds spent in rehearsal during the initial rehearsal analysis (RA) and the consecutive rehearsals for Gladessa (top panel), Humphrey (middle panel), and Ingrid (bottom panel). The open circles depict the one rehearsal condition

(tangible), the open squares depict the three rehearsal condition (escape), and the open triangles depict the 10 rehearsal condition (attention).

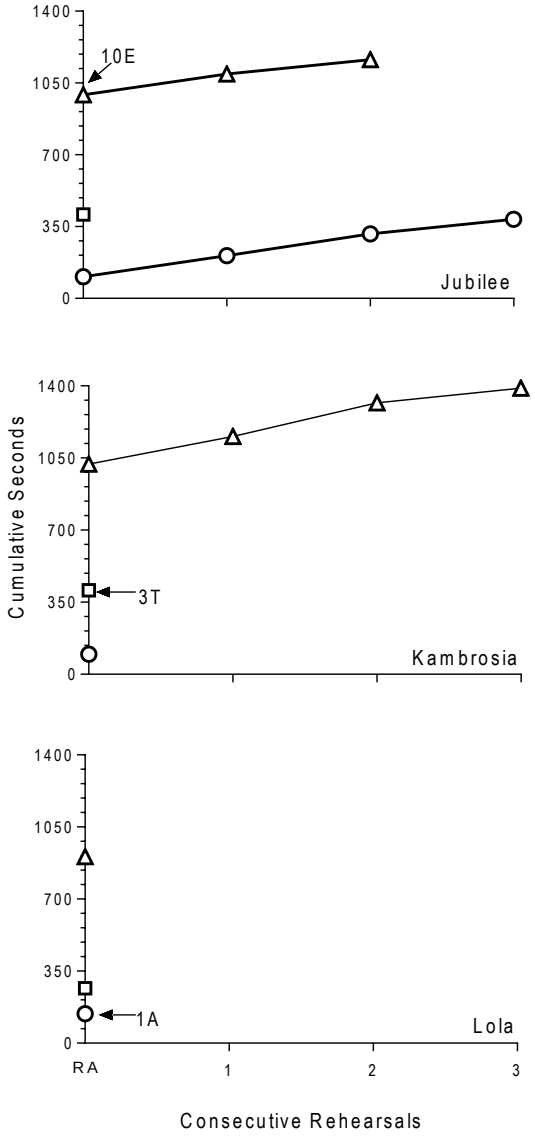


Figure 22. This figure depicts the cumulative seconds spent in rehearsal during the initial rehearsal analysis (RA) and the consecutive rehearsals for Jubilee (top panel), Kambrosia (middle panel), and Lola (bottom panel). The open circles depict the one rehearsal condition

(attention), the open squares depict the three rehearsal condition (tangible), and the open triangles depict the 10 rehearsal condition (escape).

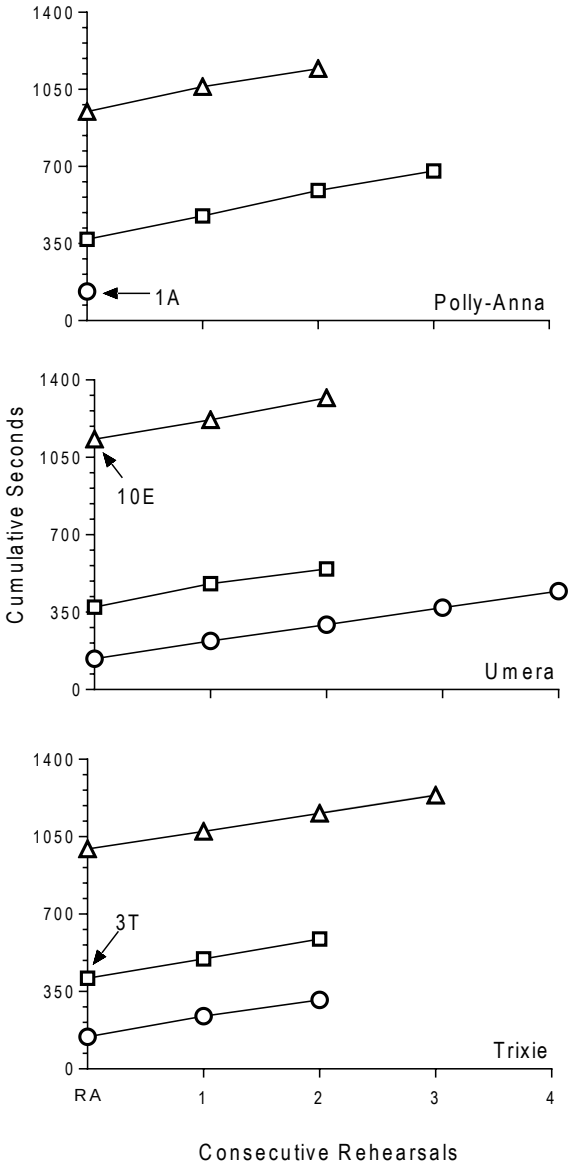


Figure 23. This figure depicts the cumulative seconds spent in rehearsal during the initial rehearsal analysis (RA) and the consecutive rehearsals for Polly-Anna (top panel), Umera (middle panel), and Trixie (bottom panel). The open circles depict the one rehearsal condition

(attention), the open squares depict the three rehearsal condition (tangible), and the open triangles depict the 10 rehearsal condition (escape).

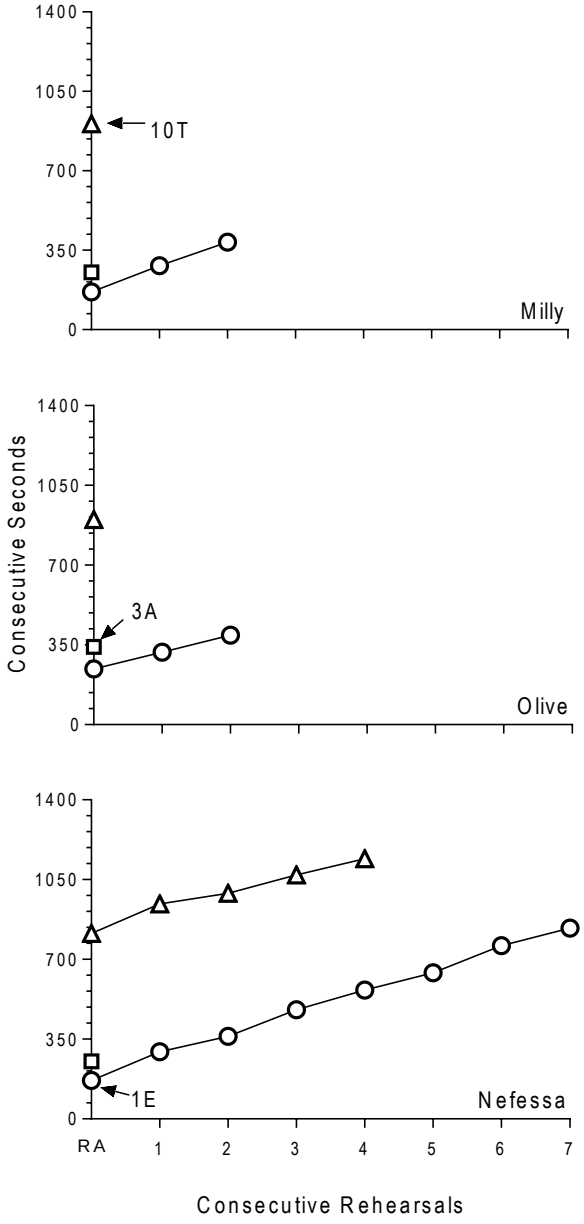


Figure 24. This figure depicts the cumulative seconds spent in rehearsal during the initial rehearsal analysis (RA) and the consecutive rehearsals for Milly (top panel), Olive (middle

panel), and Nefeesa (bottom panel). The open circles depict the one rehearsal condition (escape), the open squares depict the three rehearsal condition (attention), and the open triangles depict the 10 rehearsal condition (tangible).

