EFFECTS OF PYRAMIDAL TRAINING ON SCHOOL PSYCHOLOGIST AND TEACHER IMPLEMENTATION OF TRIAL-BASED FUNCTIONAL ANALYSIS

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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

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ABSTRACT

Educators often seek consultation with school psychologists for the assessment of problem behavior and the development of intervention plans to address problem behavior. School psychologists typically conduct functional based assessments (FBA) using indirect and direct observations of the target student prior to. Research has indicated that descriptive assessments are not always reliable indicators of behavioral function, and thus should not be used exclusively when conducting FBA (e.g., Hall, 2005; Lerman & Iwata, 1993; St. Peter et al., 2005, Thompson & Iwata, 2007). Trial-based functional analysis (FA) is an alternative, brief yet rigorous assessment designed to accurately determine the function of students' problem behavior in the classroom setting (Bloom et al., 2013; Sigafoos & Saggers, 1995). To empower teachers and increase their efficacy in assessing problem behavior, school consultants can train a group of educators to conduct trial-based FA using a pyramidal approach. This training model allows a consultant to train a small group of supervisors (e.g., school psychologists) who in turn train and support other educators (Page et al., 1982). Ultimately, the consultant will work him/herself out of the role as supervisors become the in-house individuals providing training and support directly to teachers.

This study addressed significant gaps in literature by evaluating the effectiveness of pyramidal training procedure to train school psychologists and general education teachers to implement trial-based FA with high integrity. Three school psychologists were trained in a group format via didactic presentation and Behavioral Skills Training (BST) which included instruction, models, rehearsal, and feedback. During baseline, the mean fidelity to implement trial-based FA for school psychologists was 52.21%. After completion of training, their mean fidelity increased to 97.07%. School psychologists each trained one general education teacher

using the same training protocol. General education teachers also improved their mean fidelity to implement trial-based FA accurately from 40.50% at baseline to 97.38% after training. Results suggest that general education teachers can be trained by school psychologists using the pyramidal training method to conduct trial-based FA with a high degree of procedural fidelity.

CHAPTER I: INTRODUCTION

Background

Student problem behavior is a major source of concern for schools due to its negative impact on student achievement, teaching, school climate, and beyond. Previous research has consistently concluded that children with behavioral problems have persistent academic difficulties (Kremer et al., 2016) and have higher rates of requiring mental health services (Darney et al., 2012). Not only is problem behavior detrimental to academic achievement and socio-emotional outcomes for the student him/herself, but it can problematic for peers as well.

Teachers' classroom management procedures are strongly correlated with the level of disruptive behavior in the classroom (Reinke et al., 2013) indicating that appropriate and successful application of classroom management procedures are necessary to promote academic and behavioral success for all students. To improve classroom management, educators often seek consultation with school psychologists for the development of intervention plans and evaluation of their effectiveness. School psychologists engage in school-based consultation and collaborate with teachers by typically conducting functional based assessments (FBA) using indirect and direct observations of the target student. In fact, in a national survey of school psychologists, Shapiro and Heick (2004) found that descriptive assessments (e.g., interviews, rating scales, observations without manipulation of environmental variables) were reported as the most frequently used assessment method.

Research has indicated that descriptive assessments are not always reliable indicators of behavioral function, and thus should not be used exclusively when conducting functional behavior assessments (e.g., Hall, 2005; Lerman & Iwata, 1993; St. Peter et al., 2005, Thompson & Iwata, 2007). Alternatively, educators should use rigorous assessments, such as functional

analysis (FA; Iwata et al., 1982/1994), to accurately determine the function of students' problem behavior. Traditional functional analysis is used to identify events contributing to, or maintaining, the problem behavior (Iwata et al., 1982/1994). Typical FA procedure involves repeated exposure to a series of conditions presented in 5- to 15-min sessions, where each instance of problem behavior results in a specific consequence. Although the FA procedure is considered the most rigorous approach to assessment of problem behavior, this assessment may not be practical in the classroom setting due to its long duration. Trial-based FA is an alternative, brief assessment designed for the classroom setting (Bloom et al., 2013; Sigafoos & Saggers, 1995). Each trial consists of only one opportunity for problem behavior such that if the target behavior occurs, the specific consequence is provided, thus ending the trial.

To empower general education teachers and increase their efficacy in assessing problem behavior, school consultants can train a group of educators to conduct trial-based FA using a pyramidal approach. This training model allows a consultant to train a small group of supervisors (e.g., school psychologists) who in turn train and support other educators (Page et al., 1982). After supervisors are trained to conduct trial-based FA with high procedural fidelity, they can train other teachers independent of the consultant. Ultimately, the consultant will work him/herself out of the role as supervisors become the in-house individuals providing training and support directly to teachers.

Statement of the Problem

Evidence is scarce regarding the effectiveness of pyramidal training on trial-based FA in educational settings (Kunnavatana et al., 2013). Educators must implement trial-based FA with high procedural fidelity to correctly identify the function of student problem behavior before implementing appropriate and effective interventions. Research is needed to examine the

implementation fidelity of trial-based FA by school psychologists who in turn train and support general education teachers.

Theoretical Framework

The current study is based in the dimensions of applied behavior analysis described by Baer et al. (1968). More specifically, the training procedure of this study will use Behavioral Skills Training (BST; Miltenberger, 2008) to train school psychologists and general education teachers to conduct trial-based FA. Additionally, trial-based FA methodology is built upon the conceptual foundation of operant conditioning (Skinner, 1957). School psychologists' and teachers' fidelity to implement trial-based FA will be quantified, measured, and analyzed within the framework of applied behavior analysis.

Purpose of Current Study

Research is available addressing the effectiveness of trial-based FA in determining the function of behavior (e.g., Bloom et al., 2011). Literature also exists on effectively training educators to conduct this assessment (e.g., Bloom et al., 2013). However, little research is available regarding pyramidal training of educators conducting trial-based FA (Alnemary et al., 2016; Kunnavatna et al., 2013; Lambert et al., 2013). Therefore, the proposed study seeks to examine the effectiveness of pyramidal training on school psychologists to conduct trial-based FA as well as train educators to conduct trial-based FAs with high procedural fidelity.

Research Questions

The study will be guided by the following questions:

1. To what extent will school psychologists accurately conduct a trial-based functional analysis after receiving training?
2. To what extent will general education teachers accurately conduct a trial-based functional analysis after receiving training?

Definition of Key Terms

Behavioral Skills Training (BST): A training package that consists of instructions, modeling, rehearsal, and feedback in order to teach a new skill (Miltenberger, 2008).

Establishing operation (EO): An antecedent variable that increases the effectiveness of a reinforcer (Michael, 1982).

Functional analysis (FA): An assessment that utilizes experimental manipulation of environmental variables to determine the function of behavior (Iwata et al., 1982/1994).

Trial-based Functional Analysis (FA): A variation of the traditional FA such that clients are exposed to specific antecedent and consequences over brief trials within the context of ongoing routines with test and control segments (Bloom et al., 2013).

Pyramidal training: A training approach that typically involves an "expert" training a small group of staff who in turn train other staff (Haberlin et al., 2012).

Assumptions

There are several underlying assumptions regarding this study. First, it is assumed that participants have no prior knowledge or exposure to FA and its variations. Second, it is assumed that general education teachers are typical general education teachers who engage in instruction, assessment, and intervention similar to other general education teachers.

Delimitations

For this study, there are two delimitations that predetermine the boundaries and limit the study. First, only school psychologists and general education teachers will participate to receive training in this study, which limits the generalizability of trial-based FA fidelity with other educators. Second, the trial-based FA will be conducted in simulations with a graduate student acting as the client using scripts. Doing so may reduce the trainees' and clients' potential risk of harm due to poor fidelity of trial-based FA implementation. Additionally, simulated sessions will provide participants to contact problem behaviors across all trials that may not be possible via in-situ situations.

Limitations

There are two possible limitations that may occur during the course of this study. First, the participants may have some prior knowledge of trial-based FA or traditional FA procedures. Second, the lack of actual students may limit generalizability of the trial-based FA fidelity to classroom; however, simulated sessions will provide a more stringent and efficient measure of trainees' skill acquisition than in-situ sessions.

CHAPTER II: LITERATURE REVIEW

This chapter reviews relevant literature for the study's purpose. First, research regarding the function of behavior will be examined. Then, indirect assessments (e.g., functional behavior assessment) and direct assessments (e.g., functional analysis) to identify the function of behavior will be examined. Finally, literature for educator training on functional assessments will be reviewed.

Problem Behavior

Student problem behavior is a major source of concern for schools due to its negative impact on student achievement, teaching, school climate, and beyond. Most notably, problem behavior interferes with student learning and achievement (Hinshaw, 1992). Children with behavioral problems have persistent academic difficulties (Kremer et al. 2016; Darney et al., 2012). For example, externalizing behaviors, such as disruptiveness, aggressiveness, defiance, predicted lower reading scores (Kremer et al., 2016), and co-occurring behavior and academic problems in 1st grade predicted long-term negative outcomes even in the 12th grade (Darney et al., 2012).

Problem behavior in elementary school is linked to long-term outcomes other than achievement difficulties including increased risk for receipt of special education services, suspension from school, and conduct problems (Reinke et al, 2008), and higher rates of requiring mental health services, school dropout (Darney et al., 2012), poverty, unemployment, and incarceration (Morgan et al., 2009). Early elementary-aged students with high levels of disruptive and aggressive behaviors are particularly at an increased risk for peer rejection, substance abuse, and delinquency (Schaeffer et al., 2003; 2006).

Not only is problem behavior detrimental to academic achievement and socio-emotional outcomes for the student him/herself, but it can problematic for peers as well. A disruption in the classroom setting due to problem behavior can interrupt teacher instruction and create a poor class climate (Wehby et al., 2003). Peers tend to dislike classmates who cause disruption, start fights, and break rules (Wentzel, 1991). Students who engage in problem behavior are often removed from the classroom to avoid disrupting their peers' learning. Such students when suspended or referred to the school office for engaging in problem behavior miss crucial instruction and thus, fall further behind their peers (McIntosh & Goodman, 2016).

Operant Conditioning

Behavior problems can be understood through the principles of operant conditioning. Skinner (1957) conceptualized operant conditioning as a type of learning where behavior changes based on life experiences. In simpler terms, it is the regulation of behavior by its consequences (Pierce & Cheney, 2004). According to Skinner (1953), operant learning is based on several principles. First, behaviors are observable events (e.g., what a student does). Second, these events can be analyzed in a deterministic fashion, making them lawful. Third, behavior follows a stimulus-response-stimulus (S-R-S) contingency paradigm that has also been referred to as antecedent-behavior-consequence (ABC) or three-term contingency. In other words, stimuli (i.e., antecedents) evoke a response, the response is exhibited (i.e., target behavior), and then a stimulus (i.e., consequence) follows. After completing this three-term contingency, the consequence that follows the behavior either increases (positive or negative reinforcement) or decreases (extinction or punishment) the likelihood of that behavior occurring again in the future under similar antecedent stimuli conditions.

From the perspective of operant conditioning, all problem behavior are members of two general functional response classes: positive and negative reinforcement (Iwata et al., 1993). Positive reinforcement indicates that a stimulus is presented, while negative reinforcement indicates that a stimulus is removed. For example, if a challenging behavior results in attention, which in turns reinforces the behavior, the attention is given in a form of positive reinforcement (Mace et al., 1986). If engaging in problem behavior results in the removal of an aversive stimulus, it is considered a negative reinforcer (Iwata et al., 1993). There are also two means for this reinforcement to occur in that reinforcement can be socially mediated or automatic. Socially mediated reinforcement (whether positive or negative) is delivered by another individual, whereas automatic reinforcement occurs when behavior is reinforced by the stimulation it produces, making it independent of the action of others (Vaughan & Michael, 1982). Automatic reinforcement can be either positive (e.g., self-stimulation to address low stimulation in the environment) or negative (e.g., plugging the ears with one's fingers to remove the aversive sound of the fire alarm). Other types of automatic reinforcers such as primary reinforcers (e.g., food) also exist.

