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What's the Function? Assessing Correspondence between Functional Analysis Procedures

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by

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Dedication

I dedicate this manuscript to my parents, Rafael and Silvia, who came to a foreign land in pursuit of a better life for their children. Thank you for your fearlessness and encouragement. I also dedicate this manuscript to my husband, Camilo, for being my rock and constant supporter. Thank you for your love, your patience, and your faith in me. And finally, I dedicate this manuscript to my daughter Alexa, my sweetest Lilliputian. Thank you for your smiles, hugs, kisses, and brightening even the darkest days.

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Abstract

In 1997, Congress established the Individuals with Disabilities Education Act (IDEA, 1997), which required that schools conduct functional behavior assessments when a student engages in problem behavior that may lead to suspension or expulsion (Ervin et al., 2001; Yell & Katsiyanis, 2010). As a result, research has expanded to include ways to adapt the functional assessment process in school settings. The purpose of this study was to compare the correspondence between functional analysis procedures for students in a private school and validate the assessment outcomes with interventions conducted in the classroom settings. The results indicate that both assessments corresponded in 87% of all functions identified in the study. Furthermore, the interventions yielded reductions in problem behaviors for all participants.

Individuals with Disabilities Education Act (IDEA)

In 1997, Congress established the Individuals with Disabilities Education Act (IDEA, 1997), which according to many represents the most significant change in special education law since 1975. IDEA reenergized a focus on issues related to discipline in special education. Primarily, IDEA required that schools incorporate ways to address problem behavior, such as conducting a Functional Behavior Assessments (FBA) and developing a Behavior Intervention Plans (BIPs) when a child engages in behavior that may lead to suspension or expulsion (Ervin et al., 2001; Yell & Katsiyanis, 2010). In 2004, IDEA 1997 was reauthorized and it became the Individuals with Disabilities Education Improvement Act (IDEA, 2004), which not only maintained the policies regarding behavior management, it also required school teams to use peer-reviewed methods to conduct these procedures (Etscheidt & Murran, 2010). Unfortunately, IDEA does not directly specify the skills needed to conduct functional behavior assessments, or which components are necessary for a thorough FBA (Ervin et al., 2001). Despite this lack of detail, these new requirements encourage a departure from a compliance-based model to a more individualized, results-oriented approach to the assessment and treatment of problem behavior in school settings (Yell, Shriner, & Katsiyannis, 2006).

Although the effectiveness of FBAs has been documented countless times over the past 50 years (e.g. Beavers, Iwata, & Lerman, 2013; Carr, Newsom, & Binkoff, 1980; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) the application of this technology in schools is still in its infancy. For this reason, most of the research has been conducted in clinical settings with individuals with disabilities, and gaps still exist regarding its application and utility in schools

(Gresham, Quinn, & Restori, 1999). For example, many educators are still unsure how to properly conduct FBAs, the types of data and how much data to collect, and who exactly should be involved in the FBA process. Additionally, many school personnel may not have the expertise required to conduct these assessments effectively, which not only threatens the integrity of the process and produces unreliable and inaccurate data, it may lead to inadequately designed BIPs, ineffective interventions, and poor student outcomes (Conroy, Clark, Fox, & Gable 2010; Gable, 1999; Quinn, 2010).

What is a Functional Behavior Assessment (FBA)?

Rooted in Applied Behavior Analysis (ABA), the primary purpose of an FBA is to identify the function of a target behavior. At the cornerstone of behavior theory is the assumption that behavior is a product of its environment, and as behavior may be maintained by positive or negative reinforcement - either social or automatic in nature (Carr, 1977) - a functional, rather than topographical account of problem behavior is most useful. Assessments that clearly identify functional relationships are paramount as they determine which antecedents and reinforcement contingencies evoke and maintain problem behavior, and which intervention strategies are likely to be effective or contraindicated (Iwata, Vollmer, & Zarcone, 1990).

In 1968, Bijou, Peterson, and Ault proposed one of the first approaches to functional behavior assessment. The authors incorporated descriptive and experimental methods to identify relationships between environmental events and problem behavior, however, an experimental analysis was not incorporated, and the data only yielded correlations between environmental events and behavior. Iwata et al. (1982/1994) addressed this limitation by expanding upon the preliminary work of researchers who had already experimented with behavior-environment interactions (Berkson & Mason, 1965; Carr et al., 1980; Lovaas & Simmons, 1969; Schaefer,

1970) to develop the functional analysis (FA), which is considered one of the most significant developments in the assessment and treatment of problem behavior (Mace, 1994). These procedures involved the systematic manipulation of environmental events to experimentally identify the function of problem behavior and inform the most effective treatments. Since then, hundreds of articles have been published establishing the functional assessment process, and in particular, functional analysis, as crucial in the selection of treatment of problem behavior (Hanley, 2012).

There are three types of functional assessments: indirect assessments, direct or descriptive assessments, and functional analyses (Miltenberger, Bloom, Sanchez, & Valbuena, 2016). Indirect methods gather basic information about the problem behavior such as topography, when it is likely to occur, and its antecedents and consequences. These methods employ interviews (e.g. Iwata, DeLeon, & Roscoe, 2013; Matson, Tureck, & Rieske, 2012), rating scales (e.g. Durand & Crimmins, 1988), and questionnaires (e.g. Lewis, Scott, & Sugai, 1994). The results obtained by indirect assessments often suggest a hypothetical function and help inform subsequent assessments - descriptive assessments, functional analyses, or both. Although often found to have poor validity and reliability (e.g. Zarcone, Rodgers, Iwata, Rourke, Dorsey, 1991) the ease of conducting indirect assessments has resulted in their frequent use by clinicians and educators alike, many times as the sole or primary form of functional behavioral assessment (e.g. Ellingson, Miltenberger, & Long, 1999).

Direct assessments represent a more objective method for identifying the function of problem behavior. These assessments require direct observation of the problem behavior in relevant contexts and descriptions of the environmental events that precede and follow the behavior. They can take the form of narrative ABC recording (Bijou et al., 1968), structured

descriptive assessments (e.g. Freeman, Anderson, & Scotti, 2000), and interval recording or scatterplots (Repp & Karsh, 1994; Touchette, MacDonald, & Langer, 1985). Regardless of the method used, the main purpose of direct assessments remains the same - to identify relationships between the environment and behavior, and use this information to hypothesize a likely function. It is important to note that most direct assessments do not involve experimental manipulations and, as such, the data produced do not demonstrate a functional relationship and thus are correlational in nature (Mace & Lalli, 1991). Additionally, several studies have noted a lack of correspondence between the outcomes of direct assessments and functional analyses (e.g. Lerman & Iwata, 1993; Mace & Lalli, 1991; Thompson & Iwata, 2007). Camp, Iwata, Hammond, and Bloom (2009) suggested a few factors that may contribute to the discrepancy between these two assessments. First, it may be difficult to accurately identify the maintaining consequences for behavior that is intermittently reinforced; second, consequences may often follow bursts of behavior rather than discrete instances; third, some behavior topographies are very intense and are often followed by a consequence other than the one actually maintaining the behavior. For example, Thompson and Iwata (2007) found that problem behavior was followed by attention in 88.9% of cases, but attention was the maintaining consequence in only 25%. Finally, caregivers may often remove discriminative stimuli (S^Ds) and establishing operations (EOs) that evoke the problem behavior and thus these events cannot be captured during observations.

Despite this lack of correspondence, practitioners may follow several guidelines to increase the effectiveness of direct assessments. These are: focusing on observable events, objectively and thoroughly describing the behavior, antecedents, and consequences, having at least two independent observers and calculating interobserver agreement (IOA), and designing a

data collection system that can accurately capture the desired dimension of behavior (Bijou et al., 1982). Additionally, direct assessments are flexible, can apply to a variety of situations, can identify precursors to the problem behavior, and can suggest environment-behavior relations that occur in the natural environment.

Finally, the most empirical approach to behavior assessment is the functional analysis. Functional analyses encompass a set of experimental procedures that directly manipulate antecedents and/or consequences to demonstrate a functional relationship between environmental stimuli and a target behavior. The first standardized procedure for conducting functional analyses was proposed by Iwata et al. (1982/1994) who used this technology to assess self-injurious behavior. The authors created a series of analogue test conditions and systematically exposed participants to different reinforcement conditions - escape, alone, and attention, and compared the rate of SIB to that found in a control condition (play). All sessions took place in a therapy room that featured a one-way mirror, tables, chairs, toys, and instructional materials. The escape condition consisted of the researcher placing a demand and prompting the participant to comply by following a three-step, least-to-most prompting sequence (verbal, model, physical) (Horner & Keilitz, 1975). Problem behavior resulted in 30-s removal of the demand. Higher levels of the problem behavior relative to the control condition suggested an escape function. In the alone condition, the participant was left alone in the room without access to any instructional demands or preferred materials. Problem behavior did not result in any social consequences. Higher levels of the problem behavior relative to the control condition suggested an automatic reinforcement function as the behavior occurred in the absence of social consequences. During the attention condition, the researcher sat next to the participant who had access to a moderately preferred item. The researcher only interacted with the participant upon instances of problem behavior,

which produced brief, 30-s statements of concern and light physical touch. Higher levels of the problem behavior relative to the control condition suggested an attention function. In the play (control) condition the researcher sat next to the participant who had access to preferred items and provided him/her non-contingent reinforcement every 30 s. The results were graphed using a multi-element design and a function was identified when the level of the problem behavior was consistently higher in one or more test conditions than in the control condition. Iwata et al. provided evidence that self-injurious behavior was maintained by a variety of reinforcement contingencies individual to each participant – a conclusion that was further supported by Iwata, Pace, et al. (1994) and many other researchers.