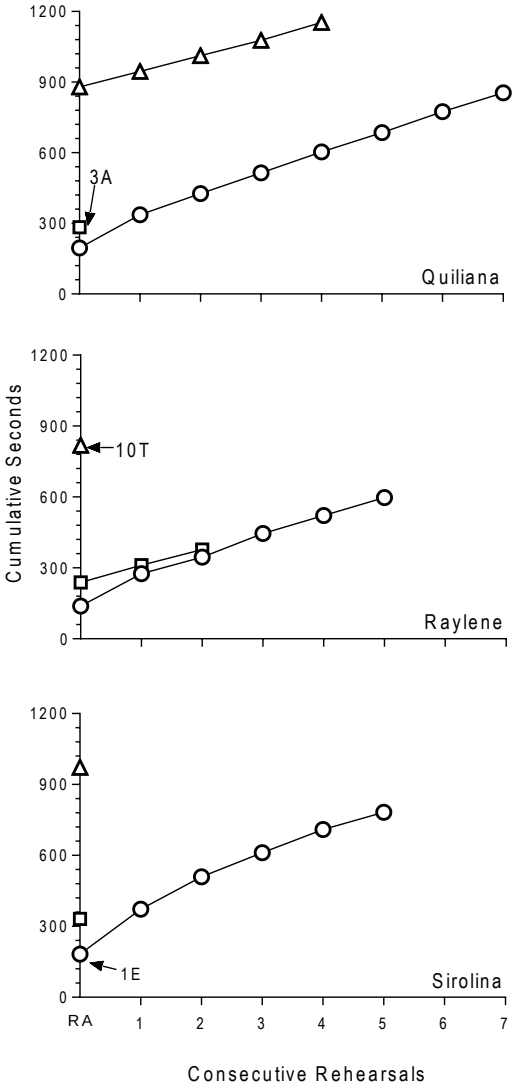


Figure 25. This figure depicts the cumulative seconds spent in rehearsal during the initial rehearsal analysis (RA) and the consecutive rehearsals for Quiliana (top panel), Raylene (middle

panel), and Sirolina (bottom panel). The open circles depict the one rehearsal condition (escape), the open squares depict the three rehearsal condition (attention), and the open triangles depict the 10 rehearsal condition (tangible).

Appendix A

Authors	Participants	Procedures	Results

Arnal et al. (2007)	Four undergrads	AB design across all participants
		• Baseline
		  o Written instructions
		  o Role-play with confederate three learning programs
		• Training
		  o Self-instructed manual with content questions
		  o Mastery criterion of 100% on content questions
		  o Role-play with confederate
		  o **Mastery Criterion: 90% or higher**
		• Social validity survey
			• Overall, participants performance improved after training

Bishop and Kenzer (2012)	11 direct-care staff for children with autism	Multiple probe design
		• Baseline
		  o Implement discrete-trial training
		  o No instructions
		• Group instruction
		  o Five-item quiz
		  o Lecture to review reinforcement concepts
		  o Video models
		  o Role-played with other participants and received feedback
		• Post-instruction
		  o Identical to baseline
		• In vivo feedback
		  o **Mastery Criterion: 75% during post-instruction observations**
		  ▪ If participants performed below 75%, they received feedback from the experimenter during therapy sessions
		• Follow-up
		  o Four weeks after participants obtained 75% or higher during post-instruction
			• Group training improved implementation

Bolton and Mayer (2008)	Three paras working with children with autism	Delayed MBD across participants
		• Baseline & training
		  o Small group training
		  o Instructions about applied behavior analysis and discrete-trial training
		  o Participants implemented discrete-trial training with other participants
		  o Instructions + modeling
		  o Practice one trial from each program with other participants—received feedback
		  o **Mastery Criterion: 98% or higher**
		• Generalization: Implementation with child
			• All participants improved performance after training
			• Mastery criterion was met after:
			  o Two, three, and four practice sessions

Chafouleas et al. (2012)	177 undergrads	Group design
		• 6 conditions
		• **Three or six practice ratings**
		  o Standard training
		  ▪ Didactic, modeling, practice video clips (three or six times), feedback
		  ▪ Practice consisted of watching and rating a novel video clip, experimenter reviewing the correct rating---this was
			• Six practices did not always produce higher accuracy than three practices

		repeated 3 or 6 times—**NO mastery criterion** o Frame-of-reference ▪ Didactic, modeling (provided a FOR when giving rational for video, practice video clips (3 or 6) + feedback (participants reported on observed behavior—participants rewatched videos while experimenter pointed out specific behavior as it occurred o FOR + rater error training ▪ Same procedure as previous conditions + additional instructional slides added to training	
Dib & Sturmey	Three teaching assistants; three children with autism	MBD • Baseline: conducted discrete-trial training as usual with clients • Training o Instructions, modeling, rehearsal (with client), feedback o Mastery criterion no specified o # of rehearsals not specified	• Improvements in discrete-trial training fidelity • Decreases in client stereotypy
DiGennaro et al. (2005)	Four teachers	MBD • Pretraining baseline • Training o Didactic, modeling, coaching, feedback o Performance (student/teacher) feedback + negative reinforcement o Missed steps were reviewed and **practiced three times** o Phase continued until **100% integrity** for **three consecutive days was obtained** • Fading o If participants met criterion, feedback faded	• Performance feedback + negative reinforcement contingency was effective in improving treatment integrity after decreased performance was observed following initial training • Teachers rated directed rehearsal as an acceptable intervention to improve treatment integrity
DiGennaro et al. (2007)	Four special education teachers	MBD • Pretraining baseline • Training o Didactic, modeling, coaching, feedback • Goal setting/student performance feedback • Teacher performance feedback + directed rehearsal w/ meeting cancelation o This phase implemented if treatment integrity fell below 100% in previous phase o Missed steps were reviewed and **practiced three times** o Phase continued until **100% integrity for three consecutive days was obtained** • Fading • If participants met criterion, feedback faded	• Teacher performance feedback + directed rehearsal with meeting cancelation increased teacher treatment integrity • Decreased rates of problem behavior observed for three of four students
Downs et al. (2008)	Six undergrads, four children with DD	MBD across participants • Baseline o Experimenter observed participants in classroom setting o No specific feedback • Training o Didactic instruction o Modeling o Practice + feedback (two 30-min sessions) o **No indication of the use of a mastery criterion**	• All participants reached 90% correct implementation by the second training session in baseline • Performance continued to improve after training sessions in the next phase • Performance remained high during follow-up

		• Intervention sessions
		  ○ Specific feedback
		  ○ Implement with different students
		• Follow-up sessions
		  ○ Two, four, six, & 10 weeks after intervention sessions
		  ○ Discrete-trial training with two different students
			sessions
			• Students had higher performance during the intervention phase; three of which maintained high performance during follow-up

Erbas et al. (2006)	Five special education teachers, one student teacher	Multiple probe design across participants
		• Baseline—participants were given Iwata (1982/1994)
		• Training I
		  ○ Didactic instruction, video model of each condition shown twice, quiz (90% or higher to move to next phase)
		• Training II
		  ○ Definitions of problem behavior provided/discussed
		  ○ Participants interviewed parents and teacher aides about problem behavior they experience with target children
		  ○ Participants observed students in classroom—summarize interview/observation & suggest function of problem behavior—once agreement reached, participants implemented functional analysis conditions
		  ○ Feedback provided after each condition by viewing videotape
		  ○ **No indication of the use of a mastery criterion**
			○ The training significantly improved participants performance compared to baseline

Fazzio et al. (2009)	Five undergrads	MBD across participants + AB design
		• Baseline
		  ○ Written instructions
		  ○ Role-play with confederate with no feedback
		• Phase 2: Self-instruction manual
		  ○ Principles of applied behavior analysis
		  ○ Steps of discrete-trial training
		  ○ Study questions
		  ○ Written test
		  ○ Role-play with confederate
		  ○ **Mastery Criterion: 90% or higher before moving to phase four**
		  ▪ <90% move to phase three
		• Phase three: Feedback + modeling
		  ○ Review of performance in previous phase
		  ○ Modeling of incorrect steps three times during role-play
		  ○ Role-play with confederate
		  ○ **Mastery Criterion: 90% or higher before moving to phase four**
		  ▪ <90%=repeat phase three
		• Phase four: Generalization tasks
		  ○ Role-play new task with confederate
		• Phase five: Generalization of teaching with student with autism
		  ○ Discrete-trial training in home with child
		• Social validity survey
			• Participants performance improved after instruction manual
			• Modeling + feedback further improved performance

Gianoumis et al. (2012)	three teaching assistants; six children w/ autism	MBD across participants • Pre-training ○ Task analysis (preference assessment & natural language paradigm)	• Two of three met mastery criterion for both skills after one training session • Performance remained