Operant Conditioning and Behavior Assessment

It is crucial for those who work in the school settings to be educated in ways that they may be able to identify problem behaviors and then ways to discover the root or reason for those problem behaviors. Methods for determining function of problem behavior are important because they allow educators to develop effective and efficient interventions (Ingram et al., 2005). The importance of appropriate intervention design and implementation is highlighted in Individuals with Disabilities Education Act (IDEA; 1997, 2004) by requiring implementation of a functional behavioral assessment (FBA) and subsequent design of a behavior intervention plan (BIP) or

modification of an existing BIP for students with disabilities who engage in challenging behavior that interfere with their learning or the learning of other students. However, IDEA does not provide guidance on what the FBA process should involve and each state has interpreted this requirement differently (Weber et al., 2005). In most educational settings, information for FBA is gathered using a combination of both indirect and direct descriptive assessments (Johnston & O'Neill 2001).

Indirect Methods of Assessment

Indirect methods of assessment involve collecting information reported by an informant. The informant is typically the classroom teacher, school counselor, or any educator who has at least some interaction with the student engaging in problem behavior. Some of common indirect methods of assessment include: functional assessment interviews and checklists (e.g., March et al., 2000, O'Neill et al., 1997), functional assessment rating scales (e.g., Durand & Crimmins, 1992; Matson & Vollmer, 1995), and historical records reviews (i.e., school records). Functional assessment interviews have four primary goals: (a) to identify and operationalize target problem behavior(s); (b) to identify antecedents that may precede the target behavior(s); (c) to identify hypothesized maintaining variable(s) for the target behavior; and (d) to identify appropriate replacement behavior(s) for subsequent programming (Gresham et al., 2001). Functional assessment rating scales are completed by parents, teachers, or other caregivers and include items that seek to identify potential maintaining variables for target problem behaviors. Historical/archival record reviews are also used to gather student information such as demographics, special education status, attendance, office discipline referral, achievement test scores, grade retentions, suspensions, and Title I services (Gresham et al., 2001).

There are several advantages of using indirect method of assessments. First and foremost, these methods are easy and time-efficient to conduct. Conducting interviews, rating scales, and record reviews require minimal professional time to obtain a great deal of information swiftly. Second, information obtained from indirect assessment methods may be useful in the later stages of a comprehensive FBA. For example, teacher interview can facilitate the identification and operationalization of target and replacement behaviors. Interview information can also identify the appropriate times and settings for conducting direct observations in the future. Fourth, some behaviors may be difficult to observe via direct methods due to infrequency (e.g., truancy) or their cover nature (e.g., stealing), thus, indirect methods of assessment may be more appropriate (Barnhill, 2005; Gresham et al., 2001).

Although indirect methods may be more convenient and time-efficient, there are several disadvantages that should not be overlooked. First, when providing information via interviews, checklists, or rating scales, the informant rely on his or her memory of events. And most importantly, research has found indirect assessments to be unreliable especially when used in isolation (e.g., Alter et al., 2008; Duker & Sigafoos, 1998; Newcomer & Lewis, 2004; Sturmey, 1994).

Descriptive Assessments Methods

Descriptive assessments are used when directly observing behavior in its naturally occurring environmental conditions (Barnhill, 2005). In other words, these assessments involve direct observation and measurement of target behavior(s) without any manipulation of variables. As such, descriptive observation methods identify only correlations rather than causal hypotheses regarding functional relationships between behaviors and consequences. Additionally, these

direct assessments can identify antecedents that reliably precede the occurrence of problem behavior.

The antecedent-behavior-consequence recordings (ABC; Bijou et al., 1968) allows observers to gather information on antecedents to behavior (A), the topography of student behavior (B), and environmental consequences to behavior (C). This information is then analyzed to identify patterns in antecedents and consequences of behavior and a functional hypothesis of behavior is developed. This method is considered open-ended as it contains descriptions of all events that occur prior and subsequent to the target behavior (Barnhill, 2005). Another common way to conduct direct observations is to use scatterplots to record the occurrence and nonoccurrence of problem behavior across a designated time period (Touchette et al., 1985). Typically, the data are displayed as a graph with time intervals on the y-axis and consecutive days on the x-axis. These graphs provide a visual representation of the occurrence of problem behavior across intervals of time that correspond to various contexts and activities throughout the day (Barnhill, 2005).

A major advantage of using direct descriptive assessments is that it allows an individual to observe the problem behavior in the environment in which it naturally occurs, thus allowing for the opportunity to record a multitude of variables which may be relevant to the target behavior (Thompson & Borrero, 2011). However, as with indirect assessment methods, there are several disadvantages of utilizing descriptive assessments in isolation. First, descriptive analysis requires an adequate sampling of the target behavior which may result in bias if the individual's environment is not sampled properly. Second, as mentioned previously, these direct descriptive assessment methods only provide correlational data, as such ambiguous results are a potential concern (Rooker et al., 2015). Demonstrating correlation may not actually reveal the function of

behavior, rendering the assessment impractical. Some of the disadvantages can be alleviated if descriptive assessments are conducted in a more structured format; however, as noted by Thompson and Borrero (2011), the more structure added to the observations, the less naturalistic they become. Perhaps the largest potential disadvantage of descriptive assessments is that prior research has demonstrated that descriptive assessments have inconsistent and low correspondence to robust experimental assessment method, such as a functional analysis (Hall, 2005; Lerman & Iwata, 1993; St. Peter et al., 2005, Thompson & Iwata, 2007). As such, relying solely on either indirect or descriptive assessments to identify and treat problem behavior should be cautioned.

Functional Analysis

Unlike indirect and descriptive assessments, functional analysis (FA) can empirically demonstrate a causal relation between two variables (Baer et al., 1968). Although FA procedures can differ, all variations share essential characteristics to systematically observe behavior in test and control conditions. Specifically, the test condition contains the variable of interest whose influence is being evaluated and the control condition is used to rule out the possibility that the target behavior observed under the test condition would have occurred regardless of what the condition contained (Iwata & Dozier, 2008). Another characteristic of FA includes antecedent events. Antecedent events are those in effect prior to the occurrence of the target behavior and serve as potential establishing operations (EO; Laraway et al., 2003). For example, in the test condition for tangible, a stimulus is withheld from the participant, which may increase the value of the tangible as a reinforcer. Thus, restriction of a potential positive reinforcer or presentation of a potential negative reinforcer to increase the effectiveness of consequences (i.e., EO) is an important component of the test condition when conducting FA (Iwata et al., 1994).

First introduced in 1982, FA offers a systematic method of evaluating factors maintaining an individual's problem behavior (Iwata et al., 1982/1994). The FA process includes presenting and withdrawing different stimuli (e.g., reinforcer) during brief (i.e., 5-15 min) test conditions to observe how they affect an individual's behavior (O'Neill et al., 1997). The process also involves evoking and reinforcing the problem behavior by creating an EO (e.g., attention deprivation), with the presentation of a possible reinforcer (e.g., teacher attention). Consistent increases of a target behavior during an FA when compared to a control condition, are evidence of the function that is maintaining the problem behavior. For example, if presenting an academic demand to a student and then removing it when the problem behavior is exhibited consistently evokes the problem behavior, then it can be determined that presenting the task (i.e., discriminative stimulus) triggers the problem behavior and removing the task reinforces the behavior.

Carr (1977) first operationalized FA by providing a framework for an experimental methodology for determining functions of self-injurious behavior. Specifically, Carr proposed five hypotheses for challenging behavior in individuals with developmental disabilities; three of which were maintained by contingencies of reinforcement (i.e., attention, escape, and sensory consequences). Iwata et al. (1982/1994) extended this by defining a more comprehensive methodology for examining the functions of self-injurious behavior. In this particular study, Iwata et al. manipulated antecedent and consequent stimuli within 15 min sessions conducted in an analogue (i.e., contrived) setting to assess the function of self-injurious behavior (i.e., biting, head banging, face slapping, self-choking, and hair pulling) of nine participants with developmental disabilities. In order to assess the socially mediated positive reinforcement (e.g., attention) hypothesis, Iwata et al. (1982/1994) set conditions of low attention and provision of

mild reprimands and physical contact as forms of attention contingent only when participants engaged in self-injurious behavior.

When assessing the social negative reinforcement hypothesis (e.g., escape from demands), Iwata and colleges (1982/1994) presented tasks to participants, and only withdrew tasks contingent on occurrence of self-injurious behavior. To assess the automatic reinforcement hypothesis, the participants were placed in a room alone (i.e., without other people, toys, or materials). A control condition, which consisted of unrestricted access to materials and attention, was used for comparison to the test conditions. All conditions were conducted within a single-case, multielement research design. Results indicated multiple functions of behavior within and between participants, which suggested self-injurious behavior could be maintained by different sources of reinforcement for different students. Findings from this study also indicated intervention selection could be both individualized and targeted for maximum efficacy by identifying the function(s) of behavior for each individual.

Since the Iwata et al. (1982/1994) initial description of the expanded approach to FA, it has been successfully used to assess a variety of problem behaviors, including self-injury (e.g., Iwata et al., 1994), aggression (e.g., Marcus et al., 2001), tantrums (e.g., Vollmer et al., 1996), vocalizations (e.g., Wilder et al., 2001) and noncompliance (e.g., Wilder et al., 2007). Furthermore, FA has been used successfully to asses a variety of behavioral functions including: attention from others (e.g., teacher or peer attention), access to tangible items (e.g., toy) or activity (e.g., video game), escape from instructional demands (e.g., independent seatwork), social interaction (e.g., recess), aversive noise (e.g., siren/alarms), and automatic stimulation (e.g., finger-flicking). Identification of clear behavioral functions was reported in 91% out of 152 cases by Iwata et al., (1994). Specifically, social-negative reinforcement (e.g., escape from

demands) accounted for 58 cases, social positive-reinforcement (e.g., attention) accounted for 40 cases, and automatic reinforcement accounted for 39 cases. A review conducted by Asmus et al. (2004) indicated successful identification of behavioral function in 96% of 138 FA of the challenging behavior of individuals with and without developmental disabilities.

Many studies have also used FA to determine the function of behavior with varying populations and settings. Hanley et al., (2003) noted in their review of studies using FA that 70% included children, 37.2 % included adults, 91.3% included individuals with a developmental disability, 20.9% included individuals with autism, and 9% included individuals with no diagnosis of a disability. In addition, Hanley et al. indicated that 32.5% of these studies were conducted in a hospital inpatient setting, 31.4% in a school setting, 25.3% in an institution, 7.6% in the home, 7.6% in a clinic (outpatient setting), and 2.2% in a vocational program.

The settings in which FA has been conducted vary from highly contrived (i.e., analogue) settings, such as hospitals, outpatient clinics, and unoccupied rooms in schools (e.g., resource rooms or cafeterias) to somewhat uncontrolled settings such as bedrooms in clients' homes and classrooms with other children present (Hanley et al., 2003). Analogue settings are usually preferred because they provide strong experimental control over variables that may affect the integrity of the analysis (Stichter, 2001); however, there are some limitations in conducting FA in these settings. Sterling-Turner et al., (2001) found that the ability of the analysis to accurately depict behavior in analogue settings is compromised by the artificial conditions of the setting. For example, it may be difficult to evoke the challenging behavior if the setting is different from the classroom where the challenging behavior typically occurs. If the classroom setting is itself a discriminative stimulus that signals the availability of reinforcement (e.g., peer attention), an

analysis conducted in an analogue setting may not produce accurate results (Lang et al., 2010; Sterling-Turner et al., 2001).

The natural setting refers to a setting where the challenging behavior actually occurs (e.g., the student's classroom rather than an unoccupied classroom). Lang et al. (2008) compared implementing FA in an analogue setting (i.e., empty assessment room) to a more natural setting (i.e., the students' actual classroom) with two students with ASD who exhibited challenging behavior including dropping to the floor, hitting the therapist, elopement, and head hitting. Attention, escape, and control conditions were conducted with both students. FA conditions were alternated in a single-case, multielement research design, and the influence of the setting (assessment room compared to the natural classroom) was examined using an ABAB design (Lang et al., 2008). Results indicated that for one student, escape was the identified function in both settings, whereas for another student problem behavior was elevated during both attention and escape conditions compared to control conditions in the assessment room. For this latter student, unclear results were obtained in the classroom. Lang et al. (2008) noted that a possible reason for this discrepancy could have been alternative sources of reinforcement (e.g., peer attention).

FA conducted in natural settings (i.e., classroom) raise concerns about threats to experimental control due to various potential variables that may influence the conditions. For example, control over reinforcement may be weakened by the presence of peers in the classroom setting. Another potential limitation of FA conducted in the classroom is that teachers are reluctant to allow FA in their classrooms due to the increased risk to staff and peers in cases where students' challenging behavior are evoked (Solnick & Ardoin, 2010). Iwata and Dozier (2008) found most common criticisms of FA in the classroom focus on time, training, and setting

constraints. Specifically, the authors noted that many researchers described FA as too time-consuming, too specialized or complex to train teachers to perform, and unable to exert tight control over environmental conditions. To address these limitations, I will discuss variations to FA procedure to strengthen the design in school settings.