Since the first publication of this article, this FA procedure (hereafter called session-based FA) has been used to select functional treatments for multiple topographies of problem behavior across a variety of participants and settings, used by 80.5% of the studies reviewed by Beavers et al. (2013). For example, Kennedy and Souza (1995) conducted the session-based functional analysis as proposed by Iwata et al. (1982/1994) to select functional treatment for the eye poking exhibited by youth with severe intellectual disabilities. Piazza, Hanley, and Fisher (1996) also used methodology session-based FA to select treatment to decrease the cigarette pica exhibited by a male adult diagnosed with autism and intellectual disabilities. More recently Armstrong, Madaus Knapp, and McAdam (2014) carried out a session-based FA to select functional treatment for bruxism in a girl diagnosed with autism. The results obtained by these studies informed effective interventions that eventually reduced led to reductions in the behavior of concern.

As previously mentioned, the results of the session-based FA are typically graphed using a multi-element format. The rate of problem behavior (or percentage of intervals with problem

behavior) is displayed in the y-axis and the sessions are graphed in the x-axis. Data are then analyzed by individually comparing each test condition to the control (play). Differentiated responding – evidence of the function of the problem behavior - is exhibited when there is an elevated rate of problem behavior in any test condition in relation to the control. For example, high rates of problem behavior during the escape condition relative to the control condition would suggest an escape function. Similarly, high rates of problem behavior during the escape and attention condition relative to the control condition would suggest both an escape and attention function. Undifferentiated responding occurs when the data show similar rates of behavior in all conditions or in two or more conditions, one of which is the control. The former case may be evidence of behavior maintained by automatic reinforcement, and both may also suggest poor discrimination between all the conditions (Miltenberger et al., 2016).

The guidelines established by Iwata et al. (1982/1994) represent a major advancement in the assessment and treatment of problem behavior in general. However, is it important to acknowledge that perhaps the most significant outcome of this study is not the set of procedures, but rather, an experimental approach to understanding the variables maintaining behavior (Miltenberger et al., 2016). As a result, several functional analysis variations have been developed such as the trial-based FA (e.g. Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011; Sigafoos & Saggers, 1995), antecedent only FA (e.g. Carr & Durand, 1985), brief FA (e.g. Northup et al., 1991), latency FA (e.g. Thomason-Sassi, Iwata, Neidert, & Roscoe, 2011), single-test FA (also referred to as hypothesis testing, pairwise, or test-control) (e.g. Hanley, Jin, Vanselow, & Hanratty, 2014; Iwata, Duncan, Zarcone, Lerman, & Shore, 1994; Miltenberger, 2016), and precursor FA (e.g. Smith & Churchill, 2002). As this paper will focus on the session-based FA (already described) and trial-based FA, procedural details will only be provided for

these variations. Table 1 depicts essential features of both types of assessments for ease of comparison.

The trial-based FA was first proposed by Sigafoos and Saggers (1995) and helped address the criticism that functional analyses had to be conducted in analogue settings. This FA variation attempted to increase the ecological validity of the assessment by embedding the trials into naturally occurring routines. Sigafoos and Saggers (1995) used the trial-based FA to identify the function of aggressive behavior exhibited by two children in school settings. The methods included a total of 20 trials for each condition (attention, tangible, and demand) lasting 2 min each. Individual trials were comprised of a 1 min test segment and a 1 min control segment. During the test segments, the relevant EOs, S^Ds, and reinforcement contingencies were present whereas during the control segments the reinforcer was presented noncontingently and problem behavior did not result in any consequences. The results in this study showed clear differences between the frequencies of problem behavior in the different conditions, suggesting that for one participant aggression was maintained by attention and for the other participant aggression was maintained by access to tangibles. Although this variation of FA methodology was promising, as it seemed to be effective at isolating the variables maintaining problem behavior for both participants, this was the first study of its kind and did not include a treatment or comparison component, thus it is unclear if the functions obtained were indeed correct.

A subsequent study by Bloom et al. (2011) addressed some of the limitations in the study conducted by Sigafoos and Saggers (1995) and expanded on the methodology. First, Bloom et al. (2011) reversed the order of the test and control segments, so that the control segment would occur first followed by the test segment. This arrangement was expected to eliminate any possible carryover from the test to the control. An additional control segment was also added

following the test segment to replicate the order used by Sigafoos and Saggers (1995) and compare the results to the first segments to identify the most favorable order (test-control or control-test). Second, the length of each segment was increased from 1 min to 2 min. Third, this study included ignore trials to test for automatic reinforcement. Finally, the results were compared to those obtained by a session-based FA. The trials were conducted as follows: during the control segments of the attention trials, the researcher sat next to the student who had access to a moderately preferred item. The researcher delivered attention non-contingently throughout and did not respond to problem behavior. Immediately after the first control segment, the test segment began. The student still had access to a moderately preferred item, however, the researcher told the student that she "had to do some work" and turned away. Problem behavior resulted in the researcher turning toward the student and delivering brief attention with gentle physical contact. During control segments of the tangible condition, the researcher sat with the student who had access to a highly preferred item. No consequences were provided for problem behavior. During the test segments, the researcher removed the item and only returned it to the student upon the first instance of problem behavior. During the control segments for the demand condition the researcher sat next to the student who did not have access to tasks or leisure items. Once the test segments began the researcher presented the student with a task and followed a least-to-most, three-step prompting sequence to help the student comply with the demand. Instances of problem behavior produced escape. The test and control segments for the ignore trials were the same. The student was seated next to the researcher without access to materials, tasks, or attention, and problem behavior did not result in any social consequence. The results showed correspondence between the trial-based and the session-based FA for six out of 10 participants, or eight out of 10 with some minor changes in how the trials were conducted.

However, a treatment phase was not included and consequently it cannot be determined which method resulted in the correct function for those students whose assessment results did not agree. Given that the trial-based and session-based FAs are conducted in different settings, it is possible that the functions identified by each method are applicable to the setting in which the assessment is conducted, and as such, agreement between both is not necessary.

The data obtained from trial-based FAs are typically displayed using a bar graph. The y-axis represents the percentage of trials with problem behavior and the x-axis represents the different conditions (attention, demand, ignore, tangible). The data are then analyzed using a visual analysis. Each test condition is individually compared to its respective control condition and higher percentage of trials with problem behavior in the test condition compared to the control condition is indicative of the function. For example, high percentage of trials with problem behavior in the test condition for attention compared to low percentage of trials with problem behavior in the control condition suggests that attention is a maintaining consequence. Similarly, high percentage of trials with problem behavior in the attention and demand condition compared to low percentage of trials with problem behavior in the corresponding control condition suggests that both attention and escape may be maintaining the behavior.

Despite these variations in procedures between session-based and trial-based FAs, there are three essential features shared by all functional analyses (Miltenberger et al., 2016). The first is systematically manipulating reinforcement contingencies to assess the effect of different reinforcers on behavior. For example, in the attention condition, a brief statement of concern (attention) is provided following each instance of problem behavior. Second, each test condition in the functional analysis must include its respective EO - in the attention condition the participant experiences deprivation from attention at the beginning of the test. The final

component is manipulating discriminative stimuli (S^Ds), which evoke the problem behavior by signaling that reinforcement is available in its presence, thus increasing the likelihood of discriminated responding in the test and control conditions.

Functional Behavior Assessments in Schools

In a school, students exhibiting the most intense topographies of problem behavior are typically the best candidates for FBAs. Although these students are representative of no more than 5% of the school population, the problem behavior they exhibit contribute to about 50% of all incidents and therefore utilize the majority of the available resources (Sugai, Sprague, Horner, & Walker, 2000). These students are often placed in restrictive settings, cannot fully benefit from general education services, are at greater risk of school failure, have higher dropout rates, and overall poor long term outcomes (e.g., Artesani & Mallar, 1998; Emerson et al., 2001). Additionally, when left untreated, challenging behavior in childhood is associated with more intense problem behavior, negative interactions with teachers and peers, and poor adaptation to educational and vocational programs in secondary education and into adulthood (Dunlap et al., 2006). Furthermore, student problem behavior is positively correlated with lower teacher self-efficacy, higher teacher burnout, job dissatisfaction, and attrition (Egyed & Short, 2006).