		○ Implemented with child • Training ○ Given graph of baseline performance ○ 10-min training sessions ▪ Instructions ▪ Modeling ▪ **Rehearsal (two times with client)** ▪ Feedback ▪ Repeated until end of training session • Post-training ○ **Mastery criterion: 90% or higher across two consecutive sessions** • Generalization probes ○ Sessions conducted with different child ○ No training or feedback	high during post-training • Four of six children improved language use and decreased maladaptive behavior during the staff training phase
Hall et al. (2010)	Six paras for children with or at-risk for ASD	MBD • Baseline • 1-day workshop ○ Participants received literature about specific teaching technique ○ **Two rehearsals** ○ Performance feedback • Generalization settings ○ No feedback from supervisors on targeted skills ○ Decreased performance resulted in feedback for the 1st generalization setting	○ Performance during workshop was significantly higher ○ Generalization of skills post-workshop did not occur • When given feedback on performance in 1st setting, performance did not improve in the 2nd setting until feedback was provided for that particular setting
Iwata et al. (2000)	11 junior/senior level undergrads	MBD across participants • Baseline—method section for Iwata (1982/1994) • Training ○ Written descriptions of conditions ○ Video model of each condition ○ Quiz: 90% of higher required ○ Conducted conditions as a role-play—could bring outline into sessions, given feedback ○ Videotaped reviewed of role-play sessions ○ **Role-plays and video viewing continued until participants conducted two consecutive sessions at 95% or higher for each condition**	○ Participants performance improved after training
Lambert et al. (2013)	Six supervisors in residential facility; Nine house managers; Nine clients	Nonconcurrent MBD • Baseline: Read Bloom et al. (2011): Implement trial-based conditions with client • Training ○ Written descriptions ○ Supervisor modeled therapist behavior ○ Supervisor role-played client ○ If errors were made during role-play, supervisor reviewed error, modeled correct implementation, and gave manager another opportunity to practice ○ **Role-plays continued until participants performance was 100% for all trial types** • Post-training ○ Participants conducted trials similar to baseline and received feedback from supervisor	○ House manager performance across conditions improved after training
Lavie and Sturmey (2002)	Three teaching assistants	MBD across participants • Baseline ○ Participants collected data and selected	• Improved performance after training

		stimuli o No instructions • Training o Description of preference assessment skills o Checklist of steps o Viewed video tape model of procedure o Practiced with child o Feedback from trainer o Video, practice, feedback repeated until **85% of steps implemented correctly across two consecutive sessions**	
Lerman et al. (2004)	Four teachers working with children with autism, One master's student; Six children with autism	MBD across Participants • Baseline o Role-play with experimenter • Workshop (one week) o Lectures o Handouts o Role-play + feedback ▪ **Three role-plays per targeted skill** ▪ Two role-plays conducted before feedback provided—third role-play **performance criteria was 80% or above**; additional role-play conducted if criteria was not met • Post-instruction o Assigned to work with child to demonstrate skills ▪ Feedback provided based on number of trials or after a fixed period of time o Direct teaching ▪ Feedback no longer provided when Participants implemented teaching tasks with 80% or higher accuracy • Generalization o Paired with two children whom they did not work with outside of generalization sessions	• Participants implemented preference assessments with near perfect fidelity after training • Participants took longer to meet criteria for prompting strategies—were able to implement skills at criteria when feedback was no longer provided • Participants implemented incidental teaching to criteria by the third role-play in the workshop • Children showed improvements in correct responding
Madzharova et al. (2012)	One teaching assistant, two students with autism	Study 1: ABC design • Baseline o Task analysis o No feedback • Training o Task analysis—reviewed each step o Video modeling o Rehearsal—role-play with experimenter o Feedback based on performance during rehearsal o **Mastery Criterion: 90% or higher across three consecutive sessions** • Post-training and maintenance o Similar to baseline o Maintenance=2 months after post-training	• Performance improved after training—highest percentage in post-training • Student performance increased—also highest in post-training
McBride & Schwartz (2003)	Three teachers	Multiple probe design • Baseline • Training: instructions, rehearsal, feedback o Rehearsal with client • Mastery Criterion: 80% or higher	• Improved rate of instruction and student engagement

		across three consecutive sessions • # of rehearsals to mastery not indicated o Generalization o Social validity survey	
McKenney et al. (2013)	Three middle school teachers	Nonconcurrent MBD across participants • Baseline o Read description of functional analysis conditions, implement condition in mock functional analysis with a confederate • Training o PowerPoint o Oral quiz o Operational definitions of student behavior o Modeling o **Rehearsal + feedback until 80% integrity across two consecutive sessions** • Classroom functional analyses o Implement functional analysis conditions with student • Social validity survey	• Two of three participants were able to maintain high fidelity both during training and in the classroom • Confound: Some participants data were already high before training began • One participant did not maintain high fidelity during classroom functional analyses • Teachers reported that the training was acceptable and it would be useful in the future
McKnight and Kearney (2001)	Eight direct care staff working in a group home	Group design: Three standardized assessments were used to evaluate behavior after training • Training o Treatment group ▪ Lecture ▪ Discussion for procedures used in various scenarios (e.g., eating, leisure, hygiene) presented by the instructor ▪ Role-play with other participants activities discussed in the previous session • Feedback provided by the instructor for number of choice opportunities presented • **Role-played 2x** ▪ Participants role-played with clients • Feedback provided • **Role-played 2x** ▪ Review of previous 4 sessions o Control group ▪ Lecture ▪ Review of lecture o **No indication of use of mastery criterion**	• Those in the treatment group generally presented more options to residents compared to those in the control group • Changes in adaptive and maladaptive resident behavior was not observed • Authors suggest training (role-play) may have been too brief in order to see more robust results
Moore et al. (2002)	Three teachers	MBD across participants • Initial training o Written instructions o Implemented attention and escape condition in role-play scenario • Training II o Performance during initial training was reviewed o Experimenter modeled attention and escape condition o Participants practiced each condition and	• Participants performance improved after Phase II (rehearsal, modeling, feedback) of training was implemented • Performance during in-class functional analysis sessions was also high

		received feedback during each session ○ **No indication of the use of a mastery criterion** • Classroom probe ○ Sessions completed with students in classroom ○ Received feedback	
Nigro-Bruzzi and Sturmey (2010)	Three special education teachers, three speech therapists, six children with autism	MBD across participants • Baseline ○ Written instructions • Staff training ○ Abbreviated instructions ○ Video model ○ Role-play with researcher + feedback ○ **Mastery Criterion: 90% or higher across three sessions** • Post-training ○ Similar to baseline • Generality sessions ○ Implementation of procedure across sessions	• Implementation improved • Improvements in unprompted mands and in different settings were observed for three of 5 children
Nosik et al. (2013)		MBD • Baseline • Training • Groups ○ Computer-based: instructions, modeling, feedback ○ BST: instructions, modeling, rehearsal, feedback ▪ Rehearsal with confederate ▪ Unknown if scripts used ▪ 90% + across three consecutive sessions ▪ Mastery met within four to 12 rehearsals • Follow-up	• Participants who received BST had increases in performance within the training and natural environments • Six-week probes were also high in the training environment and a little below mastery criterion (90%) in the natural environment
Palmen et al. (2010)	Four staff members	MBD across skills • Baseline ○ No instruction or feedback • Intervention ○ Group training ▪ Instructions (Task analysis ▪ Video evaluation ▪ Evaluate role-plays of student-teacher interactions ▪ Feedback for scoring videos ▪ Role-play, modeling, feedback ▪ Role-played with other participants ○ Participants who observed role-play scored the role-play based on presence and absence of skills demonstrated ○ Trainer provided feedback ○ Modeled steps performed	• Participants reported feedback was the most effective portion of training • Training was rated as highly acceptable • BST was an effective strategy for improving staff implementation of teaching techniques, but performance was still considered low

		incorrectly ○ Role-play repeated again ○ **Mastery criterion not used** ○ Feedback ▪ Provided written feedback for steps implemented correctly and incorrectly during group training across • Post-intervention ○ Supervisors no longer provided feedback for the skill taught during group training, observed sessions of the implementation of the skill ○ Next skill was targeted • Follow-up ○ No instructions or feedback • Social validity survey	
Parsons and Reid (1995)	10 supervisors in a facility for individuals with severe disabilities	Multiple probe design • Baseline ○ No feedback • Training ○ Classroom training for teaching skills ▪ Observations of teaching skills with clients with feedback ▪ **Mastery Criterion: 80% across two teaching + feedback sessions** ▪ Participants provided feedback to clients during classroom sessions ○ Feedback Phase ▪ Written instructions ▪ Role-play providing feedback ▪ Participants provided feedback to staff, received feedback on their delivery ○ Follow-up ▪ Evaluate if supervisor feedback impacted staff teaching skills	• Participants' feedback skills improved after the two phases of training were implemented • Staff implementation of teaching strategies improved with feedback from supervisors
Pence et al. (2013)	12 teachers	MBD across participants • Baseline ○ Predetermined number of sessions ○ Given functional analysis literature, operational definition of target behavior, preference assessment data ○ No feedback was provided during these sessions • Training ○ Trainer modeled each condition ○ Feedback for correct and incorrect steps ○ Trainers role-played steps implemented incorrectly ○ **Mastery Criterion: 90% or higher** • Classroom implementation ○ Implemented conditions with students identified to engage in problem behavior ○ Feedback provided for correct and incorrect steps	• Five of six participants met mastery criterion after training • Three maintained high performance in classroom, other three needed additional feedback to get performance at or above mastery criterion in classroom
Phillips and	Four residential-	MBD across participants (alone, attention, control, escape)	○ The multi-component