Brief Functional Analysis

Northup et al. (1991) modified the traditional FA procedure by developing the brief functional analysis (BFA). The BFA consisted of a single exposure to 5-min test and control conditions, conducted with replication of a test condition followed by a treatment probe to determine the function of problem behavior for three participants with disabilities. Results indicated conducting a BFA during a 90-min assessment can lead to the identification of a behavioral function. The BFA was found to be a practical substitute when a more comprehensive analysis could not be conducted, as it effectively addressed the issue of time constraints. However, Northup et al. noted that the BFA design may not be appropriate for low rates of problem behavior.

Derby et al. (1992) conducted BFA with 79 participants with varying problem behaviors. Participants included individuals with mild intellectual disability (ID), moderate ID, severe to profound ID, or autism. Problem behavior included self-injury and aggression towards others. The authors were able to determine the function of behavior for 46% (i.e., 37 out of 79) of the participants by conducting BFA in a short period of time. They noted that BFA was preferable over indirect measures (e.g., surveys) because it lowers the degree of conjecture needed to identify maintaining contingencies. Although somewhat effective, Derby et al. cautioned that the BFA should not be considered as a replacement for the more traditional FA procedure.

Single Function Test

Another variation of the traditional FA that addresses time constraints is the single function test (Iwata & Dozier, 2008). This variation tests for a single hypothesized function. Single-function test can be used when informal observations strongly suggest a specific source of maintenance. This method consists of a single test condition versus a control condition. If the challenging behavior occurs at a high rate, the participant immediately goes in to intervention phase. This variation may be helpful when the target behavior is potentially risky (e.g., SIB, aggression) to the participant and/or therapists. Iwata and Dozier could not confirm whether there is loss in accuracy in determining the function of behavior using the single-function test compared to a traditional FA. Furthermore, the authors cautioned to only use this method if a single function of problem behavior is highly likely.

Vollmer et al., (1995) used another variation of the single-function test as part of an assessment package to specifically assess the challenging behavior of 20 individuals with developmental disabilities. This variation consisted of observing the individual during repeated "alone" or "ignore" conditions to test for an automatic reinforcement function. Problem behavior in Vollmer et al.'s (1995) study included self-injury, aggression, stereotypy, and tantrums. Results indicated that six (approximately 30%) participants demonstrated challenging behavior as a result of automatic reinforcement identified via single functional test.

Trial-based Functional Analysis

Sigafoos and Saggers (1995) designed the first trial-based FA to address the issue of setting constraints. They conducted the trial-based FA in a classroom setting with two students with autism spectrum disorder who exhibited problem behavior (i.e., aggression towards staff). Probes trials during ongoing instruction were conducted across the school day, and continued for

the entire school week. The trial-based FA included the same conditional as the traditional FA; however, the duration of eat condition was strikingly brief. Specifically, during trial-based FA each trial included a 1 min test segment and a 1 min control segment for each condition of tangible, attention, and escape. Four trials under each condition were conducted per day across a five-day period (60 trials in total) incorporated in the classroom routine. Results indicated that trial-based FA was successful in determining the function of behavior for both students. Sigafoos and Saggers noted trial-based FA required minimal time and labor per student. They also suggested fewer trials over a shorter time period could be used rather than the extensive 60 trials dispersed over a period of 5 days in the study. Another advantage noted was that time exposed to contingencies, which may inadvertently strengthen problem behavior, is reduced with a trial-based FA. A limitation noted by the authors included carryover effects from test condition to control condition, thus, the results should be interpreted with caution. In addition, they suggested future research should include comparing traditional and trial-based FA to determine correspondence (Sigafoos & Saggers, 1995).

Wallace and Knights (2003) replicated the use of 1 min test segment and a 1 min control segment to assess correspondence between brief (i.e., trial-based) FA and extended (i.e., traditional) FA. Problem behavior included disruptive behavior (i.e., yelling, rocking, pacing, jumping up and down, finger snapping, clapping, and physical aggression) in three adults with developmental disabilities. A procedural distinction between this study and the previous study by Sigafoos and Saggers (1995) and was that the test conditions were ordered according to a modified pairwise design (i.e., a series of test-control trials for one condition was conducted followed by a series of test-control trials for another condition) rather than rapidly alternating conditions. Results indicated correspondence between the trial-based FA and traditional FA for

two of three participants, with partial correspondence identified for the third participant. In addition, the authors found the brief FA to require on average 36 min to determine the function of participants' problem behavior compared to 310 min for the extended FA. In other words, the trial-based FA required approximately 88% less time than the traditional FA to identify the function of problem behavior (Wallace & Knight, 2003).

To extend the findings and address the limitations of the previous studies, LaRue et al. (2010) compared results of trial-based FA to results of traditional FA on functions of challenging behavior of five participants diagnosed with ASD and intellectual disability. Problem behavior included aggression, self-injurious behavior, disruption, spitting, inappropriate vocalizations, and hand stereotypy. Traditional FA was conducted in therapy rooms, whereas trial-based FA was conducted in typical classroom and vocational settings with other students present. Both models of FA were conducted by the classroom teacher. Trials during the trial-based FA began with a 1 min test segment and ended with a 1 min control segment. Results indicated correspondence four of five participants with one participant with partial correspondence. Additionally, trial-based FA did not require recurring reinforcement of the problem behavior, and results were obtained in an average of 32 min compared to 208 min of the traditional FA. Similar to the results of the Wallace and Knight (2003), LaRue et al. (2010) found that conducting trial-based FA resulted in in 85% less time than the traditional FA. Another advantage noted by the authors was that data collection was much less intensive for the trial-based FA, such that data collectors were only required to document presence or absence of behavior during the presentation and absence of EO.

To address the limitation of carryover effects from test segments to control segments during trial-based FA, Bloom et al. (2011) extended the Sigafoos and Saggers (1995) study by

conducting trial-based with 10 students with developmental disabilities, hearing impairments, and speech delays exhibiting different challenging behavior. Problem behavior included aggression, self-injury, bizarre vocalizations, and inappropriate touching. Conditions included attention, tangible, demand, and ignore, and were conducted in the classroom by behavior analysts. Unlike Sigafoos and Saggers (1995), the control segment for each trial was conducted first to avoid carryover of challenging behavior from test to control segments (i.e., from EO present to EO absent). In addition, Bloom et al.'s study included a test for automatic reinforcement. Sessions consisted of 4-min trials embedded during the school day, with 20 trials conducted for each condition. Each condition consisted of a 2-min control segment and a 2-min test segment. Reinforcement was provided contingent upon challenging behavior only. When compared to traditional FA, correspondence for trial-based FA was noted for six of 10 participants. Bloom et al. noted main benefit of trial-based FA is each trial is brief in duration and can be easily embedded into ongoing classroom activities, thus minimizing disruptions. For future studies, Bloom et al. suggested that longer test segments than control segments might improve precision (e.g., 1-min control, then 3-min test).

Overall, findings from previous studies indicate trial-based FA is a feasible analysis method and may present advantages over the traditional FA method. The trial-based FA is time efficient and its results provide more ecological validity when conducted in the classroom setting (i.e., natural environment) where the problem behavior occurs. A growing number of studies have assessed teachers' ability to conduct trial-based FA with high procedural integrity in the classroom; however, only a few studies have assessed the trainee's ability to train additional educators to conduct FA with similarly high procedural integrity in the natural setting.

Educator Training

One of the roles of a school psychologist is to provide consultation to educators (e.g., teachers, para-professionals, teacher's assistants). Through the consultation process, educators are expected to learn and apply new skills, thereby becoming empowered and independent of the consultant. Therefore, it is beneficial for educators to be trained in behavioral assessment techniques to independently identify the function of problem behavior of a student and to conduct similar assessments with other students accurately.

Although Bloom et al. (2011) conducted trial-based FA in classrooms, graduate students, rather than teachers, were used as therapists. In subsequent studies, Bloom et al. (2013) and Lambert, Bloom, and Irvin (2012) used teachers as therapists; however, a limited description of the protocol used to train the teachers was provided. Similarly, Sigafoos and Saggers (1995) and LaRue et al. (2010) had teachers conduct trial-based FA, but did not provide any information about teacher training process. Although teachers have conducted trial-based FA in classrooms in previous studies, only a limited number of studies have provided information about the extent the teachers conducted the assessments independently and what supports were necessary to achieve high procedural integrity (e.g., Kunnavatana et al., 2013).

Approaches to Educator Training

Research studies have included several approaches for training educators to conduct functional assessments in schools. A common approach is to provide group staff trainings (e.g., in-service, workshops) so that multiple individuals can be trained simultaneously. Although this format allows dissemination of new information to a large group of educators, it often requires teachers to be scheduled away from their classrooms to attend the training, and repeated trainings may be necessary due to absences or educator turnover. In-service trainings are often approached

as a workshop in which educators are expected to acquire mastery of new skill and knowledge within a brief time frame (Clarke & Hollingsworth, 2002). Kunnavatana et al. (2013) suggested that large-scale in-service trainings is an ineffective approach because it does not take into consideration the training components necessary for behavior change. To increase the likelihood of a lasting change in educator behavior, Clarke and Hollingsworth (2002) recommend in-service trainings should emphasize learning through participation and practice. Additionally, case models should be used to demonstrate in situ use of the skill (Clarke & Hollingsworth, 2000; Kunnavatana et al., 2013). Staff training research also suggests that in-service training are more effective when the following components are included: active learning, practice opportunities, planning of classroom implementation, and teachers support after the initial training (Garet, Porter, Desimone, Birman, and Yoon, 2001). Overall, these aforementioned strategies may increase the degree to which educators learn a new skill as well as promote long-term use of the skills being taught in an in-service training; however, sufficient support must be available after the training to ensure that teachers implement the procedures with high integrity (e.g., Noell et al., 2002). This approach is potentially costly, especially if an outside consultant is providing training and subsequent support for all educators.

Pyramidal training, also known as train-the-trainer model, is an alternative approach to educator training and consists of providing training to a small number of individuals who in turn train and support additional individuals (Page et al., 1982). Specifically, pyramidal training involves an "expert" (e.g., behavior analyst, school psychologist) teaching a primary trainer (e.g., school counselor) both a procedure and the method of training it. Once the primary trainer has mastered the procedures, this process can be repeated by the primary trainer who would then teach additional educators how to implement the procedures and collect data with fidelity.

Pyramidal training method has been effective for training diverse groups, such as residential and institutional staff (e.g., Page et al., 1982; Parsons & Reid, 1995), parents and other family members (e.g., Kuhn et al., 2003; Neef, 1995). In addition, a wide variety of skills have been taught using pyramidal training, including strategies for teaching appropriate behavior (e.g., Kuhn et al., 2003; Neef, 1995; Page et al., 1982), treatments for problem behavior (e.g., Shore et al., 1995), and assessments (Pence et al., 2012; 2014).

Pyramidal training may be more cost-effective and time-efficient in schools, because it reduces the number of teachers requiring direct training from an outside consultant and also allows primary trainers to directly train, and provide feedback and ongoing support to teachers in the classroom (Kunnavatana et al., 2013). Incorporating educator training into the consultation process allows schools to make the most of bringing in a consultant and potentially minimize the need for hiring future consultants by training in-house educators in behavioral procedures (Traub et al., 2017). If needed, the consultant can check on the accuracy of training and program implementation by performing brief observations on subsequent visits. Further, if there is teacher turnover, primary trainers are in place to train new teachers as needed. Thus, pyramidal training approach may produce better long-term changes in educator performance than direct staff training (Haberlin et al., 2012).