Despite the utility of FBAs in the assessment and treatment of problem behavior, its use in the school system is guided by compliance to a requirement rather than using FBAs as a resource to develop effective intervention plans (Blood & Neel, 2007). School personnel also seem to have mixed reviews regarding the effectiveness, usefulness, feasibility, and practicality of FBAs in education settings. More specifically, they question the utility of behavior assessments for unique, low- frequency behavior such as drug and firearm usage. FBAs were also rated as generally time consuming and difficult to implement regardless of the topography

of problem behavior (Nelson, Roberts, Rutherford, Mathur, & Aaroe, 1999). Borgmeire and Horner (2006) echoed some of these challenges and added a lack of trained staff as another hindrance to the implementation of FBAs in schools. This deficit in training leaves students who engage in more severe problem behavior especially underserved. The use of FBAs in schools is further deterred by the precision necessary to implement FBA procedures and the many variations available (Scott et al., 2004). These barriers combined with an absence of clear descriptions by IDEA on what FBAs and BIPs are expected to include promote the hasty completion of FBAs, which could result in important information being neglected (Blood & Neel, 2007). Weber, Killu, Derby, and Barretto (2005) collected data from 48 states to investigate if a lack of guidelines had prompted state education agencies (SEAs) to develop their own blueprints for completing functional behavior assessments, and which resources were available to SEAs on the appropriate use of FBAs. The results indicate that although materials are available, many of these are generic and do not include information regarding the procedure's theoretical or scientific basis, leaving school teams to independently interpret these resources when conducting behavior assessments. The results obtained by Weber et al. (2005) are supported by studies indicating that, although many students have BIPs, these are often developed without a prior FBA, and when available, FBAs list multiple functions without an attempt to verify if the functions are correct, or without details on environmental events correlated with the problem behavior (Blood & Neel, 2007; VanAcker, Boreson, Gable, & Potterson, 2005). Further, BIPs frequently lack an antecedent manipulation component, include a "stock list" of viable consequences to the problem behavior, and most do not identify a replacement behavior. These findings are concerning given the wealth of evidence supporting that interventions developed from thoroughly conducted FBAs are more likely to produce

favorable and persistent behavior change when compared to non function-based interventions (e.g. Filter & Horner, 2009).

Given this state of affairs, researchers have focused on evaluating ways to increase the use of FBAs by school personnel, emphasizing ways to increase the efficiency of FBAs and its use by individuals with limited behavioral knowledge (Sugai et al., 1999). One way to increase the efficiency of FBAs is allowing the needs of the student to dictate the comprehensiveness of the assessment. Knowing how much information is sufficient in each situation may inform the types of assessments needed, and thus increase the overall efficiency of the FBA process (Arndorfer, & Miltenberger, 1993). However, considering the many assessment options that are available, it is not an easy task for school personnel to determine which is most appropriate and how much information is necessary. As a result, several studies have attempted to adapt several FBA methods to school settings and incorporate various school personnel as the implementers.

A survey by Blood and Neel (2007) reported that teacher interviews are the most commonly used type of FBA used in schools. As such, some studies have examined ways to increase the effectiveness of these assessments and incorporate them into education settings. Yarbrough and Carr (2000) proposed that teacher confidence ratings of the probability of problem behavior in different settings could predict the accuracy of the results obtained by interviews. Although an interesting approach, a follow-up study by Borgmeier and Horner (2006) found mixed results, as confidence ratings did not consistently predict accurate hypotheses. This discrepancy may be due to the type of participants involved in each of the studies. Yarbrough and Carr (2000) worked with students diagnosed with more acute disabilities who engaged in severe problem behavior, whereas Borgmeier and Horner (2006) included students with higher cognitive functioning and less intense behavioral topographies. It is possible

that teachers may have a more difficult time identifying the functions maintaining less severe behavior. Both studies did agree however, that informants whose confidence ratings were more likely to identify accurate hypotheses were those who had close interactions with the students and had frequently observed the problem behavior in multiple environments.

Another modification of indirect assessments to fit school settings was proposed by Kinch, Lewis-Palmer, Hagan-Burke, and Sugai (2001) who compared the results of teacher and student interviews. Eight students who engaged in different rates of problem behavior in separate classroom (high rates vs. low rates) and their corresponding teachers were interviewed using the Brief Functional Assessment Interview (for teachers) and the Student-Guided Functional Assessment Interview (adapted from O'Neill et al., 1997). The results showed substantial agreement between both students and teachers; however, there was higher agreement between students and teachers in the classroom where rates of problem behavior were higher than in the classroom where rates of problem behavior were lower. Further, students were able to identify the classroom in which they experienced more difficulty as well as antecedents and consequences for their problem behavior. Unfortunately, this study did not include a source of comparison to validate the results of the interviews, and thus it cannot be determined if either the teachers or students successfully identified the variables maintaining the problem behavior.

Just as research has expanded to include the use of indirect assessments in school settings, direct assessments have also been the subject of several studies. For example, Symons, MacDonald, and Wehby (1998) conducted a series of pilot studies in which four special education teachers directly participated in data collection, decision making, and the development of intervention plans based on the results of the FBA. All teachers were taught to use scatterplots to collect continuous frequency data in the classroom throughout the school day and met once a

week with a researcher to discuss behavioral patterns indicated by the data and develop hypotheses about environmental events correlated with the problem behavior. The researchers also created a set of guidelines to use as a problem-solving model to analyze the data collected via the scatterplots. These guidelines included behavior identification, a predetermined set of antecedent and consequent events from which the teachers could select, a prompt to formulate a hypothesis, a test to verify the hypothesis, and ways to assess if the hypothesis was supported. The results show a decrease in problem behavior for all students involved, and all the teachers found the procedure relatively simple. However, the data only reflect a 50% decrease in intervals with challenging behavior when compared to baseline and the extent to which the teachers were independently involved in the assessment is unknown. More specifically, the amount of time spent reviewing the assessment information with teachers, their ability to thoroughly and independently understand the data depicted by the scatterplots, or if the teachers could hypothesize the functions on their own is unknown. This information is useful when evaluating and developing strategies to increase the efficiency of behavior assessments in schools.

Ellingson, Miltenberger, Stricker, Galensky, and Garlinghouse (2000) conducted a study to assess if three teachers of students with disabilities could complete direct observations using ABC checklists, and whether the outcomes of these observations lead to effective interventions. All teachers received prepared ABC checklists based on information obtained from prior interviews and were asked to observe the student during regular classroom routines. To compare the results of the teachers' observations, research assistants also observed the students during the same times as the teachers and used identical ABC checklists. The results showed that teachers could conduct direct observations in the classroom and obtain results similar to those of trained research assistants. The outcomes addressing the secondary purpose of this study however were

less substantial as the interventions developed from the observations only moderately improved problem behavior.

Freeman et al. (2000) expanded on descriptive assessments by developing a structured descriptive assessment (SDA). The purpose of the SDA was to develop an assessment that incorporated the ease of more traditional descriptive assessments (e.g., ABC checklists, ABC narrative recording) and the rigor of experimental analyses. A subsequent study by Anderson and Long (2002) incorporated the SDA in schools by embedding the sessions into existing classroom routines. Teachers served as researchers and conducted sessions during times that contained activities related to the specific SDA condition. For example, attention sessions took place during a time when little to no adult attention was available. During the SDA, students were exposed to four experimental conditions: attention, demand, tangibles, and play, designed to identify antecedent events correlated with problem behavior. Throughout all the sessions, teachers were asked to respond to problem behavior as they normally would. During the attention condition, an EO was established by asking the teacher to play with the student before starting the session. Once the session started, the teacher turned away from the student and either did other work or interacted with other students. Preferred items were out of sight to eliminate possible confounds. During the demand condition, the teacher asked the student to complete a task and followed the prompting strategies he/she normally used in the classroom. The tangible condition involved the teacher removing a preferred item from the student and interacting with the student as he/she usually would if any problem behavior occurred. And finally, during the play condition the student had access to preferred items and attention without any demands. The outcomes of the SDA were then compared to those obtained from a session-based FA, which resulted in correspondence for three out of four participants. Intervention data suggested that

these results were useful for developing successful interventions for both students. One student in particular whose assessment results did not correspond required an intervention incorporating both functions, suggesting that both assessments were necessary. English and Anderson (2006) expanded the literature on SDAs by comparing the results of this assessment to those obtained by session-based FAs conducted by experimenters and session-based FAs conducted by caregivers. The results showed that responding was sensitive to the person conducting the session-based FA. For example, one participant only engaged in problem behavior in the tangible condition when parents were present. Additionally, the results of the session-based FA did not correspond to those of the SDA. However, interventions developed based on the results of the SDA resulted in more desirable behavior change than the interventions derived from the other analyses. A subsequent study by Anderson, English, and Hedrick (2006) showed that SDAs might also be a useful assessment strategy in classroom settings for typically developing children.