Mudford (2008)	care staff, two clients	• Baseline—given Iwata et al (1982/1994)
		• Training
		  ○ Rationale for functional analysis
		  ○ Video model of conditions
		  ○ Rehearsed each condition via role-plays
		  ○ Feedback at end of each session
		  ○ **Role-plays continued until performance was at least 95%**
		• Enhanced training
		  ○ One participant needed additional training for two conditions—prompting was provided during the attention and escape conditions
		• Generalization probe
		  ○ One participant conducted sessions with a client based on a different topography of behavior
			training package was successful in improving participants implementation above baseline levels
			○ One participant's skills generalized to implementing functional analysis conditions for a different topography of behavior

Rosales et al. (2009)	Two undergrads, one grad student	MBD across participants
		• Baseline
		  ○ Written PECS manual
		  ○ Quiz
		  ○ Teach confederate PECS
		• BST
		  ○ Video version of PECS manual
		  ○ Video model of implementation
		  ○ Checklist for each phase
		  ○ Trainer and confederate modeled implementation
		  ○ Rehearsal with participant and confederate; feedback provided
		  ○ **Modeling, rehearsal, feedback repeated until participants performed 80% or more correctly on 2 consecutive trials**
		• Post-training test
		  ○ Similar to baseline
		• Generalization probes
		  ○ Similar to baseline and post-training, but a real client served as learner
		• Maintenance probe
		  ○ Similar to conditions above; however a different client was the learner and sessions took place in the clinical setting
			○ After training, participants reached mastery criterion for all phases

Roscoe and Fisher (2008)	Eight newly hired staff	Multielement design
		• Baseline
		  ○ Participants implemented MSWO & PS assessment
		  ○ Written instructions
		• Training
		  ○ Feedback + role-play (15 to 20 min)
		  ▪ Feedback for performance during baseline
		  ▪ Role-play with experimenter with feedback
		  ○ Phase two
		  ▪ Participants assigned to two different conditions
		  ▪ Four received training on MSWO
		  ▪ Four received training on PS assessment
			• 14 out of 16 performances met mastery criterion within only one training session

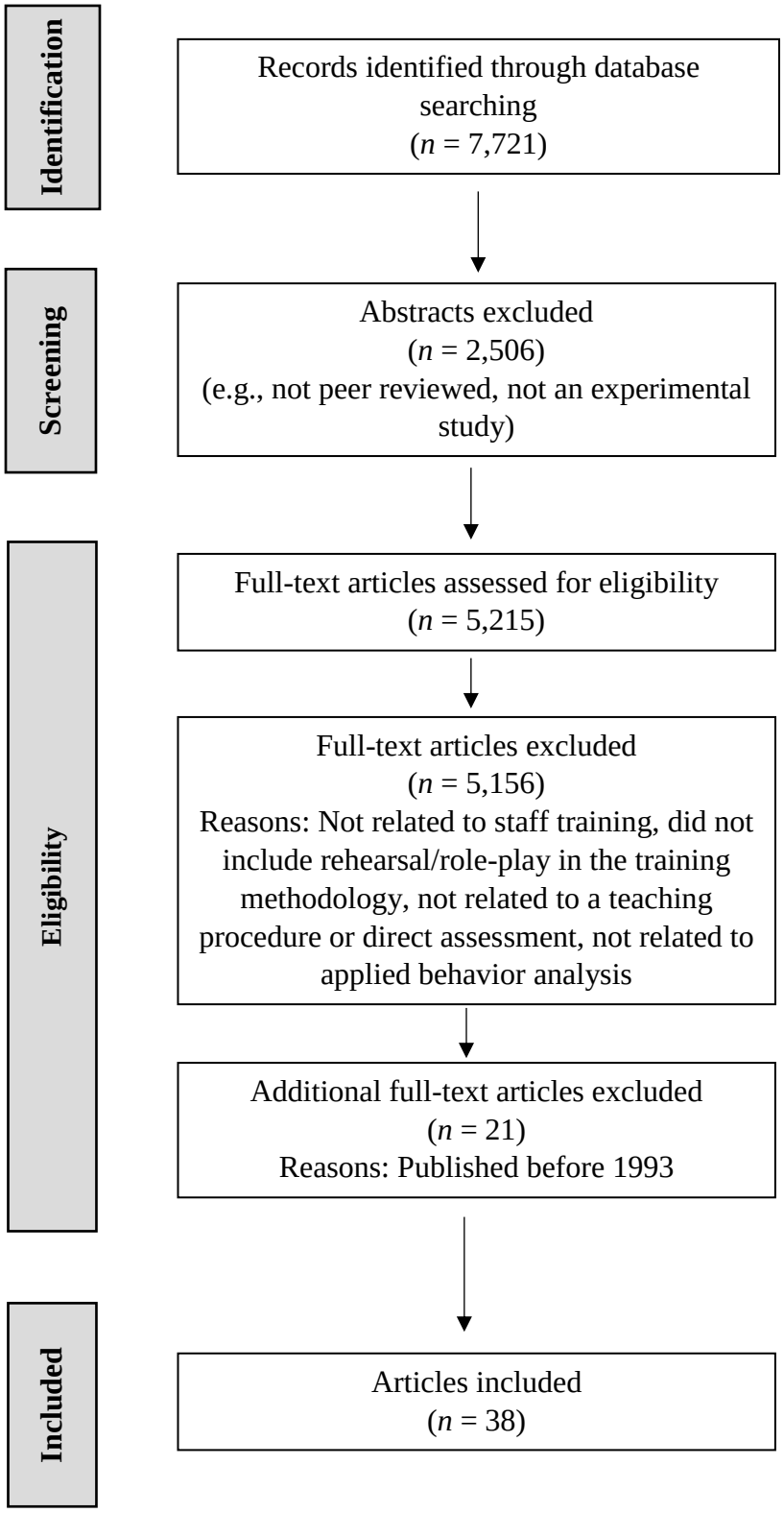
		○ Phase three ▪ Training for both procedures ○ **No indication of the use of a mastery criterion**	
Sarokoff and Sturmey (2004)	Three special education teachers	• MBD across participants • Baseline ○ Written description of discrete-trial training implementation • Training ○ Written procedure ○ Graph of baseline performance with verbal feedback ○ Rehearsed trials with student, feedback provided immediately after ○ Experimenter modeled implementation with student ○ Rehearsal and modeling repeated for 10 min, alternating b/n the participants implementing three discrete-trial training trials and the experimenter modeling three discrete-trial training trials ○ **Mastery Criterion: 90% or higher across three consecutive training sessions** • Post-training ○ Participants implemented discrete-trial training—no training components were used	○ After training, all three participants implemented discrete-trial training with at least 50% more accuracy compared to baseline (e.g., 43% to 97%)
Sarokoff and Sturmey (2008)	Three teachers working with children with autism; Five children with autism	MBD across participants • Baseline ○ Given discrete-trial training checklist ○ Implemented a couple trials from each of five programs ○ Implemented discrete-trial training on target skills • Training ○ BST ○ Implemented discrete-trial training with same student ○ **Mastery Criterion: 90% or higher across three consecutive sessions** • Follow-up ○ Generalization and student target sessions conducted similar to baseline ○ Social validity survey	• Following training, all participants performance improved • Improvements in student performance • Training program rated highly acceptable
Schepis et al. (2001)	Four staff working in a preschool; Five children with disabilities	Multiple probe design across staff • Baseline ○ Observations were conducted during regular classroom routines ○ Staff were unaware of when observations would occur • Training program ○ Classroom based instruction (60-90 min) ▪ Written and verbal instruction ▪ Instructor modeled teaching situation ▪ Role-play with instructor, with feedback • **Role-play continued until participants correctly implemented**	• The training program was effective in improving performance for all participants

		at least three of five teaching situation (e.g., child-initiated, staff-initiated, curriculum based, peer-related, IEP objectives) o On-the-job training ▪ Implement teaching and received feedback ▪ Continued until participants implemented each teaching strategy correctly ▪ Average 3.5 sessions to complete this portion of training • Observations conducted in classrooms with feedback	
Severtson & Carr (2012)	Six newly hired classroom assistants	Nonconcurrent MBD • Baseline: Instructions, datasheet, no feedback • Training: self-instruction manual, video instructions, rehearsal modeling, feedback o Rehearsal with confederate ▪ Used scripts (five correct responses, seven error responses) ▪ 90% + across three consecutive sessions ▪ # of rehearsals to meet mastery unknown • Follow-up	• Half of participants were able to meet mastery after exposure to self-instruction manual; others needed all training conditions to reach mastery
Sterling-Turner et al. (2001)	64 undergrads	Group design • Randomly assigned to one of three conditions o Didactic training ▪ Descriptions of the protocol provided ▪ Example of target behavior demonstrated o Modeling training ▪ Watched video of treatment session—trainer described components as they appeared in video o Rehearsal/feedback training ▪ Trained with experimenter and confederate –each component explained ▪ Praise and corrective feedback provided ▪ Trained first with the experimenter (5 min) and then went to rehearse in a different room with a confederate ▪ **Number of actual rehearsals or the use of a mastery criterion was not specified** o All information delivered to participants was the same across conditions	• Participants receiving the more direct forms of training had higher fidelity • Despite the short training sessions (5 min), those in the rehearsal + feedback condition had higher fidelity than those who received the same length of training in the didactic condition
Wallace et al. (2004)	Two teachers, one school psychologist	MBD across participants • Baseline—given Iwata (1982/1994)—implemented functional analysis conditions • Workshop o Description of functional analysis conditions o Viewed videotaped versions of	• Two of three participants implemented all conditions with high fidelity • One participants needed additional