Educator Training Procedures

The context of the training provided during pyramidal training can vary. Most commonly, researchers have utilized competency-based procedures such as Behavioral Skills Training (BST; Himle et al., 2004; Miltenberger, 2008). Research has demonstrated that traditional didactic training (i.e., one person simply telling another person what to do) often has short-lived effects and does not provide the trainee the opportunity to practice the procedure (Noell et al., 1997;

2002). In Behavioral Skills Training, the trainer systematically provides instructions, models the behavior, rehearses the behavior with the learner, and provides feedback on the learner's performance until the learner achieves a mastery criterion. In combination, these methods are effective in teaching new behavior and have the support of a large literature base (e.g., Hogan et al., 2015; Miles & Wilder, 2009; Miltenberger, 2008; Nuernberger et al., 2013). There are four primary benefits for employing competency-based training such as BST: "(a) it ensures staff understand how to implement recommendations, (b) it provides staff an opportunity to discover whether they are physically capable of implementing the recommendations, (c) it provides the opportunity to determine whether it is something they are able and willing to consistently implement in their classroom, and (d) it allows staff to build confidence in their own skills and abilities to produce and maintain behavior change prior to the behavior analyst leaving the classroom or case" (Traub et al., 2017, p. 13). Overall, BST has been shown to be an effective method for training educators to implement interventions (e.g., Homlitas et al., 2014; Nigro-Bruzzi & Sturmey, 2010); however, there is limited research on the effectiveness of pyramidal training using BST to train educators to conduct trial-based FA.

Pyramidal Training for Trial Based FA

To date, only two studies (Alnemary et al., 2016; Lambert et al., 2013) have examined the effectiveness of the standard train-the-trainer model on primary trainers to conduct trial-based FA and train subsequent staff. The only study to include train-the-trainer approach to teach for trial-based FA in the educational setting was conducted by Kunnavatana et al. (2013); however, a modified pyramidal training model was used. Specifically, Kunnavatana, et al. provided separate didactic training to special education program coordinators (i.e., primary trainers) and special education teachers (i.e., secondary trainers). Ten coordinators were trained

to conduct trial-based FA, calculate and graph data, and interpret the function of problem behavior; however, only five of the coordinators provided support to special education teachers. Two of the five special education teachers had students in their classroom who engaged in problem behavior at the time of the study, thus, in-situ generalization probes were only conducted with these two teachers.

Training procedure included didactic presentation with models, small group role-play rehearsal with immediate feedback, and individual rehearsal with delayed feedback. During the didactic training for teachers, coordinators lead small group role-play and provided feedback to teachers on 100% of opportunities. During baseline, all five teachers conducted trial types with varying levels of accuracy (range, 0-71.4%); however, following training during role-play, they variably improved their accuracy in conducting trials. Specifically, one teacher conducted all four trial types with 100% accuracy immediately after receiving training, while two teachers required feedback with which they increased fidelity to 100% during the second role-play test opportunity. Two additional teachers required feedback on multiple trials with only one receiving 100% accuracy for all trials.

Baseline data were available for only four of the five teachers. During baseline, three of the four teachers calculated and graphed data above 90% accuracy, while one demonstrated 65% accuracy. After training, three teachers improved their accuracy to above 94% while one teacher's accuracy decreases to 88%. Maintenance probes for calculating and graphing was calculated for two of the five teachers 10 to 13 weeks after training; for both teachers, accuracy decreased from 100% to 88%. Overall, the results demonstrate the effectiveness of a modified pyramidal training for increasing the accuracy with which special education teachers conduct trial-based FA. However, there are a number of limitations that caution interpretation. First, the

authors note that baseline and generalization data was collected via in-situ sessions in teachers' classroom, but data from scripted role-plays were used for post-training. Simulated role-plays allowed teachers the opportunity to conduct all trial conditions, which may not have been possible via in-situ sessions. Second, prior teacher experience may have influenced their performance in the study. The five special education teachers had between seven to 20 years of experience and three of the teachers had master's degrees. Further, special education teachers may have had prior experience with graphing and data collection. The absence of program coordinator's fidelity to conduct trial-based FA is a major limitation of this study.

Lambert et al. (2013) conducted pyramidal training with six supervisors (i.e., primary trainers) at a residential facility who in turn trained nine house managers (i.e., secondary trainers) to conduct trial-based FA on nine adult residents with developmental disabilities who engaged in problem behaviors (e.g., screaming, self-injury, property destruction). The house mangers' fidelity to trial-based FA procedures during baseline and post-training phase was the dependent variable. Fidelity data was recorded in response to questions (e.g., "Did the house manager ignore all client behavior during this segment?") listed on checklists specific to each trial-based FA condition. Fidelity was calculated by dividing the number of steps completed by the total number of steps for each trial and converting the results to a percentage. Before collecting baseline data, house managers were instructed to read Bloom et al., (2011) at least 24 hr before the scheduled assessment. A research assistant collected baseline data on the house managers' fidelity to assessment procedure without proving feedback.

Supervisors then conducted training sessions with house managers according to a rubric. Fidelity was recorded in response to tasks outlined on a rubric and calculated by dividing the tasks completed by the total number of tasks and converting the results to a percentage. The

training included the following steps in order: (a) 15 min review of written description of the assessment, (b) describe and model each trial segments in each condition of the trial-based FA with house managers acting as clients during role play, (c) describe and model data collection procedures using a completed trial-based FA data collection sheet, and (d) role play with supervisors as clients and house managers as therapists according to scripts. If errors were made, supervisors provided feedback at the end of that particular role play trial by stating the error, describing and modeling the correct procedure, and providing an additional opportunity to conduct the trial. These role plays were continued until all house managers demonstrated 100% fidelity to the trial-based FA procedure. Four of the six supervisors conducted their training with 100% fidelity (range, 85% to 100%).

Post-training data was collected similar to baseline with two exceptions: house managers were not instructed to read Bloom et al. (2013) and feedback was provided after trials conducted with less than 100% fidelity. As such, only the first trial of each type of condition reflected the effect of house manger training alone. Baseline data revealed that house managers conducted trial types with less than 50% accuracy. Results indicated that house managers' post-training fidelity prior to receiving feedback from research assistant improved across all conditions compared to fidelity during baseline. Eight of the nine house managers required feedback in at least one condition during post-training trials to achieve perfect fidelity. Although Lambert et al. (2013) demonstrated successful application of pyramidal training for teacher supervisors to train house managers, there are a few limitations that warrant attention. First, providing feedback during post-training trials may have obscured the effect that training alone had on performance of house managers' fidelity. Another limitation noted by the authors included using a nonconcurrent multiple baseline design with brief baseline length. A concurrent multiple

baseline design may have strengthened experimental control in the study. A major limitation includes the absence of supervisor's fidelity data in baseline and post-training trials.

To address the limitation of Lambert et al. (2013), Alnemary et al. (2016) replicated the study with behavior consultants to conduct the assessment as well as train others to conduct trial-based FA. Participants included four behavior consultants (i.e., primary trainers) and four behavior technicians (i.e., secondary trainers) employed a behavioral agency. Similar to Lambert et al. (2013), the dependent variable was the correct implementation of trial-based FA procedure and a nonconcurrent multiple baselines design was employed. Alnemary et al. (2016) also used checklists to record participants' fidelity data as well as behavior consultant's training fidelity data. The behavior consultants training include the following steps: (a) 2 hr group training to describe the assessment procedure using PowerPoint presentation and videos, (b) role play practice with each participant alternating between playing the role of the therapist and client, (c) simulated trial-based FA for one set of conditions, (d) feedback, and (e) additional opportunities to conduct the trial if fidelity was less than 90%. Behavior consultants followed the same training procedure with the following exceptions: the behavior technicians were trained independent and the duration of training was shorter (approximately 75 min). Their adherence to training protocol was on average 96%.

Results were consistent with Lambert et al. (2013) in that pyramidal training was effective in training participants to conduct trial-based FA with high procedural fidelity. Specifically, during baseline the mean percentage of correct implementation across all conditions and participants was approximately 48% (range, 20–100%) and post-training mean percentage of correct implementation was approximately 95% (range, 75–100%) for all participants across all conditions. Limitations noted by the authors include the use of nonconcurrent multiple baseline

design, which may not have demonstrated strong experimental control, as well the use of simulated roles. Because actual clients were not included in any part of the study, it is not clear whether pyramidal training was sufficient in training participants to conduct trial-based FA with high fidelity. Lastly, similar to Lambert et al. (2013), data analysis and graphing were not included in the training procedure for this study.

Purpose and Research Questions

Previous research has not examined training school psychologists to conduct trial-based FA and subsequently training teachers. As such, the current study aimed to address this gap by training school psychologists to conduct trial-based FA as well as supervise general education teachers to conduct trial-based FA with high fidelity. The study was guided by the following questions:

1. To what extent can school psychologists accurately conduct a trial-based functional analysis (FA) after receiving training?
2. To what extent can general education teachers accurately conduct a trial-based FA after receiving training from a school psychologist who received the initial training?

CHAPTER III: METHOD

The current study sought to evaluate the effectiveness of pyramidal training procedure designed to teach school psychologists and general education teachers to (a) conduct a trial-based functional analysis, (b) calculate data, and (c) interpret the data to determine the function of problem behavior. The study was guided by the following questions:

1. To what extent can school psychologists accurately conduct a trial-based functional analysis (FA) after receiving training?
2. To what extent can general education teachers accurately conduct a trial-based FA after receiving training from a school psychologist who received the initial training?

Below I will discuss the research methods of this study. The following sections are discussed, (a) participants, (b) setting, (c) measures, (d) procedure, (e) interobserver agreement, (f) experimental design, and (g) analysis.

Participants

The participants for the study included three school psychologist-general education teacher pairs. Prior to this study, none of the participants had received academic training in behavior analysis or any exposure to any form of FA.

School Psychologists

Three school psychologists were contacted through the researcher's workplace who were interested in learning about and conducting FA. The potential school psychologist participants were contacted prior to the study to describe the study and to be invited to participate in this study. A brief description of their training experience (i.e., number of years employed as a school psychologist, degree obtained) was collected. All three school psychologists were Caucasian females, licensed to practice in Missouri, and worked at nearby public schools. School

Psychologist 1 and 2 worked at the same suburban school district, while School Psychologist 3 worked at another school district also located in the suburbs. All school psychologist participants had bachelor's and educational specialist degrees and had 3 to 5 years of experience working in their current position. The school psychologists ranged in age from 28 years to 32 years at baseline.

Teachers

Each school psychologist participant identified one general education teacher each at their suburban school of employment who was likely to have students who engage in problem behavior and who might benefit from an FA. Potential teacher participants were contacted prior to the study to describe the study and to be invited to participate in this study. A brief description of their teaching experience (i.e., number of years taught, grade levels taught, degree obtained) was collected. All three teachers were Caucasian females and taught in elementary school. Teacher 1 taught fourth grade, had 6 years of experience and was currently working on her master's degree. Teacher 2 had 2 years of experience as a second-grade teacher and had her bachelors' degree. Teacher 3 was a fifth-grade teacher with a bachelor's degree and had 5 years of experiencing teaching in elementary school. The teachers ranged in age from 23 years to 28 years at baseline.

Measures

The school psychologists' and teachers' fidelity of implementing trial-based FA procedures was the dependent variable. Fidelity data were recorded in response to questions outlined in a modified version of Fidelity Task Analysis Form (Alnemary et al., 2017) specific to each trial-based FA type conducted during baseline and post-training (see Appendix A). The

accuracy of implementation was compared to trial-based FA procedure as described by Bloom et al. (2011) summarized below.

Attention

The attention trial was designed to test for positive reinforcement in the form of implementer (i.e., school psychologist and teacher) attention. The control segment of the attention trial consisted of delivering non-contingent attention for 2 min with no consequence for problem behavior. Prior to commencing the test trial, the implementer provided verbal attention to the student (i.e., a graduate student acting as a student) for 30 s. The attention trial began with the implementer informing the student that he/she was busy. During this trial, the implementer averted his/her attention by orienting away from the student. Upon the occurrence of problem behavior or the passage of 2 min, the implementer provided high quality attention (e.g., speaking to student without reprimands, touching) for 30 s.

Tangible

The tangible trial was designed to test for positive reinforcement in the form of accessing a preferred stimulus. The control segment of this trial consisted of allowing the student to access to preferred item for 2 min with problem behavior producing no consequences. Prior to beginning test segment, the student was given access to a preferred item for 30 s. The tangible trial began with the implementer informing the student that it was his/her turn to play with the item. During this trial, the implementer removed the item from the student and only returned the item if problem behavior occurs or 2 min have elapsed.

Escape

The escape trial was designed to test for negative reinforcement in the form of breaks from demands. The control segment of this trial consisted of 2 min of break (i.e., no demands, no

access to preferred stimuli) with no consequences for engaging in problem behavior. The test segment commenced with the implementer providing simple demands (e.g., “Touch your nose,” “Write today’s date,” “What is your name?”) to the student. Upon the occurrence of problem behavior or the passage of 2 min, the implementer ceased giving demands by saying, “You can have a break” and removing any instructional materials from the student.