Thus far, the literature on SDAs is slightly mixed as some studies show correspondence between SDAs and functional analyses and others do not, however, treatment plans derived from these assessments seem to be successful at producing acceptable behavior change. In addition to replicating and expanding the literature on SDAs, which shows promising outcomes, more research is still needed to evaluate the utility and effectiveness of other descriptive assessments in school settings. For example, when conducting direct observations, it may be helpful to know how many observations are required to increase the likelihood of obtaining an accurate hypothesis (Scott et al., 2004).

Although descriptive assessments sometimes are used independently to hypothesize behavioral functions and develop effective interventions, they are many times part of an assessment package that helps inform future assessments. Bassette and Willis (2007) and Rispoli,

Davis, Goodwyn, and Camargo (2013) conducted descriptive assessments in a classroom to obtain data on the topography of problem behavior, frequency, intensity, and duration, as well as possible antecedents and consequences, which helped develop the conditions for subsequent functional analyses.

One criticism of functional analysis methodology is that it typically is only be conducted in analogue settings (e.g. Hanley, 2012). However, Moore et al. (2002) trained teachers to incorporate functional analyses in classroom settings. Three teachers with limited experience in behavior analysis and their corresponding students participated in this study. Two of the students were not diagnosed with developmental disabilities. Training consisted of written and vocal instructions on how to implement the attention and demand condition, as well as opportunities for rehearsal and feedback. Following the training, the teachers employed the skills they learned to conduct functional analysis sessions with their students in the classroom. The results showed that following training all three teachers engaged in the correct skills with fidelity during classroom probes, however, data on student behavior were not collected, and thus it is impossible to know if the teachers' use of FA methodology engendered differential responding between the conditions. This is unfortunate, as this study not only represents an application of functional analyses outside of analogue settings, it also shows its use with students without disabilities.

Wallace, Doney, Mintz-Resudek, Tarbox (2004) extended the research on training school personnel to conduct FAs by evaluating the effectiveness of training in a workshop format. Three school staff without experience conducting FAs or coursework in behavior analysis participated in the study. About 38 individuals attended the 3-hr workshop, which consisted of instructions on the procedures, videotapes of each condition, and role-playing. Participants were then asked to conduct simulated functional analyses of the attention, demand, and play conditions. Following

the training, a teacher conducted generalization probes in the classroom with one student who engaged in head hitting. The researchers did not provide feedback to the teacher following the sessions. The results suggest that this training was effective for teaching all the participants to implement FA procedures proficiently, including high fidelity during generalization probes. Bessette and Willis (2007) also reported success training a paraprofessional to implement attention, escape, and play conditions with an elementary school student engaging in severe problem behavior. Social validity results indicated that that although the paraprofessional rated the procedure favorably, she was not sure if she would recommend it to others. The paraprofessional suggested that the assessment could be improved by conducting the sessions throughout the day instead of in an analogue format.

Other researchers have also alluded to the importance of the setting in which functional analyses are conducted, as it may affect the results (Lang, Sigafoos, Lancioni, Didden, & Rispoli, 2010). It is possible that analogue assessments cannot capture environmental events such as discriminative stimuli, establishing operations, or environmental stimuli maintaining the problem behavior that are inherent to the classroom environment (Tiger, Fisher, Touissant, & Kodak, 2009). In addition, administrators are less likely to support assessments that result in even temporary increases in rates of problem behavior (Repp, 1994), may not allow students to be out of the classroom for the length of time required to complete a FA. Furthermore, although inconclusive results have only been reported in 6% of analogue FAs, this may be enough to deter school personnel from implementing this procedure given the time and resources it requires (Lang et al., 2010; Tiger et al., 2009). Moreover, temporary increases in rates of problem behaviors while conducting FAs in classroom settings may be distracting to other students (Hanley, Iwata, & McCord, 2003).

A solution to these concerns is the trial-based FA, as the trials are embedded into already existing classroom routines, and all trials end upon the first instance of problem behavior. Bloom et al. (2011) conducted trial-based FAs in classrooms and found that the outcomes obtained by the trial-based FA matched those obtained from the session-based FA 60-80% of the time. Although these results are promising, a treatment condition was not included, and all the trials were conducted by trained research assistants, which limits the utility of trial-based FAs in schools as trained researchers and/or behavior analysts are not always available. Bloom, Lambert, Dayton, and Samaha (2013) addressed this limitation by training three teachers to conduct trial-based FAs in the classroom setting with three students diagnosed with developmental and intellectual disabilities. Training involved a presentation and one-on-one meetings describing the procedures and data collection. Following the trainings, the teachers conducted the first few trials of each condition in the presence of the researchers to ensure treatment integrity. The outcomes of the trial-based FA suggested that higher rates of problem behavior occurred during the tangible and demand conditions for two students and during both the test and control segments in all conditions for one student suggesting an automatic reinforcement function. These results were then used to develop interventions that were effective at decreasing problem behavior and increasing alternative responses for all students. Similar results were obtained by Lambert, Bloom, and Irvin (2012) who used the results of trial-based FAs to implement Functional Communication Training (FCT) with children in early special education settings.

Rispoli et al. (2013) compared the results of teacher implemented session-based and trial-based FAs in the classroom setting for two students diagnosed with developmental disabilities. All assessment sessions took place in the classroom setting using normally available materials.

Trials for the trial-based FA were embedded within naturally occurring routines, whereas the sessions for the session-based FA took place in a separate area within the classroom. The results showed non-correspondence between the trial-based and the session-based FA. The results also depicted very low levels of responding in the session-based FA compared to the trial-based FA. Low levels of responding during the session-based FA may have been due to reactivity, as the presence of observers may have been more salient during the session-based FA, or perhaps the trial-based FA captured relevant EOs that are only available in the classroom setting during normal routines. As a treatment phase was not included in this study, it cannot be determined if the outcomes from either assessment would have indeed resulted in improvements in behavior.

Although several studies suggest that teachers can be trained to implement trial-based FAs (Bloom et al., 2013; Kunnavatana, Bloom, Samaha, & Dayton, 2013) the extent to which teachers are able to maintain these skills over time and implement trial-based FAs on their own is still an area that merits further research. McIntosh, Brown, and Borgmeier (2008) suggest that without continued support, teachers are likely to return to non-functional or punitive intervention strategies. One way to create a support structure that can provide additional assistance to teachers is through a pyramidal model of training. Pyramidal training refers to a training strategy in which a small number of individuals receive training and then train others. Kunnavatana, Bloom, Samaha, Lignugaris/Kraft, et al. (2013) used pyramidal training to teach special education coordinators and teachers to conduct trial-based FAs, calculate and graph data, and identify the function based on the data. Special education coordinators were trained first to use the trial-based FA based on the procedures described by Bloom et al. (2013). Following the training, coordinators were expected to assist with the teacher training. Training consisted of a didactic presentation, small group role-plays with feedback, and individual tests with feedback. Once all

coordinators were trained, teacher training started. Prior to training, 28 teachers were given the method section from Bloom et al. (2011) and were asked to conduct baseline trials. The coordinators then helped with teacher training by providing feedback and leading the small group role-plays. The results indicate that implementation accuracy increased for all the teachers, and two teachers were able to proficiently conduct trial-based FAs in the classroom with two students. Teachers also learned to graph and analyze data and did so with high fidelity. Although follow-up data were not collected to see how long both teachers and coordinators maintained the skills, or whether coordinators could individually teach an untrained teacher to conduct trial-based FAs, this article represents a promising approach at increasing the efficiency of training and conducting trial-based FAs in schools.