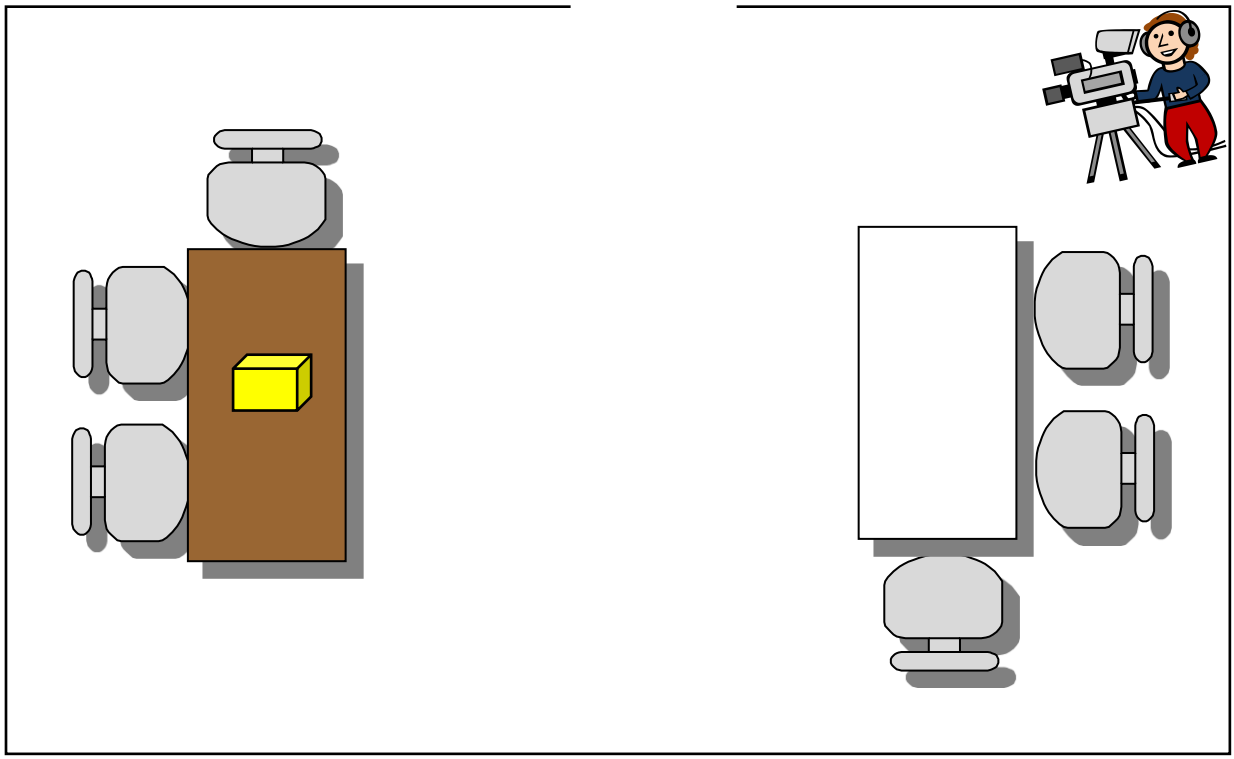
		conditions ○ Role-played implementation of conditions ○ **If participants did not implement condition with less than 90% accuracy feedback was provided then additional role-play sessions were conducted** • Generalization probes—no instructions or feedback	training component (feedback) in order to meet criterion • Performance was maintained
Ward et al. (1998)	Four undergrad practica students	MBD across teaching behaviors • Baseline • Intervention ○ Feedback and review of teaching behaviors and rehearsal ○ **Rehearsal of incorrect steps 10 times before leaving for the day** • Social validity survey	• Directed rehearsal improved participants implementation of the teaching strategies, such that, the collective number of times directed rehearsal needed to be used after a lesson was 11 • Participants reported that directed rehearsal was an acceptable training technique
Ward-Horner and Sturmey (2012)	Three direct-care staff	Alternating treatments design • Baseline ○ Instructions for purpose and functional analysis protocol ○ Quiz: performance below 90% resulted in review of the correct answers and retaking quiz until mastery criterion was met ○ No feedback • Training I ○ Modeling, rehearsal, or feedback (counterbalanced across participants and functional analysis conditions ○ Assessments immediately followed the condition for that was trained ○ **Mastery criterion: 90% or higher across two consecutive sessions** • Training II ○ Combined two training techniques • Training III ○ If participants did not meet mastery criterion during the previous two training phases for any condition, received training using modeling, rehearsal, and feedback • Social validity rating for the effectiveness of the training techniques and how much the participants liked/disliked the training method	• Participants exposed to rehearsal during Phase I had negligible changes in performance compared to baseline • Participants exposed to feedback & rehearsal had similar performance during generalization and analog assessments • Modeling, rehearsal, and feedback was effective in improving performance to criterion for any conditions in which participants did not reach this criterion during the previous training phases • Feedback training was the most effective component, whereas rehearsal was never effective at improving performance • Overall, participants rated feedback as the most favorable and effective training component
Wood et al. (2007)	Four staff members at a community-based habilitation	MBD • Baseline—implement Phase I of the PECS, no feedback provided • Training ○ Written instructions	○ All participants' performance improved after training ○ Three of four maintained high levels

	organization	○ Implementation modeled by trainer ○ Participants rehearsed steps, received feedback ○ **No indication of the use of a mastery criterion**	

Appendix B


Identification
Records identified through database searching
(n = 7,721)
Screening
Abstracts excluded
(n = 2,506)
(e.g., not peer reviewed, not an experimental study)
Eligibility
Full-text articles assessed for eligibility
(n = 5,215)
Full-text articles excluded
(n = 5,156)
Reasons: Not related to staff training, did not include rehearsal/role-play in the training methodology, not related to a teaching procedure or direct assessment, not related to applied behavior analysis
Additional full-text articles excluded
(n = 21)
Reasons: Published before 1993
Included
Articles included
(n = 38)

Appendix C



Appendix D

Procedural Descriptions
(Adapted from Iwata et al., 2000; Iwata el al., 1994)

A functional analysis is a carefully designed assessment commonly used in behavior analysis to determine why individuals engage in problem behavior. It involves manipulating the events that occur before (e.g., work activities available, limit attention) and after (e.g., remove work, provide attention) problem behavior.

Escape Condition

Purpose

The Escape condition is designed to determine whether the client engages in the target behavior in order to escape from work tasks or instructions. The condition involves remaining in the room with the client, presenting a series of instructions to the client throughout the session, providing praise when the client complies with the instruction, and briefly removing the materials only when the target behavior occurs

Target Behavior

The target behavior assessed consists of self-slapping, defined as the client's open hand striking against another part of her body with an audible sound.

How to Conduct a Session

1. Begin a session with you and the client seated at a table. Select an appropriate task based on the client description.
2. As soon as you present the task, you will activate a stopwatch and give a clear instruction (e.g., "[Name], add 45 and 44").
3. If the client performs the response within 5 seconds (count to 5 slowly), or at least begins to initiate the response during that time, deliver praise (e.g., say ''nice job,'' ''that's great,'' ''good,'') when the client has finished complying with the specific instruction.
4. Do not deliver praise for other appropriate behaviors (e.g., sitting nicely, using two-word sentences).
5. If the client engages in the target behavior (self-slapping), immediately remove the materials from the table and turn away from the client for 15 seconds. When you turn away, position yourself so you can still see what the client is doing. You will want to reset your stopwatch as soon as you turn away so that you can keep track of the time accurately. If the client continues to engage in the target behavior while you are turned away, restart your stopwatch and begin the 15-second countdown again.
    a. Be sure to ignore all behaviors when you are turned.
    b. Present the task materials and the next instruction only when the client has not engaged in the target behavior for 15 seconds.
6. If the client engages in any other inappropriate behaviors (e.g., self-pinching, disengagement with materials), do not remove the materials or turn away.
7. Follow these guidelines until the researcher signals the end of the session.