Ignore

The ignore trial was designed to test for automatic reinforcement. The control and test segments were identical such that no interaction between the implementer and student occurred and no consequences for engaging in problem behavior were delivered. The segments began with the student sitting alone without access to preferred stimuli and implementer attention.

After conducting the trial-based FA, data were analyzed to determine the function of the behavior. Responding more frequently during a test segment compared to the control segment of a trial type was considered to be evidence of the function tested in that trial type, except for the ignore trials. For the ignore trials, responding occurring in both segments and persisting or increasing in subsequent test segments were considered evidence of an automatic reinforcement function (Bloom et al., 2013).

Checklist

To determine fidelity to the trial-based FA procedure described above, the researcher directly observed each participant and used a modified version of the Fidelity Task Analysis Form (Alnemary et al., 2017) checklist to record each participant’s responses in each trial type as correct, incorrect, or not applicable (see Appendix A). Percentage of correct responses was calculated by summing the total number of correct response and dividing it by the total number

of responses and multiplying by 100 to yield a percentage. A single data point per trial-based FA condition was recorded for baseline, roleplay, and post-training sessions for each participant.

Procedure

Prior to training participants on trial-based FA procedures, each participant was instructed to read Bloom et al. (2011) at least 24 hours before the scheduled assessment. Requiring participants to read the article independently assured that participants have some knowledge, rather than training, to implement trial-based FA.

Baseline

After obtaining background knowledge in FA, the researcher then instructed the school psychologists to collect data on a student's problem behavior by conducting each of the trials types in the conference room. A graduate student acting as student used a script consistent across all participants. Each participant recorded the data on the sheet provided (see Appendix B) and interpreted the function of behavior independently. No feedback was provided during baseline.

School Psychologist Training

Baseline and training of school psychologists in trial-based FA procedures took place in a large conference room at a local public library. The researcher met with three school psychologists together for 2 hours in the conference room to conduct training sessions using BST.

First, a didactic group presentation using PowerPoint slides was used to review trial-based FA (e.g., what it is, why use it, different trial types and conditions). Each trial type based on Bloom et al. (2011) was explained and modeled to include of setting-up, control condition and test condition specific to that trial type. The researcher specified that trial-based FA include 2-min trials consisting of a control segment followed immediately by a test segment (i.e.,

attention, tangible, escape, ignore). Student responding during control segment would result in the segment ending without the delivery of any consequences, while student responding during the test condition would result in the delivery of the programmed consequences and ending of the segment. Only ignore trials, which tested for automatic functions, should be conducted with two consecutive test segments.

The researcher emphasized that attention trials should be conducted when school psychologist would normally divert their attention away from the target student and that the trial should start with the control segment (deliver continuous attention). Finally, the school psychologists were trained that the test segment should begin by turning away from the student.

The researcher emphasized that tangible trials should be conducted with the student has access to preferred activities or items. The control segment of the tangible trial consists of the student having access to the item for up to 2 min or until they engaged in problem behavior and the test segment consists of restricting the item or activity.

For the escape trials, the researcher emphasized that trials should be conducted when the student had to complete academic tasks. The training also taught that the control segment of the trial should consist of no demands being placed on the student for 2 min or until the student engaged in problem behavior and the test segment should consist of the school psychologists delivering continuous instructions to complete a task. If problem behavior occurred in any of the trials described previously, then the psychologists were taught to provide the programmed consequence (i.e., 15-s attention from school psychologist in attention trials, 2-min access to preferred activity or item in tangible trials, and a 30-s break in escape trials) to the student and to end the segment. If problem behavior does not occur, then the segment should be ended as usual at 2-min.

For ignore trials, the researcher emphasized that school psychologists conduct these trials when the student would not expected to work and would not have access to preferred activities or items. No consequences should be provided if the student engages in problem behavior and each segment should last the entire 2 min.

Second, school psychologists were shown brief videos to model how to conduct each trial type. The researcher explained how to collect and analyze the data accurately to identify the function of problem behavior using the procedure outlined by Kunnavatana, et al. (2013). School psychologists were provided blank data sheets for collecting data. They were instructed to write a dash to denote the behavior did not occur during a segment of a trial and write a plus sign to denote the behavior did occur during a segment of a trial. Participants were instructed to calculate the sum of problem behavior occurrences in each test segment and to compare this sum to the occurrence of problem behavior in control segments for each condition.

Third, role-play with feedback were conducted during training. School psychologist engaged in role-play in simulated situation (i.e., a graduate student acting as the target student) to rehearse conducting each trial type and practice collecting data. All role-plays were scripted and consisted across participants. Role-plays continued until school psychologists conducted all trial types with 100% fidelity. The researcher provided immediate feedback during the role-plays and answered any questions.

Teacher Training

Teacher training was identical to the school psychologist training with two exceptions. First, each school psychologist trained one teacher rather than the researcher training all school psychologists. Second, the school psychologist conducted the role-play as the student with the teacher acting as the functional analyst. Role-plays continued until the teacher conducted all trial

types with 100% fidelity. The school psychologist provided immediate feedback during the role-plays and answered any questions. Teacher training by school psychologists took place in a smaller study room at a local public library. Trainings lasted approximately 1.5 hours for each school psychologist-teacher pair.

Post-Training

Post-training observations were nearly identical to baseline with the following exceptions: participants were not asked to read Bloom et al. (2011) and delayed feedback was provided if errors were made in the implementation of trials. Similar to baseline, post-training sessions took place in the conference room with simulated situations.

Fidelity of Trainings

A modified version of the Task-Analyzed Training Protocol (Alnemary et al., 2017) was used to assess the fidelity of the training conducted by the researcher and the school psychologist (see Appendix C). The protocol included 52 steps that were coded dichotomously (i.e., yes/no) when training participants. The 52 steps were derived from the training presentation that explained in detail how to implement a trial-based FA and how to record and interpret data. The percentage of correct responses was calculated using the same calculations as for the fidelity to implementation measure described above. Reliability of the fidelity of training measure was assess by having a second observer independently collected fidelity to implementation data.

The researcher's and school psychologists' fidelity of training are presented in Table 1. A second observer independently collected data on fidelity to training protocol. Adherence to training was high for the researcher and the school psychologist participants.

Researcher

The researcher's adherence to the training protocol is shown in Table 1. All 52 training steps following the PowerPoint presentation were implemented correctly and interobserver agreement was 100%.

School Psychologists

School Psychologists 1's fidelity to training Teacher 1 is shown in Table 1. School Psychologist 1 adhered to the training protocol with 100% fidelity (interobserver agreement was 100%). School Psychologists 2's fidelity to training Teacher 2 is shown in Table 1. School Psychologist 2 made two errors during the training and received a fidelity to training score of 96%. An independent second observed calculated School Psychologist 2's fidelity to training at 98%. School Psychologists 3's fidelity to training Teacher 3 is shown in Table 1. School Psychologist 3 adhered to the training protocol with 100% fidelity (interobserver agreement was 100%).

Table 1

Fidelity to Training Protocol

	Percent Correct	
	Observer 1	Observer 2
Researcher	100	100
School Psychologist 1	100	100
School Psychologist 2	96	98
School Psychologist 3	100	100

Interobserver Agreement of Fidelity of Implementation Data

A second observer independently collected data on school psychologist and teacher fidelity of implementing trial-based FA procedure during 30% of baseline and post-training sessions. The observer also collected data on the researcher's and school psychologists' fidelity to training protocol. Reliability was calculated by dividing the number of agreements by the number of agreements plus disagreements, and converting the result to a percentage. Mean percent agreement across 24 trials in baseline and post-training was 94% (range = 83-100%).

Experimental Design

The current study employed a nonconcurrent multiple baseline design across participants. Each session was observed by the researcher using the aforementioned checklists (data was acquired via paper and pencil). Baseline data were collected for each trial type before participants receive trial-based FA training. Post-training data were collected using the same observation procedure as baseline. A priori specification of baseline durations and random assignment of participants to baseline durations occurred before commencing data collection (Kratochwill & Levin, 2014). Specifically, baseline lasted for 5, 8, and 11 sessions for School Psychologist 1, 2, and 3, and Teacher 1, 2, and 3, respectively. Establishing a priori baseline durations combined with the random assignment of participants strengthened the experimental control in the current study and the resulting internal validity of the conclusions (Christ, 2007; Kratochwill & Levin, 2014).

Analysis

In order to evaluate the training effects of fidelity, observation data were graphed and visually inspected for change in level, trend, and variability. To supplement the visual analysis, Percent of Nonoverlapping Data (PND) was computed to estimate change in level for fidelity

before and after training for each participant. PND was calculated by identifying the most extreme baseline data point for each team and drawing a straight line across that data point. The number of intervention data points that were above the line were be divided by the total intervention data points to determine PND. A large effect was represented by a PND of 80% or higher.

Effect size was calculated for each participant's average fidelity using nonoverlap of all pairs (NAP; Parker & Vannest, 2009). NAP was computed by determining the frequency of overlap between each individual pair of baseline data point to each post-training data point and dividing by the total number of pairs (number of baseline data points multiplied by the number of intervention data points).

CHAPTER IV: RESULTS

This chapter focuses on the research questions and results of the present study. The study addresses the following research questions: 1) to what extent can school psychologists accurately conduct a trial-based FA after receiving training, and 2) to what extent can general education teachers accurately conduct a trial-based FA after receiving training from a school psychologist who received the initial training? The researcher and school psychologists' fidelity to training was measured. Additionally, both school psychologists' and teacher's fidelity to implementation of trial-based FA was calculated. The results of each for each participant are discussed below respectively.

Research Question 1: Fidelity of Implementation of Trial-Based FA for School Psychologists

Results of each school psychologist's implementation fidelity of implementing trial-based FA are presented in Table 2 and Figure 1. Trial-based FA implementation across three phases (i.e., baseline, role play, and post-training) are discussed below for each participant.

School Psychologist 1

School Psychologist 1's mean performance on trial-based FA for baseline, training role play, and post-training are shown in Figure 1 and Table 2. During baseline, the mean percentage of correct implementation for all conditions was 33.8% (*SD* = 6.68, range = 27-44%). School Psychologist 1's performance during baseline had a slight positive trend. During role play, the mean fidelity to correct implementation drastically increased to 96.4% with immediate feedback (*SD* = 8.04, range = 82-100%). Following completion of training, the mean percentage of correct implementation was 97.8% with delayed feedback (*SD* = 4.92, range = 89-100%). The percent of

non-overlapping data (PND) between baseline and post-training was 100% and the nonoverlap of all pairs (NAP) was 1. The phi coefficient was 0.99, which indicates a large effect size.

School Psychologist 2

School Psychologist 2's mean performance on trial-based FA for baseline, training, and post-training are shown in Figure 1 and Table 2. School Psychologist 2's mean percentage of correct implementation for all conditions during baseline was 52.1% (*SD* = 11.54, range = 36-67%). School Psychologist 2's performance during baseline had a positive trend. During training role play trials, the mean fidelity to correct implementation increased to 95.8% with immediate feedback (*SD* = 6.52, range = 86-100%). During post-training trials, the mean percentage of correct implementation was 95.6% with delayed feedback (*SD* = 9.83, range = 78-100%). The PND between baseline and post-training was 100% and the NAP was 1. The phi coefficient was 0.99 indicating a large effect size.

School Psychologist 3

School Psychologist 3's mean performance on trial-based FA for baseline, role play, and post-training are shown in Figure 1 and Table 2. During baseline, the mean percentage of correct implementation for all conditions was 60.64% (*SD* = 7.06, range = 45-67%). School Psychologist 3's performance during baseline remained stable throughout the phase. During role play, the mean fidelity to correct implementation increased to 93.25% with immediate feedback (*SD* = 8.11, range = 78-100%). Following completion of training, the mean percentage of correct implementation was 97.8% with delayed feedback (*SD* = 4.92, range = 89-100%). Similar to School Psychologists 1 and 2, the PND was 100% and the NAP was 1 for School Psychologist 3. The phi coefficient was 0.99, which indicates a large effect size.