Future Directions

Thus far, the utility and effectiveness of functional behavior assessments in a variety of settings, including schools, has been well established (e.g., Hanley et al., 2003). Several studies have incorporated indirect assessments (e.g., Kinch et al., 2001), descriptive assessments (e.g., Anderson & Long, 2002), and functional analyses (e.g., Bloom et al., 2013) in education settings, establishing a precedent for their effectiveness and continued use. However, a few limitations still exist. As the demographics of students change, educators have to adjust to more heterogeneous groups of students (VanAcker et al., 2005). This means that behavior assessments, more specifically functional analyses, also need to evolve to encompass different groups of students without disabilities, with varying degrees of disabilities, and from multiple cultural backgrounds (Gable 1999; Quinn et al., 2001). Lewis and Sugai (1996) suggest that it is possible that functional analyses may be reactive for students without disabilities who posses average or above average intelligence and have more complex learning and social behavior

repertoires. Austin, Groves, Reynish, and Francis (2015) directly addressed this concern and expanded the research in this area by conducting trial-based FAs in mainstream classrooms with typically developing students. For this study, teachers were asked to select students who engaged in disruptive or off-task behaviors in the classroom that negatively impacted academic performance. Interestingly, this study also included a peer attention condition. In the control segment, the participant and a preferred peer interacted during a moderately preferred task, however, if problem behavior occurred, the peer was called away by the researcher and the segment ended. If the problem behavior occurred during the test segment, the peer was instructed to go back to the table with the participant, which generally resulted in conversation between the two students. The results of this study showed that the trial-based FA was effective at identifying the function of problem behavior for students without developmental disabilities. The inclusion of a peer attention condition in this study was also unique. However, the procedures used to test this condition did not seem to entirely match with those proposed before. Generally, during the control segment of the attention condition, problem behavior terminates the segment but does not result in a programmed consequence or any visible change in the way the adult interacts with the participant. However, in the peer attention condition, problem behavior resulted in the removal of the peer, as the researchers asked the peer to walk away from the participant. When looking at the graphs for this study, there seems to be a clear difference in the percentage of trials with problem behavior between the test and control segments for the adult attention condition, but there is not a clear difference in the percentage of trials with problem behavior between the test and control segments for the peer attention conditions. Therefore, it is difficult to say if peer attention did indeed function as a reinforcer for the participants' problem behaviors.

Several studies have attempted to establish the validity of different variations of functional analyses by comparing their results with the session-based functional analysis (e.g. Bloom et al., 2011; Iwata, Duncan, et al., 1994). When the results do not match, the results obtained by the respective variation are assumed to be incorrect while the results obtained by the session-based FA are assumed to be correct. Although the session-based FA has been identified as the gold standard, the true test of validity lies with treatment (Mace, 1994). As such, more studies should focus on developing interventions to assess the validity of the results, especially when one or more functional analysis approaches do not correspond with each other. It is possible that when results do not correspond, both are equally valid if the FAs took place in different settings. This is supported by a study conducted by Lang et al. (2010) who showed that the results of functional analyses were sensitive to the setting in which they were conducted. These results are especially relevant for the trial-based FA as it takes place in classrooms instead of analogue settings. Further, more studies are needed to assess if the interventions developed are effective within the classroom context. Many studies implement interventions in separate settings, and although this maintains the rigor required for research, it is important to know if these interventions are effective in the context in which the behavior occurs once the researchers are gone. Austin et al. (2015) conducted trial-based FAs to identify the function of off-task and disruptive behaviors exhibited by three, typically developing students. Once the FAs were completed, the results were used to design interventions that were implemented entirely in the classroom setting. Baseline sessions occurred during natural classroom routines, and were procedurally similar to the test segments of the trial-based FA, however, problem behavior did not terminate the session, but rather resulted in a specific consequence. Different variations of DRO were alternated during the treatment sessions, in the classroom. The results suggest some

decrease in problem behaviors during the treatment conditions when compared to baseline, however, these outcomes did not directly correspond to the results obtained by the trial-based FA and the number of sessions in each treatment condition was not enough to conclusively support favorable results as some conditions concluded with increasing trends.

Trial-based functional analysis procedures appear to be increasing in popularity among researchers with an increasing number of studies evaluating different aspects of this approach. With a small body of research evaluating the correspondence between trial-based functional analysis and other established functional analysis approaches, and with results mixed, more research is warranted in this area. Therefore, the purpose of this study was to conduct a further comparison of the results of session-based and trial-based functional analyses with children in a special needs classroom to evaluate correspondence between the two approaches and their relation to other functional assessment results. The second purpose was to validate the results obtained by the FAs by evaluating interventions in the classroom based on the results of the FAs.

Study 1 Method: Correspondence Analysis

Participants and Setting

This study took place at a private school in Brandon, Florida. This school specialized in working with children with varying disabilities and problem behaviors. Classrooms were arranged based on a level system. Level 1 classrooms were designed for students with the lowest academic achievement scores and the most intense behavioral concerns. These classrooms typically required a primary teacher and an aide. Level 2 classrooms were designed for students that were moderately academically delayed and engaged in fewer problematic behaviors. Lastly, Level 3 classrooms were designed for students that were on grade level, but engaged in problematic behaviors throughout the day.

The trial-based FA and treatment evaluation sessions took place in the participating students' classrooms. The session-based FA was conducted in a separate classroom. The session-based FA for the first three participants was conducted in the school's sensory room (dimensions 4 m by 3 m), as this was the only unoccupied classroom available that could be modified. However, it is important to note that although the research team removed as many visible items as possible prior to the start of the session-based FA, the classroom was not completely empty, as this was not feasible in this setting. Items remaining in the room included a TV, and computer, and drawers with items inside. The session-based FA for the last two participants was conducted in an entirely empty classroom that became available later in the year when an office was vacated (dimensions 3.5 m by 3 m). This empty room was created as a calm down room with the intention of minimizing classroom disruptions when students engaged in severe problem

behaviors. All trial-based FAs were conducted first, followed by the session-based FA. This experimental sequence prevented possible biased responding in the trial-based FA, as the students were not previously exposed to any of the session-based FA contingencies that may have influenced their behavior.

Five students, ages 5-10 participated in this study. Both the teacher and his/her corresponding student agreed to be included in this study, and teachers were not required to have a background on behavior assessment and treatment.

Participant 1 was a 5-year-old, Hispanic boy from a middle-class family diagnosed with Autism Spectrum Disorder (ASD). This was his first year attending school and he was placed in a level 1 classroom. Approximately five other students were present in the classroom. Although participant 1 was above level academically, he engaged in severe problem behaviors throughout the entire school day, including screaming, physical aggression, property destruction, self-injury, rigidity with routines and arrangements, and elopement. He required continual supervision and monitoring, in addition to individualized one-on-one instructions during academic activities.

Participant 2 was a 6-year-old, Caucasian boy from a lower middle-class family, diagnosed with ASD, Oppositional Defiant Disorder (ODD), and Attention Deficit Hyperactivity Disorder (ADHD). Participant 2 was placed in a level 3 classroom as he was on grade level academically and did not require direct instruction. Approximately 10 other students were present in the classroom. However, participant 2 was at risk of being removed to a level 1 classroom given the frequency and intensity of his problem behaviors, which included physical aggression, self-injury, property destruction, and cursing. During one observation in particular, participant 2 engaged in over 100 instances of physical aggression in approximately 20 min. His day generally consisted of several similar episodes, which usually resulted in being sent home.

Participant 3 was a 10-year-old, Caucasian boy, from a lower middle-class family, also diagnosed with ASD and attending this school for the first time. He was placed in a level 1 classroom, was severely below level academically, and generally communicated using the same sounds or gestures. Approximately six other students were present in the classroom. He engaged in mouthing, pica, elopement, flopping on the ground, and some physical aggression.

Participant 4 was a 7-year-old, Caucasian girl, from an upper middle-class family diagnosed with ASD. She was placed in the same level 3 classroom as the second participant, was on grade level academically, but would generally communicate using scripts from movies or TV shows. Participant 4 engaged in high pitched screaming lasting 5 to15 min, and some physical aggression. As the classrooms were in close proximity to each other, the screaming would typically evoke problem behaviors in other students with noise sensitivities.

Lastly, participant 5 was a 9-year-old Asian American boy, from an upper middle-class family, diagnosed with ASD and placed in the same classroom as participant 3. Participant 5 was also severely below level academically but engaged in some vocal communication consisting of repetitive phrases. In the classroom, he engaged in screaming, flopping on the ground, and self-injury that was frequent and severe enough to leave a permanent callus in the back of his right hand. He was the only participant currently receiving ABA therapy afterschool or at a clinic setting several times a week. However, the teacher did not report improvements in problem behaviors since the beginning of the school year.

Response Measurement

Prior to the assessments, the researcher conducted direct observations in the classrooms and worked with the teachers to identify the target behavior and develop operational definitions for each individual student (see Table 2 for details). The researcher and the reliably observer also

conducted simultaneous observations prior to the start of the FAs to edit the definitions as needed.

The dependent measure was the rate of problem behavior (calculated as responses per minute, RPM). Data were collected via continuous frequency recording using a printed data sheet and writing utensil.

Interobserver Agreement

Interobserver agreement (IOA) was assessed by calculating agreement between two independent observers. A second, independent data collector collected data for least 30% of all FA sessions. IOA for the trial-based FA was calculated by comparing trial segments when both the primary researcher and the research assistant (RA) scored occurrence and nonoccurrence of problem behavior, dividing the trial segments with agreement by the total number of trial segments, and multiplying by 100. For the session based FA, IOA was calculated by obtaining the number of responses recorded by the primary researcher and the RA, dividing the smaller number by the larger number, and multiplying by 100.