Attention Condition

Purpose

The attention condition is designed to determine whether the client engages in the target behavior in order to get attention from staff. The condition involves remaining in the room with the client and ignoring all client behavior, except for the target behavior, which is followed by attention.

Target Behavior

The target behavior assessed consists of self-slapping, defined as the client's open hand striking another part of her body with an audible sound.

How to Conduct a Session

1. Begin a session with the client seated at the table. Select a preferred leisure item based on the client description.
2. Give the item to the client and tell her that she should play with the items while you do work ("[Name], play with the items while I do work").
3. After issuing this initial instruction, move away from the client, sit in another chair, and read or do paperwork (or pretend to do so).
4. If the client engages in the target behavior (self-slapping), you will give attention in the following way:
    a. Walk over to the client and vocally express concern and/or disapproval. For example, ''Stop that, you're going to hurt yourself,'' ''[Name], you shouldn't hit yourself; play with your items,'' ''[Name], I don't want you to do that; you're going to get hurt,'' or something similar.
    b. While you express concern, briefly touch the client's arm, place your hand on the client's shoulder, or physically block self-slapping. Do not physically restrain the client. The goal is to express concern, briefly interrupt the behavior, and calm the client. Do not shout at the client and do not physically interact with the client in a rough manner.
    c. Return to reading or paperwork.
5. If the client engages in any other appropriate (e.g., sitting nicely, using two-word sentences playing appropriately) or inappropriate (e.g., self-pinching, disengagement with materials) behavior, do not provide attention.
6. Follow these guidelines until the researcher signals the end of the session.

Tangible Condition

Purpose

The tangible condition is designed to determine whether the client engages in the target behavior in order to get preferred items from staff. The condition involves remaining in the room with the client and ignoring all client behavior, except for the target behavior, which is followed by brief access to a preferred item.

Target Behavior

The target behavior assessed consists of self-slapping, defined as the client's open hand striking against another part of her body with an audible sound.

How to Conduct a Session

1. Begin a session with you and the client seated at the table. Select a preferred item based on the client description.
2. Give the item to the client, but do not make any comments.
3. Wait for 5 seconds but do not provide attention or deliver instructions during this time.
4. After time has elapsed, take the item away and say, "It's my turn."
5. If the client engages in the target behavior (self-slapping), give the client the preferred item in the following manner:
    a. Give the item to the client for 5 seconds. Do not make any comments to the client.
    b. Take the item away and say, "It's my turn."
6. If the client engages in any other appropriate (e.g., sitting nicely, using two-word sentences, playing appropriately) or inappropriate behaviors (e.g., self-pinching, disengagement with materials), do not provide access to the item. Do not provide attention or give instructions.
7. Follow these guidelines until the researcher signals the end of the session.

Appendix E

Client Description

You will implement the functional analysis conditions with a research assistant who will pretend to be an adult client who engages in problem behavior. The client lives in a group home for adults with disabilities and is diagnosed with autism. She can perform a number of important skills but also has some delays. When assigned tasks, she prefers to count money or complete math problems, but does not enjoy arts and crafts or puzzles. When given a choice of a leisure activity, she enjoys reading. Lately, she has been slapping herself on the arm throughout the day. The staff who work with her are concerned because the slap makes a loud sound, which distracts other clients, and leaves a red mark. This is scary for the staff! The client also engages in other problem behavior, such as pinching her hand or arm. This behavior does not occur very often, does not leave a mark, and does not distract other clients. As a result, pinching is a low priority. Thus, the staff only want to focus on evaluating the function of slapping.

Below are the skills the client can perform:

- Speaks in two-word sentences and uses gestures (pointing) to communicate what she wants
- Responds to praise and high fives appropriately
- Taking turns
- Completes two- and three-digit addition, subtraction, and multiplication math problems
- Reading
- Counting money

Below are skills the client has <u>not</u> yet learned and/or does <u>not</u> prefer:

- Speaking using full sentences
- Writing in cursive
- Two- and three-digit division math problems
- Arts and crafts
- Puzzles
- Sewing

Procedure

- Implement the functional analysis conditions according to the procedural descriptions provided.
- Throughout each condition, the client will engage in the following behaviors:
    - Target behavior: self-slapping
    - Other problem behavior (not targeted): self-pinching, not engaging with materials
    - Appropriate behavior: using two-word sentences, appropriately interacting with materials, completing the task

Appendix F

Escape V1						
Date:_____Observer_____ Px:_____ Phase: BL VM RA CA Follow-up						
Time	**Confederate**		**Px**		**Type of Error**	**Nature of Error**
:01			Selects math worksheet	Y N		
			Gives clear instruction as soon as task presented	Y N		
:10	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Does not re-present task with instruction	Y N		
:21	Slap	Y N	STAYS TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
:38	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
:55	Slap:	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
1:13	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		

1:30	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
1:47	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
2:03	"Done please"	Y N	No praise or comments	Y N		
2:17	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
2:34	Compliance	Y N	Praise when client <u>finishes</u> complying with instruction	Y N		
2:49	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
3:05	Pinch	Y N	No comments or consequences	Y N		
3:18	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Does not re-present task with instruction	Y N		
3:31	Slap	Y N	STAYS TURNED: Ignores	Y N		

			all behaviors			
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
3:48	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
4:04	Pinch	Y N	No comments or consequences	Y N		
4:19	Slap	Y N	Removes materials and turns away	Y N		
			WHEN TURNED: Ignores all behaviors	Y N		
			Does not re-present task with instruction	Y N		
4:21	Slap	Y N	STAYS TURNED: Ignores all behaviors	Y N		
			Does not re-present task with instruction	Y N		
4:34	Slap	Y N	STAYS TURNED: Ignores all behaviors	Y N		
			Presents task and instruction after 15 sec with *no* self-slapping	Y N		
4:51	Compliance	Y N	Praise when client <u>finishes</u> complying with instruction	Y N		
		/20		____/48		

Appendix G

Attention V1						
Date:_____ Observer_____ Px:_____ Phase: BL VM RA CA Follow-up						
Time	**Confederate**		**Px**		**Error**	**Nature of Error**
:01			Selects puzzle, book, or coloring	Y N		
			Gives item to client; Says: "You play while I work"	Y N		
			Sits in different chair pretends to work	Y N		
:21	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
:37	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
:54	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
1:06	Pinch	Y N	No comments or consequences	Y N		
1:22	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
1:37	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		

1:47	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
2:09	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
2:21	Pinch	Y N	No comments or consequences	Y N		
2:34	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
2:55	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
3:12	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
3:35	"Let's play"	Y N	No praise or attention	Y N		
3:37	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
3:48	Play	Y N	No praise or attention	Y N		

4:11	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
4:23	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
4:37	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
4:39	Slap	Y N	Walks over to client AND vocally expresses concern	Y N		
			Touches client's arm while expressing concern	Y N		
			Returns to work	Y N		
4:53	Play	Y N	No praise or attention	Y N		
		/20		_____/53		

Appendix H

Tangible V1

Date:_____ Observer_____ Px:_____ Phase: BL RA CA Follow up

Time	Confederate		Px		Type of Error	Nature of Error
:01			Select puzzle, book, or coloring.	Y N		
			Give item to client. No comments.	Y N		
			Wait 5 sec. No attention. No instructions.	Y N		
			After time has elapsed, take the item away and say, “It’s my turn now.”	Y N		
:16	"Give me"	Y N	No praise or attention	Y N		
:34	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
:58	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
1:02	Play	Y N	No praise or attention	Y N		
1:27	Pinch	Y N	No comments or consequences	Y N		
1:36	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
1:48	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
1:58	Pinch	Y N	No comments or consequences	Y N		
2:23	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		

			Take the item away and say, “It’s my turn now.”	Y N		
2:37	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
2:40	Play	Y N	No Praise or attention	Y N		
3:00	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
3:17	Slap	Y N	Give item to client. No attention. No instructions.	Y N		
3:19	Slap	Y N	Let’s client have item for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
3:46	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
4:07	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
4:21	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
4:36	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn now.”	Y N		
4:47	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, “It’s my turn	Y N		

			now."			
4:52	Slap	Y N	Give item to client for 5 sec. No attention. No instructions.	Y N		
			Take the item away and say, "It's my turn now."	Y N		

___/20 _____ /38

Appendix I

Knowledge Assessment

Participant Code: _____ Date: _____

1. At the start of the tangible condition the therapist should:
    a. Tell the client to play while the therapist works
    b. Provide brief access to a preferred item and then take it away
    c. Present task materials and instruct the client to complete the task
    d. Provide brief access to a preferred item until the target problem behavior occurs and then take away the item