Table 2

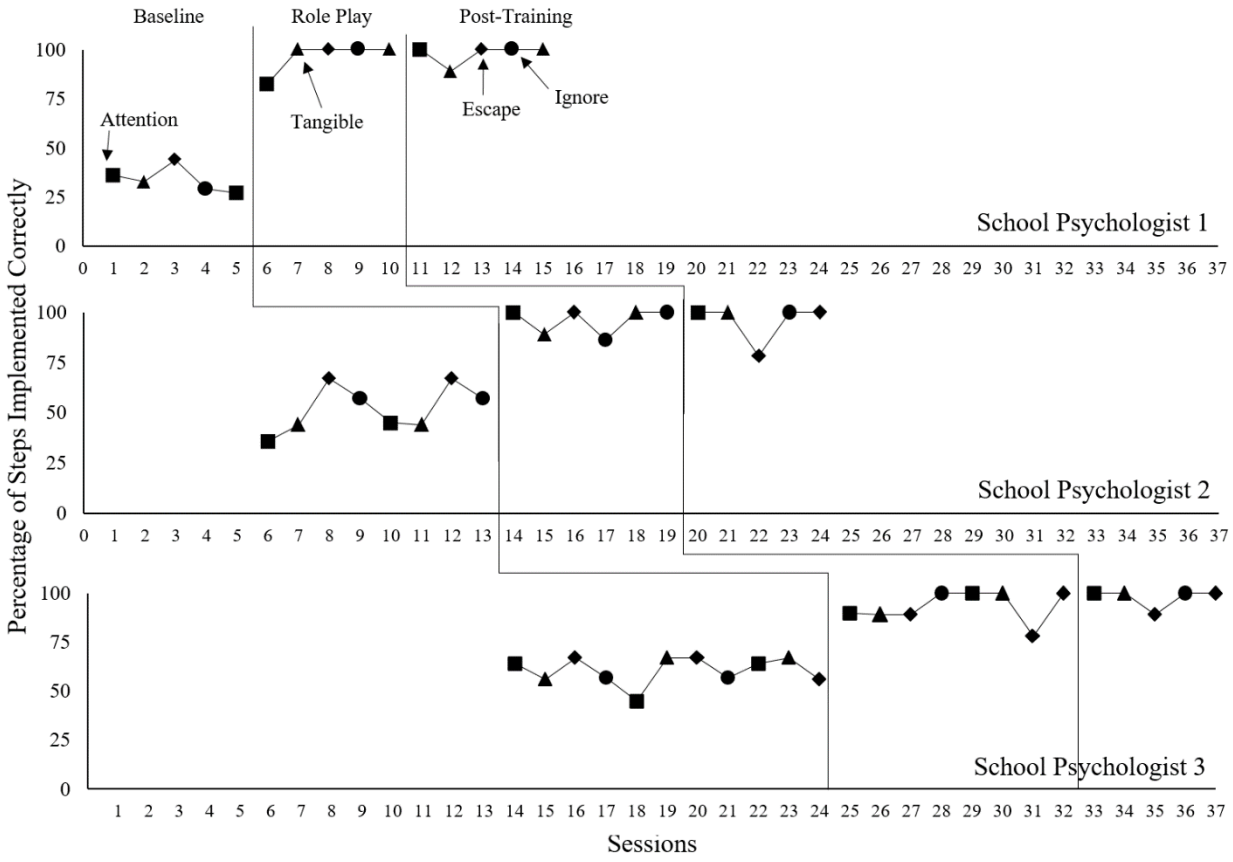
Means, Standard Deviations, Percent of Nonoverlapping Data, and Nonoverlap of All Pairs and Effect Sizes for Fidelity of Implementing Trial-Based Functional Analysis Implementation by School Psychologists

	Baseline		Training		Post-Training				
	M	SD	M	SD	M	SD	PND	NAP	Phi
School Psychologist 1	33.80	6.68	96.40	8.04	97.80	4.91	1.00	1.00	0.99
School Psychologist 2	52.13	11.54	95.83	6.52	95.60	9.83	1.00	1.00	0.99
School Psychologist 3	60.64	7.06	93.25	8.11	97.80	4.92	1.00	1.00	0.99
Total	52.21	13.33	94.89	7.35	97.07	6.53	1.00	1.00	0.99

Note. Percent of Nonoverlapping Data (PND) and Nonoverlap of all pairs (NAP) compares baseline phase data to post-training phase data.

Figure 1

School Psychologists' Fidelity to Implement Trial-Based Functional Analysis



Research Question 2: Fidelity of Implementation of Trial-Based FA for Teachers

Results of each teacher's implementation fidelity of implementing trial-based FA are presented in Table 3 and Figure 2. Trial-based FA implementation across three phases (i.e., baseline, role play, and post-training) are discussed below for each participant.

Teacher 1

Teacher 1's mean performance on trial-based FA for baseline, role play, and post-training are shown in Figure 2 and Table 2. Teacher 1's mean percentage of correct implementation for all conditions during baseline was 23% (*SD* = 14.47, range = 10-43%). Teacher 1's performance during baseline had a positive trend. During training role play trials, the mean fidelity to correct

implementation increased to 92% with immediate feedback (*SD* = 13.23, range = 64-100%). During post-training trials, the mean percentage of correct implementation was 97.8% with delayed feedback (*SD* = 4.92, range = 89-100%). The PND between baseline and post-training was 100% and the NAP was 1. The phi coefficient was 0.99 indicating a large effect size.

Teacher 2

Teacher 2's mean performance on trial-based FA for baseline, role play, and post-training are shown in Figure 2 and Table 2. During baseline, the mean percentage of correct implementation for all conditions was 52.5% (*SD* = 12.11, range = 44-71%). Teacher 2's performance during baseline had a slight positive trend. During role play trials, the mean fidelity to correct implementation increased to 96.6% with immediate feedback (*SD* = 5.20, range = 89-100%). Upon completion of training, the mean percentage of correct implementation was 97.8% with delayed feedback (*SD* = 4.92, range = 89-100%). The percent of non-overlapping data (PND) between baseline and post-training was 100% and the nonoverlap of all pairs (NAP) was 1. The phi coefficient was 0.99, which indicates a large effect size.

Teacher 3

Teacher 3's mean performance on trial-based FA for baseline, role play, and post-training are shown in Figure 1 and Table 2. During baseline, the mean percentage of correct implementation for all conditions was 39.7% (*SD* = 12.20, range = 18-57%). Teacher 3's performance during baseline remained generally stable throughout the phase. During role play, the mean fidelity to correct implementation increased to 90.83% with immediate feedback (*SD* = 14.62, range = 67-100%). Following completion of training, the mean percentage of correct implementation was 98% with delayed feedback (*SD* = 4.47, range = 90-100%). Similar to

Teachers 1 and 2, the PND was 100% and the NAP was 1 for Teacher 3. The phi coefficient was 0.99, which indicates a large effect size.

Table 3

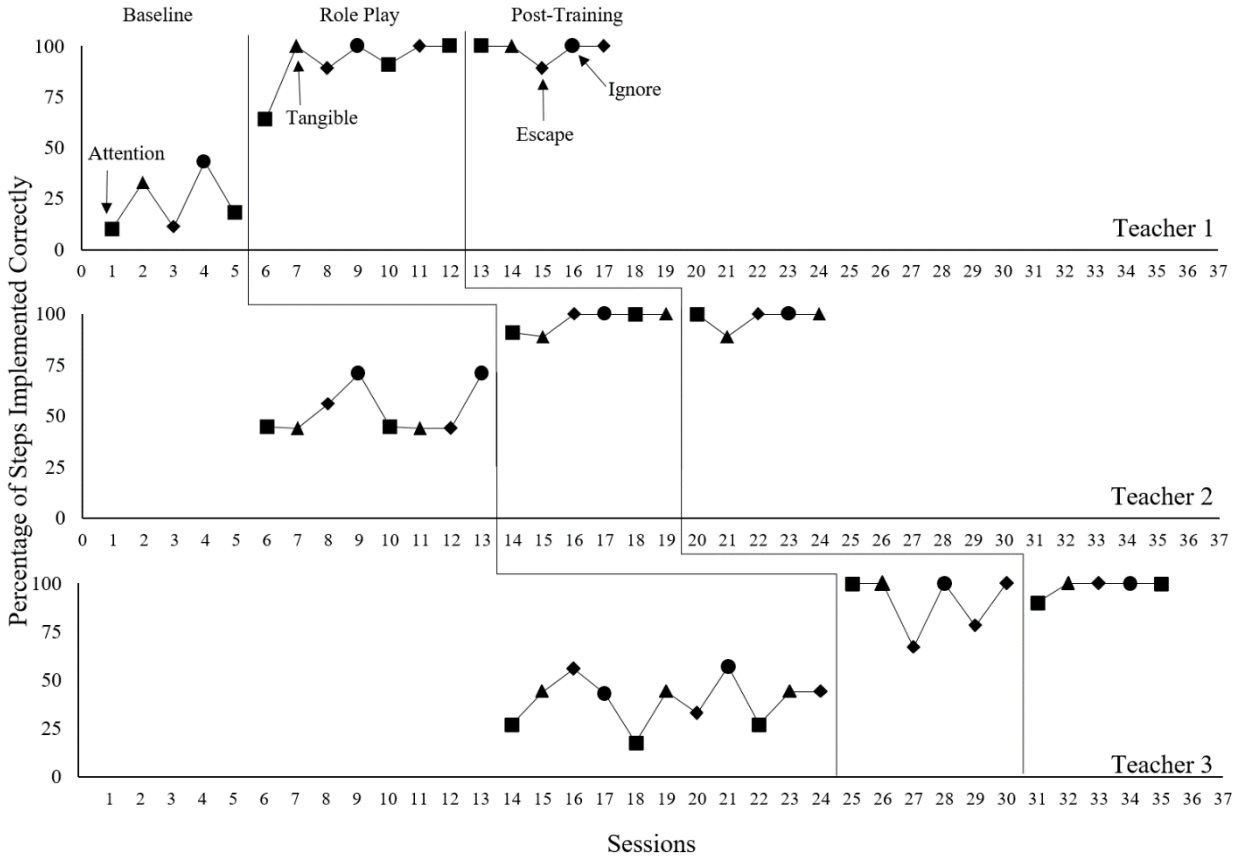
Means, Standard Deviations, Percent of Nonoverlapping Data, and Nonoverlap of All Pairs and Effect Sizes for Fidelity of Implementing Trial-Based Functional Analysis Implementation by Teachers

	Baseline		Training		Post-Training				
	M	SD	M	SD	M	SD	PND	NAP	Phi
Teacher 1	23.00	14.47	92.00	13.23	97.80	4.92	1.00	1.00	0.99
Teacher 2	52.50	12.11	96.67	5.20	97.80	4.92	1.00	1.00	0.99
Teacher 3	39.73	12.20	90.83	14.62	98.00	4.47	1.00	1.00	0.99
Total	40.50	16.21	93.11	11.47	97.38	4.72	1.00	1.00	0.99

Note. Percent of Nonoverlapping Data (PND) and Nonoverlap of all pairs (NAP) compares baseline phase data to post-training phase data.

Figure 2

Teachers' Fidelity to Implement Trial-Based Functional Analysis



Across Participants

The fidelity to implement trial-based FA for all participants was lower during baseline compared to training role plays and post-training sessions. During baseline, the mean fidelity for school psychologist participants was 52.21% (*SD* = 13.33, range = 27-67%). Teacher participants had a mean percentage of correct implementation of 40.50% (*SD* = 16.21, range = 10-71%). The mean increased drastically during training role plays for both school psychologist (mean = 94.89, *SD* = 7.35, range = 82-100%) and teacher participants (mean = 93.12, *SD* = 11.47, range = 64-100%). During post-training, school psychologist participants had a high mean fidelity of trial-based FA implementation of 97.07% (*SD* = 6.53, range = 78-100%). Similarly,

teacher participants implemented trial-based FA with high fidelity during post-training (mean = 97.38, *SD* = 4.72, range = 89-100%). The PND, NAP, and phi coefficient across all participants was 100%, 1, and 0.99, respectively indicating a large effect size.

CHAPTER V: DISCUSSION

Previous research has not examined the effects of training school psychologists to conduct trial-based functional analysis (FA) or to train other teachers to implement trial-based FA. This study addressed significant gaps in literature by evaluating the effectiveness of pyramidal training procedure to train school psychologists and general education teachers to implement trial-based FA with high integrity. The study was guided by the following research questions: 1) To what extent can school psychologists accurately conduct a trial-based FA after receiving training, and b) To what extent can general education teachers accurately conduct a trial-based FA after receiving training from a school psychologist who received the initial training? It was hypothesized that school psychologists and teachers would improve their implementation of trial-based FA when provided Behavior Skills Training (BST) which includes instruction, models, rehearsal, and feedback until the learner achieves a mastery criterion. The purpose of this chapter is to discuss the study's results in light of the proposed research questions. Limitations of the study, implications for practice, and directions for future research are also discussed.