IOA for the trial-based FA was 100% for all participants. For the session-based FA, IOA averaged 97% (range 92% to 100%) for participant 1, 98% (range 93% to 100%) for participant 2, 92% (range 77% to 100%) for participant 3, and 100% for participants 4 and 5.

Preference Assessment

Prior to carrying out the functional analyses, the researcher conducted a multiple-stimulus without replacement (MSWO; DeLeon & Iwata, 1996) preference assessment with each student to identify moderately preferred items to use in the attention condition, and highly preferred items to use in the tangible condition.

Procedural Fidelity

A graduate student who served as the RA received training on the trial-based and session-based FA prior to the beginning of the study. The RA collected treatment integrity (TI) data for 30% of all assessment sessions. The RA used a treatment integrity checklist (Appendix A) to ensure that all components of the assessments were carried out as intended. TI was 100% across all participants for both types of assessment.

Researcher Training

The researcher conducted all the assessment sessions. The RA was trained to help assess treatment fidelity and reliability. Prior to the beginning of the study, the RA received additional training in conducting the trial-based and session-based FAs. Trainings were conducted individually and followed a BST format in which the researcher instructed the RA on what to do, modeled the correct responses, asked the RA to rehearse, and provided feedback. Training ended once the RA achieved 100% proficiency in three consecutive rehearsals for each individual condition in both types of assessments.

Indirect Assessment

Prior to conducting the functional analyses the researcher conducted a FAST as described by Iwata et al. (2013) (Appendix B) with all the teachers. The FAST consists of three sections. The first section asks demographic information about the student and the behavior of concern. The second section contains 16 yes or no questions that focus on environmental events that precede and follow the target behavior. The last section is a scoring summary, which requires tallying up the results of the questions that address the same function. The scoring summary gives a hypothesis for the possible maintaining reinforcer. Once the FAST was completed, the researcher asked the teachers additional, open-ended questions regarding a) preferred items or

materials, b) routines or activities when the target behavior was more or less likely to occur, c) the types of academic tasks that would generally evoke problem behavior, d) the quality and wording of the attention provided following the problem behavior, and e) any known setting events or antecedent conditions that would increase the likelihood of the behavior.

Direct Observations

In addition to the indirect assessment, the researcher also conducted several direct observations and recorded ABC data on the target behavior as it occurred in the classroom setting. The researcher observed each participant at least two times for a minimum of 30 min and observed 9 to 14 instances of the target behavior for each participant. Direct observations helped identify the target behavior and develop accurate operational definitions. In addition, these observations identified patterns of antecedents and consequences of the problem behavior and helped to the researcher select appropriate antecedent and consequent conditions to include in the functional analyses (e.g. the types of demands, the quality of the attention that followed problem behaviors). Lastly, direct observations helped inform which items could also be used in the assessments, as the preferred items identified by the preference assessments did not always correspond to items the participants preferred on particular days. Additional preferred items identified via direct observations were selected by monitoring the participant in the classroom setting and choosing items the participants were interacting with the most.

Trial-Based Functional Analysis

The trial-based FA was comprised of 10 trials addressing each function; the trials were embedded within the regular classroom routines. Data consisted of the presence or absence of problem behavior in each segment of the assessment. Each trial was divided into two 2-min segments - control and test - as suggested by Bloom et al. (2011). During the control segment,

the EO was absent (the student had free access to reinforcers) and the problem behavior did not result in any consequences. Conversely, during the test segment, the EO was present (no access to the reinforcer) and problem behavior resulted in the programmed reinforcer. Trials were conducted in any order, and no more than two trials addressing the same function were done back to back. Trials did not directly follow each other and if something occurred in the classroom that disrupted the trials, the trial was considered "failed" and did not count towards the total number of trials. Any instance of problem behavior at any time in a segment resulted in the programmed consequence and terminated that segment (except during the ignore trials).

Attention. During the control segment of the attention condition, the researcher was seated or standing by the student who had access to a moderately preferred item. The researcher delivered non-contingent attention to the student approximately every 30 s throughout the segment. Instances of problem behavior did not result in a programmed consequence and terminated the segment. The test segment began immediately after the control segment, at which time the researcher told the student that she was busy and had something to do. Any instance of problem behavior was followed by attention from the researcher in the form of social disapproval (e.g. "That's not nice") and the trial ended. If at any time the student left the area where the trial was being conducted, the researcher followed the student.

Tangible. The control segment of the tangible condition began with the researcher seated or standing by the student who had access to a highly preferred item. Instances of problem behavior during the control segment did not result in a programmed consequence and terminated the segment. Right after the control segment, the researcher transitioned to the test segment. During the test, the researcher removed the item and kept it in view but out of the student's reach. The researcher returned the item to the student contingent on problem behavior, at which

time the segment ended. If the student left his/her seat the researcher followed but blocked any attempts to access other tangibles.

Escape. Prior to the start of the escape trials, teachers were interviewed to identify non-preferred tasks that were likely to trigger problem behaviors in the classroom. These tasks were used in the test segments of the escape trials. During the control segment, the researcher was seated or standing close to, but facing away from the student and did not initiate any interactions. During this segment, the student was allowed to leave the area, was not required to complete any tasks, and did not have access to any leisure items. Instances of problem behavior did not result in any programmed consequences and terminated the segment. If at any time the student grabbed an item from the classroom or the researcher blocked the student from accessing tangible items, the segment ended, was considered "failed," and did not count towards the total number of trials. The test segment immediately followed the control segment, at which time the researcher instructed the student to complete a task and used a three-step prompting sequence (verbal prompt, model prompt, and physical prompt). Upon the first instance of problem behavior, the researcher removed the task and let the student know he/she did not need to complete the work (e.g. "You don't have to work"). If at any time in the test segment the student attempted to leave, the researcher blocked and continued to prompt him/her to finish the task.

Ignore. The ignore condition was comprised of two, identical test segments. The researcher stood near the student to provide the opportunity for him/her to still exhibit the target behavior but did not interact with the student. The student did not have access to any leisure items and was not required to complete any tasks. The student was allowed the leave the area and instances of problem behavior did not result in any consequences. Both segments always lasted 2 min each, as problem behavior did not terminate either segment. If the participant grabbed an

item in the classroom or the researcher blocked the student from accessing tangible items, the segment ended, was considered "failed," and did not count towards the total number of trials.

Session-based Functional Analysis

The session-based functional analysis was modeled after the procedures described by Iwata et al. (1982/1994). Data consisted of the frequencies of problem behavior observed during each session. Sessions were conducted by the primary researcher and lasted 10 min. To encourage faster discriminated responding between the conditions, the researcher wore different color shirts, which were assigned to each condition type. The total number of sessions depended on the frequencies of problem behavior observed in each condition. Once the data indicated differential responding, the assessment ended. If something occurred in the analogue setting that disrupted the session, the session was immediately stopped and considered "failed." The researcher conducted four test conditions (ignore, attention, escape, and tangible) and one control condition (play).

Ignore. The student and the researcher were alone in the assessment room. The researcher did not interact with the student and he/she did not have access to preferred items or work materials. Problem behavior did not result in any consequences.

Attention. During this condition, the researcher was seated or standing next to the student who had access to a moderately preferred item. The researcher told the student that she had work to do and turned away from the student. Any instance of problem behavior resulted in a statement from the researcher (e.g. "I don't like that"). The researcher then restated that she had work to do and turned away once more.

Escape. Prior to this condition, the teachers were interviewed to identify tasks that were likely to evoke problem behavior. The researcher was seated or standing by the student,

presented a task, and guided the student to complete it using a three-step prompting sequence (verbal, model, and physical prompts). Upon any instance of problem behavior, the researcher terminated the task (e.g. "Okay, you don't have to do it"), and removed the task for 30 s. The researcher then reintroduced the task and continued the assessment for the remainder of the 10 min.

Tangible. The researcher was seated or standing by the student who had access to a highly preferred item. The researcher removed the item and kept it out of the student's reach. Instances of problem behavior resulted in 30-s access to the item. The researcher then removed the item once more and continued the assessment.

Play. The researcher was seated or standing with the student in the therapy room. The student was not presented with any tasks, he/she had continuous access to preferred items, and the researcher made friendly statements every 30 s. The researcher did not ask the student any questions, but if the student interacted or attempted to play with the researcher, he/she responded accordingly. There were no consequences for problem behavior.

Data Analysis and Outcome Comparisons

The outcomes for the FAST were identified by tallying up the questions that addressed the same function. The outcomes of the direct observation ABC recording were reported as the percentage times each consequence followed instances of the problem behavior. Data for the trial-based FA were analyzed by graphing the percentage of trials with problem behavior for both the test and control segments for each type of trial (attention, tangible, escape, ignore). The data for the session-based FA were analyzed by calculating the rates of problem behavior and graphing these rates in a multi-element graph.