2. When the target problem behavior occurs during the attention condition
    a. A new work task is presented
    b. Access to a new toy is provided for 10 seconds
    c. The work session ends and materials are put away
    d. A disapproving statement and light physical contact is provided

3. In the tangible condition, when the therapist takes the preferred item away from the client, the therapist should:
    a. Say, "It's my turn"
    b. Not say anything
    c. Play with the item
    d. Provide a different item

4. When presenting task materials for the first time during the escape condition, the therapist should:
    a. Present an instruction
    b. Help the client complete the task
    c. Praise the client for waiting patiently
    d. Let the client choose which activity to complete

5. When the attention session starts, the client should be told to:
    a. "Not make too much noise"
    b. "Play nicely with the toys"
    c. "Play while the therapist works"
    d. "Complete the worksheets until the session is complete"

6. If the target behavior occurs during the tangible condition, access to a preferred item should be provided for no longer than _____seconds.
    a. 5
    b. 10
    c. 15
    d. 20

7. When behaviors such as self-pinching and disengagement with tasks occur during the attention condition, the therapist should
    a. End the session
    b. Ignore the behaviors
    c. Provide additional toys
    d. Provide a disapproving statement

8. When the target problem behavior occurs during the escape condition, _____ is (are) taken away for 15 seconds.
    a. Attention
    b. Assistance
    c. Task materials
    d. Preferred items

9. If self-pinching or disengagement with task materials occurs during the escape condition, the therapist should:
    a. Ignore all behaviors
    b. End the session early
    c. Provide a disapproving statement
    d. Restart the stopwatch and wait an additional 15 seconds

Appendix J

The purpose of this questionnaire is to get information that will help us identify appropriate training procedures. Please circle the number which best describes your agreement or disagreement with each statement.

1- strongly disagree 2-disagree 3-slightly disagree 4-slightly agree 5-agree 6-strongly agree

Written instructions (procedural descriptions) *alone* would be an acceptable way to help educators implement a functional analysis.	1	2	3	4	5	6
Written instructions *alone* would be effective in changing the accuracy with which educators implement a functional analysis.	1	2	3	4	5	6
I would suggest the use of written instructions alone for use with other educators.	1	2	3	4	5	6
I would be willing to use written instructions alone again in the future.	1	2	3	4	5	6
Role-play would be an acceptable way to help educators implement a functional analysis.	1	2	3	4	5	6
Role-play would be effective in changing the accuracy with which educators implement a functional analysis.	1	2	3	4	5	6
I would suggest the use of role-play for use with other educators.	1	2	3	4	5	6
I would be willing to use role-play again in the future.	1	2	3	4	5	6
Rehearsal (practice) + feedback would be an acceptable way to help educators implement a functional analysis.	1	2	3	4	5	6
Rehearsal (practice) + feedback would be effective in changing the accuracy with which educators implement a functional analysis.	1	2	3	4	5	6
I would suggest the use of rehearsal (practice) + feedback for use with other educators.	1	2	3	4	5	6
I would be willing to use rehearsal (practice) + feedback again in the future.	1	2	3	4	5	6
One rehearsal + feedback was sufficient for me to implement the functional analysis condition well.	1	2	3	4	5	6
Three rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	1	2	3	4	5	6

Ten rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	1	2	3	4	5	6

In order for educators to implement functional analyses well, they should have _____(indicate number) rehearsal(s) + feedback.

I like the procedures (i.e., written instructions, role-play, and rehearsal + feedback) used to assist me in learning how to implement a functional analysis.	1	2	3	4	5	6
Overall, the procedures (i.e., written instructions, role-play, and rehearsal + feedback) used would be beneficial for educators.	1	2	3	4	5	6

Please indicate which condition was the easiest and most difficult to implement:

Easiest =

Most difficult =

Please provide any additional comments you wish to share about your experience in this study: _____

_____

_____

_____

_____

_____

Appendix K

Escape Condition Sequence 1

	Opportunity for Behavior																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Topography	S	S	S	S	S	S	S	D	S	C	S	P	S	S	S	P	S	S	S	C
Time	0:10	0:21	0:38	0:55	1:13	1:30	1:47	2:03	2:17	2:34	2:49	3:05	3:18	3:31	3:48	4:04	4:19	4:21	4:34	4:51

Attention Condition Sequence 1

	Opportunity for Behavior																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Topography	S	S	P	S	S	A	L	P	S	S	S	S	S	S	S	S	A	S	S	S
Time	0:26	0:42	0:52	1:06	1:27	1:35	1:54	2:02	2:27	2:32	2:50	3:09	3:21	3:41	3:54	4:03	4:13	4:33	4:43	4:50

Tangible Condition Sequence 1

	Opportunity for Behavior																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Topography	S	S	P	S	A	G	P	S	S	S	S	S	S	S	S	S	S	S	S	A
Time	0:19	0:34	0:50	1:03	1:05	1:26	1:49	2:02	2:27	2:46	2:57	3:08	3:32	3:41	3:47	3:59	4:24	4:40	4:50	4:54

Note: S = Self-Slap; P = Self-Pinch; D = "Done Please"(Social initiation); C = Compliance; L="Let's play"(Social initiation); A= Appropriate Play; G="Give Me"(Social initiation)

Appendix L

Escape Condition Sequence 1

	Opportunity for Behavior							
	1	2	3	4	5	6	7	8
Topography	S	P	C	D	P	S	C	D
Time	0:03	0:15	0:20	0:25	0:30	0:33	0:49	0:53

Attention Condition Sequence 1

	Opportunity for Behavior							
	1	2	3	4	5	6	7	8
Topography	S	A	L	P	L	P	S	A
Time	0:10	0:12	0:22	0:23	0:31	0:41	0:48	0:50

Tangible Condition Sequence 1

	Opportunity for Behavior							
	1	2	3	4	5	6	7	8
Topography	S	A	G	P	G	P	S	A
Time	0:10	0:12	0:22	0:23	0:31	0:41	0:48	0:50

Note: S = Self-Slap; P = Self-Pinch; D = "Done Please" (Social initiation); C = Compliance; L="Let's play" (Social initiation); A= Appropriate Play; G="Give Me" (Social initiation)

Appendix M

Rehearsal/Cumulative Analysis Rehearsal and Feedback:
Participant #:
Date:_____ Observer:_____

Escape Condition

Say "Now, we are going to briefly practice the escape condition _____ times at this table with Hannah. After each practice, I will tell you which steps you performed well and which steps could be improved. Do you have any questions?"

Feedback:

Opportunities

		Selects math worksheet
		Gives clear instruction as soon as task presented
		Delivers praise when client has finished complying with specific instruction
		No praise for other appropriate behaviors (e.g., using two-word sentences)
		No comments or other consequences (e.g., turning away) for self-pinching or disengagement with materials
		If engages in self-slapping, immediately remove materials and turn away for 15 sec
		WHEN TURNED: Ignores all behaviors when turned (no attention, no additional programmed consequences -- EXCEPT step below)
		WHEN TURNED: Presents task and instruction after 15 sec with no self-slapping

Feedback should contain the following information

- "You implemented _____ of the steps correctly."
    - Zero
    - less than half
    - half
    - more than half
    - 100
- "To improve your performance, next time remember to …."

Rehearsal/Cumulative Analysis Rehearsal and Feedback:
Participant #:

Date:_____ Observer:_____

Attention Condition

Say "Now, we are going to briefly practice the Attention condition _____ times at this table with Hannah. After each practice, I will tell you which steps you performed well and which steps could be improved. Do you have any questions?"

Feedback:

Opportunities

		Select puzzle, book, or coloring.
		Gives item to client. Says "[Name], play with items while I do work."
		After initial instruction, sits in another chair and pretends to work.
		If self-slapping occurs, walks over to the client and vocally express concern and/or disapproval.
		Touches client's arm while expressing concern.
		Return to reading or paperwork.
		No praise for using two-word sentences, playing appropriately.
		No comments or other consequences for self-pinching or disengagement with materials.

Feedback should contain the following information

- "You implemented _____ of the steps correctly."
  - Zero
  - less than half
  - half
  - more than half
  - 100
- "To improve your performance, next time remember to …."

Rehearsal/Cumulative Analysis Rehearsal and Feedback:
Participant #:

Date:_____ Observer:_____

Tangible Condition

Say "Now, we are going to briefly practice the Tangible condition _____ times at this table with Hannah. After each practice, I will tell you which steps you performed well and which steps could be improved. Do you have any questions?"