The results of the study indicate both school psychologists and teachers implemented trial-based FA with low integrity prior to receiving training. During training, which included a PowerPoint presentation detailing the steps for conducting a trial-based FA, modeling, videos, role plays, and feedback, each participant improved their implementation of trial-based FA, and the improvements were maintained during post-training sessions for all participants and showed a large effect. The data from the current study indicate a strong relationship between the training provided and the procedural fidelity of trial-based FA for all participants. As such, it can be concluded that the trainings were effective in teaching school psychologists to implement trial-

based FA with high fidelity. Furthermore, school psychologists were then successful in training teachers to implement trial-based FA with high fidelity as well. Overall, the findings of this study indicate that pyramidal training was effective in training school psychologists and teachers to conduct trial-based FA with high fidelity.

The only study to employ pyramidal training in an educational setting to teach trial-based FA was conducted by Kunnavatana et al. (2013). The researchers used a modified pyramidal training procedure to separately train special education program coordinators to conduct trial-based FA, and the coordinators coached special education teachers (i.e., secondary trainers) to implement trial-based FA in a group setting. The current study's findings were consistent with the findings of Kunnavatana et al. (2013), however, with a stronger effect with both the primary (i.e., school psychologists) and secondary trainers (i.e., general education teachers) using the traditional pyramidal training approach.

The current study was also consistent with previous research in other applied settings. Lambert et al. (2013) used pyramidal training method to successfully train supervisors (i.e., primary trainers) at a residential facility who in turn trained house managers (i.e., secondary trainers) to conduct trial-based FA with high fidelity. The study's results indicated that house managers implemented trial-based FA with low fidelity during baseline, but their accuracy to implement steps correctly improved after undergoing training. Similarly, Alnemary et al. (2016) trained behavior consultants and behavior technicians using the pyramidal training approach to conduct trial-based FA. The results also indicated high procedural integrity across participants after completing training. The results of the current study complement the findings of Lambert et al. (2013) and Alnemary et al. (2016), and also strengthen support for utilizing pyramidal

training approach to train supervisors in different settings (e.g., residential facility, behavioral agency, elementary school).

The present study is the first to examine the effects of pyramidal training on school psychologist and teacher acquisition of trial-based FA. It is important to note that the inclusion of general education teachers in this study was purposeful. Research often indicate that teachers feel inadequately prepared to effectively manage problem behaviors in their classrooms (e.g., Reinke et al., 2011; Tillery, et al., 2010; Westling, 2010). Prior to developing effective and efficient interventions to address problem behaviors, it is crucial to first determine the function of the problem behavior (Ingram et al., 2005). Unlike indirect and descriptive assessments, trial-based FA can help general education teachers demonstrate a causal relation between variables, therefore, identify the function(s) of a student's problem behavior. Empowering general education teachers and increasing their efficacy in assessing problem behavior can ultimately lead to better classroom management skills.

Although the current study demonstrated that teachers can be trained to implement trial-based FA with high integrity, teachers may need additional support to implement this assessment accurately within their classrooms. Consultation and follow-up trainings in-situ would supplement the trainers' newly acquired assessment skills and provide them with additional experience. The training protocol in this study is proposed to be the introductory for preparing educators to conduct trial-based FA independently.

Implications for Theory

Although the study is applied in nature, it does have potential implications for theory. In the BST approach (Himle et al., 2004; Miltenberger, 2008) the trainer systematically provides instructions, models the behavior, rehearses the behavior with the learner, and provides feedback

on the learner's performance until the learner achieves a mastery criterion. Traditional didactic training (i.e., one person simply telling another person what to do) often has short-lived effects (Noell et al., 1997; 2002), but the new behavior taught with BST can be maintained for several sessions after completing the training. Previous research also found that combining didactic and BST was effective in teaching new behavior (Hogan et al., 2015; Miles & Wilder, 2009; Miltenberger, 2008; Nuernberger et al., 2013).

BST is based upon the conceptual foundation of operant conditioning and the implementation of the trial-based FA was quantified, measured, and analyzed within the framework of applied behavior analysis (Baer et al., 1968). The present study's training protocol included corrective feedback during role plays, which may have functioned as a positive reinforcer for trainees' correct responses. The data support that all participants maintained new skills (i.e., learned to implement trial-based FA with 100% accuracy) after completing the training.

Implications for Practice

Educator trainings are often conducted in a large group format via workshops or in-service learning. Although large-scale trainings disseminate information to multiple educators within a short period of time, they are often ineffective because they do not take into consideration the training components necessary for the trainee's behavior change (Kunnavatana et al., 2013). By utilizing a BST approach, trainees are given the opportunity to view models, practice, and receive feedback when learning a new skill. The current study utilized BST to effectively train all participants to implement trial-based FA with high integrity. School psychologists could consider incorporating BST in their training protocols to increase general education teachers' mastery of skills during the school-based consultation process.

Pyramidal training method can also be utilized as an alternative to large-group trainings because it may be more cost-effective and time-efficient in educational settings due to requiring fewer teachers who need direct training from an "expert" or outside consultant (Kunnavatana et al., 2013). Once primary trainers are proficiently trained, they can then serve as their school's in-house consultant to subsequently train other educators, provide feedback and ongoing support. The results of the present study further support pyramidal training method in the educational setting. School psychologists can become the primary trainers for their appointed schools by offering training, support, and feedback to secondary trainers.

Limitations

Although the study resulted in data that could be of interest to researchers and practitioners, they data should be interpreted within the limitations of the study design. First, due to the constraint of time, the training did not include instructions to graph trial-based FA data. Data collection and interpretation were practiced, modeled and included in the mastery criteria during training, but specifically graphing data was not covered. Second, in-situ data were not collected in classroom settings. All phases of the study included simulations with graduate student or participants acting as the student to contrive occurrence of problem in every trial segment across all conditions. The simulated sessions provided participants contact with problem behaviors that may not have been possible in-situ. Third, all simulations across phases included the same topography of behavior which may have limited the participants' implementation of trial-based FA generalization to other topographies of behavior. Fourth, generalizability of implementing trial-based FA was not addressed in this study. School psychologists and teachers did not have the opportunity to demonstrate their newly learned skills in their natural environment. As mentioned earlier, this study's training is merely a first step in preparing

educators to implement trial-based FA independently. Last, all participants were given delayed feedback in post-training sessions if they did not implement a trial with 100% accuracy. The delayed feedback may have masked the effect that training alone had on each participant's performance in post-training phase. Nonetheless, improvements in fidelity were noted across participants prior to receiving feedback when compared to baseline.

Directions for Future Research

Future research should focus on conducting pyramidal training in-situ with students in a classroom setting. In-situ would allow for generalization of trial-based FA implementation for educators. Prospective researcher can investigate what additional supports may be needed for educators to continue implementing trial-based FA independently with high fidelity. The current study included only one topography of problem behavior during trainings. Future research is needed to evaluate trainees' implementation of trial-based FA with more complex or severe challenging behaviors. In addition, future research should examine which components of BST can be eliminated or shortened in the training protocol without compromising procedural integrity. The current study required approximately 2.5 hours to train three school psychologists in a group setting which may not be feasible in school settings. Future research should also address social validity of trial-based FA in classrooms.

Conclusion

Teachers often seek consultation with school psychologists for the assessment and treatment of problem behavior. Pyramidal training method as described in this study can be utilized to empower general education teachers and increase their efficacy in assessing problem behavior independently. Ultimately, the consultant will work him/herself out of the role as school psychologists become the supervisors providing training and ongoing support directly to

teachers. This study's findings revealed improvements in school psychologists' and teacher's implementation of trial-based FA after receiving training. Furthermore, school psychologists were successfully able to train general education teachers with little to no intervention from the researcher. Using this training approach, school districts can train primary (e.g., school psychologists) and secondary trainers (e.g., teachers) to conduct trial-based FA with a high degree of procedural fidelity.

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APPENDIX A: Fidelity Task Analysis Forms

Fidelity Task Analysis Form – Attention

Participant									
Observer (primary, reliability)									
Date									
Phase (Baseline, Roleplay, Post-training)									
Trial number									
Steps	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N
1. Student has access to moderately preferred item									
2. Set timer to 4 min									
3. Start condition and timer									
4. Stay in close proximity to student									
5. Provide non-contingent attention FT10 s during the first 2 min control									
6. Ignore non-target bx in the first control 2 min control									
7. At the end of 2 min control OR the occurrence of target bx, tell student “I have some work to do” and turn away									
8. Do not provide any interaction with student									
9. Provide statement of concern/disapproval if student engages in target bx									
10. End trial when timer goes off or when target bx occurs									
11. Record data accurately									
% of correct steps (Yes/Yes+No)x100 =									

Fidelity Task Analysis Form – Tangible

Participant									
Observer (primary, reliability)									
Date									
Phase (Baseline, Roleplay, Post-training)									
Trial number									
Steps	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N
1. Student has access to highly preferred item									
2. Set timer to 4 minutes									
3. Start condition and timer									
4. Stay in close proximity to student									
5. Ignore non-target bx									
6. At the end of 2 min control OR the occurrence of target bx, remove item from student possession									
7. Give item back if student engages in the target bx									
8. End trial when timer goes off or when target bx occurs									
9. Record data accurately									
% of correct steps (Yes/Yes+No)x100 =									

Fidelity Task Analysis Form – Escape

Participant									
Observer (primary, reliability)									
Date									
Phase (Baseline, Roleplay, Post-training)									
Trial number									
Steps	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N
1. Student has no access to leisure item									
2. Set timer to 4 min									
3. Start condition and timer									
4. Stay in close proximity to student									
5. Ignore non-target bx									
6. At the end of 2 min control OR the occurrence of target bx, provide demands in 3-step prompting									
7. Remove demand if student engage in target bx									
8. End trial when timer goes off or when target bx occurs									
9. Record data accurately									
% of correct steps (Yes/Yes+No)x100 =									

Fidelity Task Analysis Form – Ignore

Participant									
Observer (primary, reliability)									
Date									
Phase (Baseline, Roleplay, Post-training)									
Trial number									
Steps	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N	Y/ N
1. Student has no access to leisure item									
2. Set timer to 4 min									
3. Start condition and timer									
4. Stay in close proximity to student									
5. Ignore both target and non-target bx									
6. End trial when times goes off									
7. Record data accurately									
% of correct steps (Yes/Yes+No)x100 =									

APPENDIX B: Trial-Based FA Data Sheet

Condition:		
Trial	Control	Test
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Total		

APPENDIX C: Training Protocol

Step	Slide	Slide Title – Content	Step completed Y/N
1	3	What is TBFA? – Covers content on slide accurately	
2	4	Why use TBFA? – Covers content on slide accurately	
3	5	TBFA Condition – Explains that there are differences by condition	
4	6	Attention Condition – Explains set-up accurately	
5	6	Attention Condition – Explains control condition accurately	
6	6	Attention Condition – Explains test condition accurately	
7	7	Data Collection – Explains symbols for data collection and data collection sheet	
8	8	Attention Condition Data – Explains all variations accurately	
9	9	Let's Practice Attention – Shows appropriate video and score	
10	9	Let's Practice Attention – Leads role play	
11	9	Let's Practice Attention – Provides praise for correct implementation	
12	9	Let's Practice Attention – Provides corrective feedback for incorrect implementation	
13	9	Let's Practice Attention – Provides opportunity for questions and provides correct answers for questions	
14	10	Tangible Condition – Explains set-up accurately	
15	10	Tangible Condition – Explains control condition accurately	
16	10	Tangible Condition – Explains test condition accurately	
17	11	Tangible Condition Data – Explains all variations accurately	
18	12	Let's Practice Tangible – Shows appropriate video and score	
19	12	Let's Practice Tangible – Leads role play	
20	12	Let's Practice Tangible – Provides praise for correct implementation	
21	12	Let's Practice Tangible – Provides corrective feedback for incorrect implementation	
22	12	Let's Practice Tangible – Provides opportunity for questions and provides correct answers for questions	
23	13	Escape Condition – Explains set-up accurately	
24	13	Escape Condition – Explains control condition accurately	
25	13	Escape Condition – Explains test condition accurately	
26	14	Escape Condition Data – Explains all variations accurately	
27	15	Let's Practice Escape – Shows appropriate video and score	
28	15	Let's Practice Escape – Leads role play	
29	15	Let's Practice Escape – Provides praise for correct implementation	
30	15	Let's Practice Escape – Provides corrective feedback for incorrect implementation	
31	15	Let's Practice Escape – Provides opportunity for questions and provides correct answers for questions	
32	16	Ignore Condition – Explains set-up accurately	
33	16	Ignore Condition – Explains control condition accurately	
34	16	Ignore Condition – Explains test condition accurately	
35	17	Ignore Condition Data – Explains all variations accurately	