The function of the target behavior in the trial-based FA was determined by higher responding in the test vs. control segment for each trial type. High rates of problem behavior during both test and control segments across multiple conditions, one of which is the ignore condition, may be indicative of automatically reinforced behavior. The maintaining reinforcer obtained by the session-based FA was identified by comparing the rates of behavior in each reinforcement contingency to the rates of behavior in the control condition.

Correspondence between the two functional analysis assessments was obtained if the same function was identified by both assessments. Disagreement between the assessments was considered non-correspondence.

Study 1 Results

The data on problem behaviors in both functional analysis procedures as well as trial-by-trial data from the trial-based FA are depicted in Figures 1-5. The data from the direct observation results is summarized for each participant in Table 3. The data from the FAST are summarized in Table 4. The functions identified in all four assessments (FAST, direct observation, trial-based FA, session-based FA) are summarized in Table 5.

The FAST suggested that participant 1's behavior (screaming) was possibly maintained by social positive (50%) and social negative reinforcement (75%). The results of the direct observations suggested that screaming was followed by attention (100%) and access to tangibles (63%). In the trial-based FA, screaming occurred in the highest percentage of trials in the test segments of the access (50%) and escape (80%) conditions of the trial-based FA. A single instance of problem behavior occurred in the control segment of the escape condition and the test segment of the attention condition. The specific trials in which problem behaviors took place for each condition during the trial-based FA are depicted in the trial-by-trial graphs in figure 1. The target behavior occurred at higher rates in the access and escape conditions of the session-based FA. A single instance of screaming occurred in the last session of the ignore condition. These results show correspondence between trial-based and session-based FAs and suggest that participant 1's behavior was multiply maintained by social positive reinforcement in the form of access to tangibles and social negative reinforcement in the form of escape from academic tasks. There was one failed trial in the trial-based FA and two failed sessions in the session-based FA.

The FAST suggested that participant 2's behavior (aggression) was possibly maintained by social positive (100%), social negative (100%), and automatic positive reinforcement (75%). The results of the direct observations suggested that screaming was followed by access to tangibles (55%), attention (44%), and escape (33%). In the trial-based FA participant 2's target behavior (physical aggression) occurred the most frequently in the escape (50%) and access (90%) trials of the trial-based FA. Problem behavior was never observed during the trials of the attention condition. The specific trials in which problem behaviors took place for each condition during the trial-based FA are depicted in the trial-by-trial graphs in figure 2. Higher rates of physical aggression were also observed in the escape and access conditions of the session-based FA. These results show correspondence between trial-based and session-based FAs and suggest that physical aggression was multiply maintained by social negative reinforcement in the form of escape academic tasks and social positive reinforcement in the form of access to tangible items. There were no failed trials or sessions for participant 2.

The FAST suggested that participant 3's behavior (mouthing) was possibly maintained by social positive (75%), negative (66%), and automatic positive reinforcement (75%). The results of the direct observations suggested that mouthing most often produced no social consequences (81%) and thus was possibly maintained by automatic. In the trial-based FA, the target behavior for participant 3 (mouthing) occurred in almost every trial of each condition of the trial-based FA, with the exception of one test trial in the ignore condition. The specific trials in which problem behaviors took place for each condition during the trial-based FA are depicted in the trial-by-trial graphs in figure 3. In the session-based FA, mouthing occurred at the highest rate in the ignore and attention conditions, although the problem behavior occurred at least once in almost every session of each condition, with the exception of the second session in the

tangible condition. These results show correspondence between trial-based and session-based FAs and suggest that problem behavior was maintained by automatic reinforcement. There were no failed trials for the trial-based FA and two failed sessions for the session-based FA.

The FAST suggested that participant 4's behavior (screaming) was possibly maintained by social positive (75%), negative (75%), and automatic positive reinforcement (75%). The results of the direct observations suggested that screaming was most often followed by attention (81%). In the trial-based FA, for participant 4, the target behavior (screaming) occurred every time in the test segments of the access conditions. There was a single instance of screaming in the first test segment of the attention condition, and three instances of screaming in the test segments of the escape condition. The specific trials in which problem behaviors took place for each condition during the trial-based FA are depicted in the trial-by-trial graphs in figure 4. In the session-based FA, there were three instances of screaming in the second session of the escape condition, but screaming occurred at the highest rates in the access condition. These results show correspondence between trial-based and session-based FAs and suggest that participant 4's target behavior is maintained by social positive reinforcement in the form of access to tangible items. There were two failed trials and no failed sessions for participant 4.

The FAST suggested that participant 5's behavior (self-injury) was possibly maintained by social positive (75%), negative (75%), and automatic positive reinforcement (75%). The results of the direct observations suggested that self-injury was followed by access to tangibles (75%) and, to a lesser extent, escape (41%). In the trial-based FA, participant 5's target behavior (self-injury) occurred with highest frequency in the test segments of the access condition (60%) in the trial-based FA. There were three instances of self-injury observed in the test segments of the escape condition, and a single instance of self-injury in both test segments of the ignore

condition. The specific trials in which problem behaviors took place for each condition during the trial-based FA are depicted in the trial-by-trial graphs in figure 5. In the session-based FA, self-injury occurred with highest frequency in the first two sessions of the escape condition. It also occurred two times in the first session of the attention condition. However, problem behavior ceased to occur in the session-based FA and a function could not be identified using this assessment method. The results of the trial-based FA suggest that participant 5's problem behavior was maintained by social positive reinforcement in the form of access to tangibles, while the session-based FA did not identify a function as the problem behavior did not continue to occur across any conditions.

Study 2 Method: Treatment Validation

Participants and Setting

All students, with the exception of participant 2, participated in this part of the study. All treatment sessions were conducted by the primary researcher and took place in each participant's corresponding classroom. There were generally ABA, occupational, or speech therapists present at any time in the classrooms, as these professionals typically worked with students at the school. Participant 1's classroom had one semi-circular table where the teacher worked with all the students in groups. There was another small table, without chairs, where the students could kneel or sit to play or work with the aide or therapist. The remainder of the classroom was equipped with toys, bookshelves, a pull-up bar, swing, and trampoline. Participant 3's and 5's classroom had two circular tables and four desks where the students worked with the teacher, aide, or therapists. The remainder of the classroom was equipped with sensory toys, bookshelves, and a TV. Participant 4's classroom had one semi-circular table, two round tables, a swing, and a corner with a carpet and pillows. The remainder of the classroom was equipped with toys, bookshelves, and a TV.

Response Measurement

The primary dependent variable for participants 1, 4, and 5 was the rate of problem behavior calculated as responses per minute (RPM), and the primary dependent variable for participant 3 was percentage of 10-s intervals with problem behavior. Data were collected using a data sheet.

Interobserver Agreement

Interobserver agreement (IOA) was assessed by calculating agreement between two independent observers. A second, independent data collector collected data during 35% of sessions for participant 1's escape condition, 33% of sessions for participant 1's access condition, 33% of sessions for participant 3, 36% of sessions for participant 4, and 40% of sessions for participant 5. IOA for participants 1, 4, and 5 was calculated by obtaining the number of responses recorded by the primary researcher and the RA, dividing the smaller number by the larger number, and multiplying by 100. IOA for participant 3 was calculated by dividing the number of intervals with agreements by the total number of intervals and multiplying by 100.

IOA averaged 100% for participant 1's escape and access baseline and treatment sessions. IOA for participant 3 averaged 86.5% (range 77% to 100%). IOA for participants 4 averaged 100%, and IOA for participant 5 averaged 98.8 (range 95% to 100%).

Procedural Fidelity

The RA collected treatment integrity (TI) data for 35% of sessions for participant 1's escape condition, 33% of sessions for participant 1's access condition, 33% of sessions for participant 3, 36% of sessions for participant 4, and 40% of sessions for participant 5. The research assistant used a treatment integrity checklist developed for each procedure to ensure that all components of the baseline and intervention sessions were carried out as intended. TI was 100% across all participants.

Researcher Training

The primary researcher conducted all baseline and treatment sessions. The same RA as in Study 1 received training on baseline and treatment procedures to help assess treatment fidelity

and reliability. Trainings were conducted individually and followed a BST format in which the researcher instructed the RA on what to do, modeled the correct responses, asked the RA to rehearse, and provided feedback. Training ended once the RA achieved 100% proficiency in three consecutive rehearsals for each individual condition in both types of assessments.

Treatment Validation

The FA results for each participant, except for participant 2, were validated using a reversal design. Participant 2 did not participate in this part of the study as his behaviors were too intense and he was at risk of being removed from the school if he did not receive full-time ABA services as soon as possible. All baseline and treatment sessions lasted 5 min, with the exception of the second baseline and treatment phases for participant 4. Her target behavior (screaming) became so intense that sessions had to be shortened to 3 min at the teacher's request.