Feedback:

Opportunities

		Select puzzle, book, or coloring.
		Give item to client. No comments.
		Wait 5 sec. No attention. No instructions.
		After time has elapsed, take the item away and say, "It's my turn now."
		If self-slapping occurs, give item to client for 5 sec. No attention. No instructions.
		Take the item away and say, "It's my turn now."
		No praise for using two-word sentences, playing appropriately
		No comments or other consequences for self-pinching or disengagement with materials

Feedback should contain the following information

- "You implemented _____ of the steps correctly."
  - Zero
  - less than half
  - half
  - more than half
  - 100
- "To improve your performance, next time remember to …."

Appendix N

Phase Checklists

Baseline

- ◯ Fold up extra table
- ◯ Place chair next to rehearsal table
- ◯ Place pen on both tables for Hannah
- ◯ Verify sequence list is on brown table
- ◯ Make sure boxes look similar
- ◯ State the following:
  Good _____. How are you? The first thing I'm going to have you do is read the consent and if you agree to participate, sign the consent form and then complete the demographic survey.
  Distribute pen, consent form, and demographic survey. Allow time for participant to read/sign consent form.
- ◯ State the following:
  Thank you for agreeing to participate in this study. Next, you are going to read descriptions of 3 functional analysis conditions. You can take as much time as you need to review the materials.
  Distribute procedure descriptions.
- ◯ State the following:
  Now you will complete a knowledge assessment that covers information that you read in the procedural descriptions.
  Distribute the knowledge assessment.
- ◯ State the following:
  Now I am going to give you a description of a client with whom you're going to interact in a role play. This summary describes the client's skills, problem behaviors, and other important information. Hannah will pretend to be the client. You can take as much time as you need to read this description.
- ◯ After the participant reviews the materials
  Now I'm going to have you role-play the _____ condition with Hannah. You can use the materials in this box and can use the stopwatch. The role-play will be 5 min.
- ◯ State the following:
  Next, I'm going to have you role-play the _____ condition with Hannah. You can use the materials in this box and can use the stopwatch. The role-play will be 5 min.
- ◯ State the following:
  Now I'm going to have you role-play the _____ condition with Hannah. You can use the materials in this box and can use the stopwatch. The role-play will be 5 min.

Fidelity : _____/12 Reliability %: _____

Rehearsal Analysis

- ◯ Fold up extra table
- ◯ Place chair next to rehearsal table
- ◯ Place pen at both tables for Hannah
- ◯ Verify sequence list is on both tables
- ◯ Make sure boxes look similar
- ◯ State the following:
  Good _____. How are you? Today we're going to start at the white table. You can sit in the left chair and Hannah will be on the right side. For today, you will have an opportunity to practice and receive feedback for all three functional analysis conditions at the white table and then you will role-play each one for 5-min at the brown table, just like last time. First, you're going to briefly practice the Attention **condition ___1____ time at this table with Hannah. After you practice, I will tell you which steps you performed well and which steps could be improved. Do you have any questions?**
- ◯ Provide feedback for Attention condition
- ◯ State the following:
  Now I'm going to have you move to the brown table and implement the Attention **condition during a 5-min role-play with Hannah. I will not provide feedback after this role-play.**
- ◯ State the following
  You can move back to the white table now and you're going to briefly practice the Tangible **condition ___3____ times at this table with Hannah. After each practice, I will tell you which steps you performed well and which steps could be improved. Do you have any questions?"**
- ◯ Provide feedback for Tangible condition 3 times
- ◯ State the following:
  Now I'm going to have you move to the brown table and implement the Tangible **condition during a 5-min role-play with Hannah. I will not provide feedback after this role-play.**
- ◯ State the following
  You can move back to the white table now and you're going to briefly practice the Escape **condition ___10____ times at this table with Hannah. After each practice, I will tell you which steps you performed well and which steps could be improved. Do you have any questions?**
- ◯ Provide feedback for Escape condition 10 times
- ◯ State the following:
  Now I'm going to have you move to the brown table and implement the Escape **condition during a 5-min role-play with Hannah. I will not provide feedback after this role-play.**
- ◯ State the following:
  For the rest of the sessions, you will implement the functional analysis conditions during 5-min role-plays with Hannah.

Fidelity:_____/15 Reliability : _____

Cumulative Analysis

- ◯ Fold up extra table
- ◯ Place chair next to rehearsal table
- ◯ Place pen at both tables for Hannah
- ◯ Verify sequence list is on both tables
- ◯ Make sure boxes look similar
- ◯ State the following:
  Today you will have opportunities to practice the conditions and receive feedback similar to the first time we did training. You will start at the white table, practice one condition at a time for 1 min with Hannah, I will provide feedback, and then you will implement the same condition at the brown table for 5 min. Do you have any questions?
- ◯ Order is correct (practice precedes observations unless mastery criterion is met—only observations for conditions at 100% for 2 consecutive sessions will be conducted)
  - Escape
    - Practice
    - Observation
  - Attention
    - Practice
    - Observation
  - Tangible
    - Practice
    - Observation
  - Attention
    - Practice
    - Observation
  - Tangible
    - Practice
    - Observation
  - Escape
    - Practice
    - Observation
  - Attention
    - Practice
    - Observation
  - Escape
    - Practice
    - Observation
  - Tangible
    - Practice
    - Observation

Fidelity:_____/16 Reliability : _____

Follow-up

◯ Fold up extra table
◯ Place chair next to rehearsal table
◯ Place pen on both tables for Hannah
◯ Verify sequence list is on brown table
◯ Make sure boxes look similar
◯ State the following:
Today you will implement each condition one time and complete a survey. Now I'm going to have you role-play the _____ condition with Hannah. You can use the materials in this box and can use the stopwatch. The role-play will be 5 min.
◯ State the following:
Next, I'm going to have you role-play the _____ condition with Hannah. You can use the materials in this box and can use the stopwatch. The role-play will be 5 min.
◯ State the following:
Finally, I'm going to have you role-play the _____ condition with Hannah. You can use the materials in this box and can use the stopwatch. The role-play will be 5 min
◯ Provide survey and pencil
◯ State the following:
Now I am going to give you a survey about the study. You can take as much time as you need to read this description.

Fidelity:_____/10 Reliability : _____

Appendix O
Training Acceptability Survey

The purpose of this questionnaire is to get information that will help us identify appropriate training procedures. Please circle the number which best describes your agreement or disagreement with each statement.

1- strongly disagree 2-disagree 3-slightly disagree 4-slightly agree 5-agree 6-strongly agree

Written instructions (procedural descriptions) *alone* would be an acceptable way to help educators implement a functional analysis.	1 2 3 4 5 6
Written instructions *alone* would be effective in changing the accuracy with which educators implement a functional analysis.	1 2 3 4 5 6
I would suggest the use of written instructions alone for use with other educators.	1 2 3 4 5 6
I would be willing to use written instructions alone again in the future.	1 2 3 4 5 6
Video modeling *alone* would be an acceptable way to help educators implement a functional analysis.	1 2 3 4 5 6
Video modeling *alone* would be effective in changing the accuracy with which educators implement a functional analysis.	1 2 3 4 5 6
I would suggest the use of video modeling alone for use with other educators.	1 2 3 4 5 6
I would be willing to use video modeling alone again in the future.	1 2 3 4 5 6
Rehearsal (practice) would be an acceptable way to help educators implement a functional analysis.	1 2 3 4 5 6
Rehearsal (practice) would be effective in changing the accuracy with which educators implement a functional analysis.	1 2 3 4 5 6
I would suggest the use of rehearsal (practice) for use with other educators.	1 2 3 4 5 6
I would be willing to use rehearsal (practice) again in the future.	1 2 3 4 5 6
Rehearsal (practice) + feedback would be an acceptable way to help educators implement a functional analysis.	1 2 3 4 5 6
Rehearsal (practice) + feedback would be effective in changing the accuracy with which educators implement a functional analysis.	1 2 3 4 5 6
I would suggest the use of rehearsal (practice) + feedback for use with other educators.	1 2 3 4 5 6

I would be willing to use rehearsal (practice) + feedback again in the future.	1 2 3 4 5 6
Viewing a video model and one rehearsal + feedback was sufficient for me to implement the functional analysis condition well.	1 2 3 4 5 6
Viewing a video model and three rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	1 2 3 4 5 6
Viewing a video model and ten rehearsals + feedback was necessary in order for me to implement the functional analysis condition well.	1 2 3 4 5 6
In order for educators to implement functional analyses well, they should have _____(indicate number) rehearsal(s) + feedback.	
I like the procedures (i.e., written instructions, video modeling, and rehearsal + feedback) used to assist me in learning how to implement a functional analysis.	1 2 3 4 5 6
Overall, the procedures (i.e., written instructions, video modeling, and rehearsal + feedback) used would be beneficial for educators.	1 2 3 4 5 6

Please indicate which functional analysis condition was the easiest and most difficult to implement:

Easiest =

Most difficult =

Please provide any additional comments you wish to share about your experience in this study: _____

_____

_____

_____

_____

_____