36	18	Let's Practice Ignore – Shows appropriate video and score	
37	18	Let's Practice Ignore – Leads role play	
38	18	Let's Practice Ignore – Provides praise for correct implementation	
39	18	Let's Practice Ignore – Provides corrective feedback for incorrect implementation	
40	18	Let's Practice Ignore – Provides opportunity for questions and provides correct answers for questions	
41	19	TBFA General Guidelines – Reviews general guidelines	
42	20	Data Collection Guidelines – Reviews data collection guidelines	
43	21	Failed Trials – Explains failed trial	
44	22	Failed Attention Trial – Explains what a failed trial for attention condition looks like	
45	23	Failed Tangible Trial – Explains what a failed trial for tangible condition looks like	
46	24	Failed Escape Trial – Explains what a failed trial for escape condition looks like	
47	25	Failed Ignore Trial – Explains what a failed trial for ignore condition looks like	
48	26	Data Interpretation – Explains how to interpret data to determine function	
49	27	Let's Practice Interpretation - Provides rationale for correct response	
50	28	Let's Practice Interpretation - Provides rationale for correct response	
51	29	Let's Practice Interpretation - Provides rationale for correct response	
52	30	Questions – Provides opportunity for questions and provides correct answers for questions	
		% of correct steps = (Yes/Yes+No)	

APPENDIX D: Institutional Review Board Approval

Institutional Review Board
University of Missouri-Columbia
FWA Number: 00002876
IRB Registration Numbers: 00000731, 00009014

310 Jesse Hall
Columbia, MO 65211
573-882-3181
irb@missouri.edu

October 21, 2022

Principal Investigator: Aqdas Haider (MU-Student)
Department: Educ, School, Couns Psych-PHD

Your IRB Application to project entitled Effect of Pyramidal Training on Teacher Acquisition of Trial-Based Functional Analysis was reviewed and approved by the MU Institutional Review Board according to the terms and conditions described below:

IRB Project Number	2093083
IRB Review Number	381930
Initial Application Approval Date	October 21, 2022
IRB Expiration Date	October 21, 2023
Level of Review	Exempt
Project Status	Active - Exempt
Exempt Categories (Revised Common Rule)	45 CFR 46.104d(3)(i)(B)
Risk Level	Minimal Risk
HIPAA Category	No HIPAA
Approved Documents	Informed Consent & Assent - Consent (Exempt Studies Only): #616829 Informed Consent & Assent - Consent (Exempt Studies Only): #616878 Other Study Documents - Supportive Document: #610622 Other Study Documents - Training Documentation: #616875 Other Study Documents - Training Documentation: #616976 Other Study Documents - Training Documentation: #616977 Recruitment Materials - Recruitment Script: #616895 Recruitment Materials - Recruitment Script: #616896

The principal investigator (PI) is responsible for all aspects and conduct of this study. The PI must comply with the following conditions of the approval:

1. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date.
2. All study changes must be IRB approved prior to implementation utilizing the Exempt Amendment Form.
3. Major noncompliance must be reported to the MU IRB on the Event Report within 5 business days of the research team becoming aware of the deviation. Major noncompliance are deviations that caused harm or have the potential to cause harm to research subjects or

others, and have or may have affected subject's rights, safety, and/or welfare. Please refer to the MU IRB Noncompliance policy for additional details.
4. The Annual Exempt Form must be submitted to the IRB for review and approval at least 30 days prior to the project expiration date to keep the study active or to close it.
5. Maintain all research records for a period of seven years from the project completion date.

If you are offering subject payments and would like more information about research participant payments, please click here to view the MU Business Policy and Procedure: http://bppm.missouri.edu/chapter2/2_250.html

If you have any questions or concerns, please contact the MU IRB Office at 573-882-3181 or email to muresearchirb@missouri.edu.

Thank you,
MU Institutional Review Board

APPENDIX E: Institutional Review Board Approved Consent Forms

School Psychologist Consent Form

SCHOOL PSYCHOLOGIST CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

INVESTIGATOR'S NAME: AQDAS HAIDER, ED.S., MATTHEW BURNS, PH.D.

PROJECT # 2093083

STUDY TITLE: THE EFFECT OF PYRAMIDAL TRAINING ON TEACHER ACQUISITION OF TRIAL-BASED FUNCTIONAL ANALYSIS

INTRODUCTION

This research is being conducted to help examine the impact of pyramidal training on teacher acquisition of trial-based functional analysis. This form may contain words that you do not know. Please ask the researcher to explain any words or information that you do not understand.

Your participation is voluntary. You do not have to be in the study if you do not want to. You may refuse to be in the study and nothing will happen. If you do not want to continue to be in the study, you may stop at any time without penalty or loss of benefits to which you are otherwise entitled.

We ask that you read this form and ask any questions that you may have before participating in this study.

DESCRIPTION OF THE RESEARCH

This research project examines the impact of a pyramidal training on teacher acquisition of trial-based functional analysis. Observations will assist in evaluating the fidelity of trial-based functional analysis conducted by teachers.

PROCEDURES OF THE STUDY

If you agree to join the study, you will be asked to read a research article about trial-based functional analysis prior to being trained in this assessment. The researchers will train you to implement a trial-based functional analysis by reviewing the procedure, practicing trials, and providing feedback. You will then be randomly assigned to a teacher. You will be asked to train the teacher to implement a trial-based functional analysis by reviewing the procedure, practicing trials, and providing feedback. The teacher-school psychologist dyad will be observed during this training to determine fidelity to implementation of trial-based analysis.

HOW MANY PEOPLE WILL BE IN THIS STUDY?

4 teacher-school psychologist dyads

WHAT ARE THE BENEFITS OF THE RESEARCH?

- Help assess students' functional behaviors within the classroom
- Help teachers assess student's problematic behaviors
- Help determine the impact of pyramidal training on teacher's implementation of trial-based functional analysis

WHAT ARE THE RISKS OF THE RESEARCH?
School psychologists will have to spend approximately 120 minutes afterschool.

WHAT WILL I RECEIVE?
You will receive two Target gift cards totaling $30 gift for participating in this study. Frist, you will receive $15 gift car for participating in the primary training by researcher. Then, you will receive another $15 gift card after training the teacher. Compensation will be dispersed upon completion of each of these two tasks.

PARTICIPATION IS VOLUNTARY
Participation in this research study is voluntary. You may refuse to participate or withdraw from the study at any time. You will not be penalized in any way if you decide not to participate or to withdraw from this study.

WHAT ARE THE COSTS?
School psychologists in the study will spend an additional 120 minutes of time afterschool.

WHAT ABOUT CONFIDENTIALITY?
Individual names will not be connected to any data we collect. The information you provide will be kept confidential and only the research team will have access.

WHO CAN I TALK TO ABOUT THE STUDY?
If you have questions about this study, you can contact the University of Missouri researcher at 314-956-6805 and afa3kb@mail.missouri.edu. If you have questions about your rights as a research participant, please contact the University of Missouri Institutional Review Board (IRB) at 573-882-3181 or muresearchirb@missouri.edu. The IRB is a group of people who review research studies to make sure the rights and welfare of participants are protected. If you want to talk privately about any concerns or issues related to your participation, you may contact the Research Participant Advocacy at 888-280-5002 (a free call) or email muresearchrpa@missouri.edu.

CONSENT
I have read this teacher consent form and have been given the opportunity to ask questions. I give my permission to participate in this study. I understand that participation is voluntary and I can withdraw at any time without penalty or loss of benefits. You will be informed of any significant new findings discovered during the course of this study that might influence your health, welfare, or willingness to continue participation in this study.

You will be given a copy of this consent form to keep for your records.

Teacher Consent Form

TEACHER CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY

INVESTIGATOR'S NAME: AQDAS HAIDER, ED.S., MATTHEW BURNS, PH.D.

PROJECT # 2093083

STUDY TITLE: THE EFFECT OF PYRAMIDAL TRAINING ON TEACHER ACQUISITION OF TRIAL-BASED FUNCTIONAL ANALYSIS

INTRODUCTION

This research is being conducted to help examine the impact of pyramidal training on teacher acquisition of trial-based functional analysis. This form may contain words that you do not know. Please ask the researcher to explain any words or information that you do not understand.

Your participation is voluntary. You do not have to be in the study if you do not want to. You may refuse to be in the study and nothing will happen. If you do not want to continue to be in the study, you may stop at any time without penalty or loss of benefits to which you are otherwise entitled.

We ask that you read this form and ask any questions that you may have before participating in this study.

DESCRIPTION OF THE RESEARCH

This research project examines the impact of a pyramidal training on teacher acquisition of trial-based functional analysis. Observations will assist in evaluating the fidelity of trial-based functional analysis conducted by teachers.

PROCEDURES OF THE STUDY

If you agree to join the study, you will be randomly assigned to a school psychologist. You will be asked to read a research article about trial-based functional analysis prior to being trained in this assessment. The school psychologist will then train you to implement a trial-based functional analysis by reviewing the procedure, practicing trials, and providing feedback. The teacher-school psychologist dyad will be observed during this training to determine fidelity to implementation of trial-based analysis.

HOW MANY PEOPLE WILL BE IN THIS STUDY?

4 teacher-school psychologist dyads

WHAT ARE THE BENEFITS OF THE RESEARCH?

- Help teachers assess students' functional behaviors within their classroom.
- Help determine the impact of pyramidal training on teacher's implementation of trial-based functional analysis.

WHAT ARE THE RISKS OF THE RESEARCH?
Teachers will have to spend approximately 60 minutes after school.

WHAT WILL I RECEIVE?
You will receive a $25 gift card to Target for participating in this study.

PARTICIPATION IS VOLUNTARY
Participation in this research study is voluntary. You may refuse to participate or withdraw from the study at any time. You will not be penalized in any way if you decide not to participate or to withdraw from this study.

WHAT ARE THE COSTS?
Teachers in the study will spend an additional 60 minutes of time afterschool.

WHAT ABOUT CONFIDENTIALITY?
Individual names will not be connected to any data we collect. The information you provide will be kept confidential and only the research team will have access.

WHO CAN I TALK TO ABOUT THE STUDY?
If you have questions about this study, you can contact the University of Missouri researcher at 314-956-6805 and afa3kb@mail.missouri.edu. If you have questions about your rights as a research participant, please contact the University of Missouri Institutional Review Board (IRB) at 573-882-3181 or muresearchirb@missouri.edu. The IRB is a group of people who review research studies to make sure the rights and welfare of participants are protected. If you want to talk privately about any concerns or issues related to your participation, you may contact the Research Participant Advocacy at 888-280-5002 (a free call) or email muresearchrpa@missouri.edu.

CONSENT

I have read this teacher consent form and have been given the opportunity to ask questions. I give my permission to participate in this study. I understand that participation is voluntary and I can withdraw at any time without penalty or loss of benefits. You will be informed of any significant new findings discovered during the course of this study that might influence your health, welfare, or willingness to continue participation in this study.

You will be given a copy of this consent form to keep for your records.

VITA

Aqdas Fatima Haider was born in Karachi, Pakistan. She immigrated to the United States with her family in 2001 at the age of 12. After graduating from Parkway West High School in Ballwin, MO. Aqdas received her bachelor's in psychology and history at Saint Louis University where she was a Martin Luther King Jr. scholar. She earned an education specialist degree from the University of Missouri – St. Louis and completed a school psychology internship with the Special School District of St. Louis County. In 2014, Aqdas entered the doctoral program in school psychology at the University of Missouri – Columbia. She earned a certificate in applied behavior analysis under the supervision of Dr. SungWoo Kahng and Dr. Casey Clay. Aqdas also received clinical training for autism evaluations at the Thompson Center for Autism and Neurodevelopmental Disorders in Columbia, MO. She completed a pre-doctoral internship at the Autism Clinical Center at Washington University in St. Louis under the supervision of Dr. Michael Bunis and guidance of Dr. John Constantino.