Baseline. All sessions were conducted by the researcher in each participant's corresponding classroom. Procedures resembled those of the relevant condition of the session-based FA, but sessions were embedded into naturally occurring classroom routines.

Both FAs identified escape as a reinforcer for participant 1. Baseline sessions consisted of placing an academic demand and allowing escape contingent on the target behavior. Both FAs identified access to preferred items as a reinforcer for participants 1, 4, and 5. Baseline sessions consisted for removing a preferred item and allowing access contingent on problem behavior. Both FAs concluded that participant 3's target behavior (mouthing) was maintained by automatic reinforcement. Mouthing generally occurred towards an array of items, however, it was observed that participant 3 would mouth Play Doh most often. He usually placed the Play Doh on his lips, took small bites of it, moved it around in his mouth, and sometimes swallowed it. As Play Doh was frequently used in participant 3's classroom, mouthing Play Doh specifically was targeted

during Study 1 and 2. Baseline sessions consisted of presenting Play Doh and recording when he mouthed it. Data consisted of rate of problem behavior or percentage of 10 s intervals with problem and replacement behavior.

Intervention. All intervention sessions were conducted by the researcher and also took place in each participant's corresponding classroom. The interventions used consisted of Functional Communication Training (FCT) and Differential Reinforcement of Other Behavior (DRO).

The target behavior for participant 1 was screaming. Both FAs suggested that screaming was maintained by escape from academic demands and access to tangible items. The intervention consisted of FCT to teach a functionally equivalent response for both escape and access conditions. The escape sessions were conducted first. Prior to the start of the intervention sessions, the researcher told the participant that if he needed a break he had to say, "go away." This response was chosen because participant 1 has an aversive emotional response to the word "break." It seems that he took the word "break" to mean physically shattering or breaking something, rather than a pause in the demand. According to his parents, participant 1 was likely to engage in problem behaviors at home if items broke or were out of place. The researcher then practiced the replacement response with the participant three consecutive times by presenting a demand, prompting the participant to say, "go away," and immediately providing a break. As soon as the practice sessions ended, the intervention sessions began. The access condition followed the escape condition. Prior to the start of the access sessions, the researcher told the participant that if he wanted an item back he needed to say, "give it to me." This response was chosen because it was already in the participant's repertoire, although he did not emit it very often. The researcher practiced the replacement response with the participant three consecutive

times by removing an item, prompting the participant to say, “give it to me,” and immediately providing access to the item. As soon as the practice sessions ended, the intervention sessions began.

The target behavior for participant 3 was mouthing, specifically mouthing Play Doh. Both FAs suggested that mouthing was maintained by automatic reinforcement. In efforts to identify a functionally equivalent replacement response for this participant, the researcher showed him several items that he could mouth instead. Some of these items included chewable necklaces, gum, and an array of chewing toys. However, he never attempted to mouth these, therefore, the intervention for participant 3 consisted of differential reinforcement of other behavior (DRO) and negative punishment, which consisted of brief removal of the Play Doh. Prior to the start of the intervention, the researcher modeled how to play with the Play Doh and used hand-over-hand guidance to show him how to play with it appropriately - rolling it on the desk, squishing it between his fingers, making figures, etc. Bubbles was selected as the reinforcer for the absence of mouthing as it was frequently used by the teachers to reinforce work completion, and he seemed to prefer this item the most. Prior to the start of the intervention, the researcher modeled how to play with the Play Doh and used hand-over-hand guidance to show him how to play with it appropriately. The intervention consisted of presenting the Play Doh, blowing bubbles every 30 s that he did not engage in mouthing, and providing specific praise (e.g., You’re doing a great job playing with the Play Doh). If mouthing occurred, the researcher removed the Play Doh for 5 s and said, “we don’t eat Play Doh, we play with Play Doh.”

The target behavior for participant 4 was screaming. Both FAs suggested that screaming was maintained by access to preferred tangibles. The intervention consisted of FCT to teach a functionally equivalent response for access conditions The replacement behavior for participant

4 was saying “give it back” when the item was removed. Prior to the start, the researcher told the participant that she could say, “give it back” anytime she wanted the item. This response was chosen because it was already in the participant’s repertoire, although she did not emit it very often. The researcher practiced the replacement response with the participant three consecutive times by removing an item, prompting the participant to say, “give it to me,” and immediately providing access to the item. As soon as the practice sessions ended, the intervention sessions began.

The target behavior for participant 5 was self-injury. The trial-based FA identified access to tangibles as a function of the problem behavior. The session-based FA did not identify a function for self-injury. Despite this disagreement between functional analyses, an access condition was tested in the classroom to assess if behavior could still be reliably evoked. The intervention consisted of FCT to teach a functionally equivalent response. The replacement behavior for participant 5 was any statement related to playing or playing with the item that was withheld (e.g., I want to play, I want to play with beans, I want the beans). A specific response was not chosen because participant 5 already emitted these responses at a pretty high frequency throughout the day and according to the teacher it took him some time to learn multiple responses to request items, and she did not want him to revert to requesting only one way. The researcher practiced the replacement response with the participant three consecutive times by removing an item, prompting the participant to say “I want to play/I want to play beans, etc.,” and immediately providing access to the item. As soon as the practice sessions ended, the intervention sessions began.

Study 2 Results

The functions identified in all four assessments (FAST, direct observation, trial-based FA, session-based FA) as well as treatment outcomes for all participants are summarized in Table 5. Treatment outcomes for participant 1 are shown in figure 6. During the first baseline phase, rates of screaming averaged 2 responses per min (range 2 to 2.2) and rates of appropriate responding averaged 0 responses per min. When the first intervention phase was introduced, there was an immediate increase in level, following by a steep decrease in the level of screaming, indicative of an extinction burst (M = 1.6, range 0 to 3.8). Problem behavior decreased to zero in the last two sessions. Rates of appropriate responding increased to 1.4 responses per min, on average (range 0 to 2.4). Once baseline was reintroduced, rates of screaming increased once again (M=1.9, range 1.8 to 2) and the average rates of appropriate responding decreased to 0.26 responses per min, on average (range 0 to 0.8). However, once the intervention was reintroduced, there was an immediate decrease in the level of screaming (M=0) and an immediate increase in the levels of appropriate responding (M=2.1, range 2 to 2.2).

Treatment outcomes for participant 3 are shown in figure 7. During the first baseline phase, mouthing occurred in 64.3% of intervals, on average (range 47% to 80%). When the first intervention phase was introduced, there was an immediate decrease in the percentage of intervals in which mouthing occurred (M=3.3%, range 0% to 7%). Once baseline was reintroduced, mouthing occurred in 71.8% of intervals (range 70% to 73.5%), on average. However, once the intervention was reintroduced, rates of intervals with mouthing rapidly decreased to 21.1% (range 16.6% to 23.3%).

Treatment outcomes for participant 4 are shown in figure 8. During the first baseline phase, rates of screaming averaged 4.8 responses per min (range 3.8 to 5.5) and rates of appropriate responding averaged 0 responses per min. When the first intervention phase was introduced, there was a decrease in the level of screaming (M=0.8, range 0 to 2) with an obvious decreasing trend to zero by the last session. Rates of appropriate responding increased to 1.2 responses per min, on average (range 0.6 to 2). Once baseline was reintroduced, rates of screaming increased once again to 3 responses per min, and the average rates of appropriate responding decreased to 0 responses per min. However, once the intervention was reintroduced, the level of screaming decreased once more to 0.3 responses per min, on average (range 0 to 1), and the level of appropriate responding increased to 1.8 responses per min, on average (range 1.7 to 2).

Treatment outcomes for participant 5 are shown in figure 9. During the first baseline phase, self-injury averaged 1.1 responses per min (range 0.2 to 2) and appropriate responding averaged 0.6 responses per min (range 0 to 1.6). When the first intervention phase was introduced, the level of self-injury decreased to 0.2 responses per min on average (range 0 to 0.2), and the level of appropriate responding increased to 1.5 responses per min (range 1 to 2). Once baseline was reintroduced, rates of self-injury increased once again to 1.2 responses per min in both sessions, and the average rates of appropriate responding decreased to 0.6 responses per min (range 0.4 to 0.8). However, once the intervention was reintroduced, there was an immediate decrease in the level of screaming (M=0) and an immediate increase in the levels of appropriate responding (M=1.6, range 1.4 to 1.8).

Discussion

The purpose of this study was to further evaluate correspondence between the session-based and the trial-based FAs, and to validate the results obtained by these assessments using function-based interventions in special education classrooms. Five students diagnosed with a range of developmental disabilities and different cognitive functioning levels participated in this study. Trial-based FA and treatment sessions took place in the corresponding participant's classroom, and session-based FA sessions took place in a separate, analogue setting.

Based on the outcomes of this study, the session-based and the trial-based FA corresponded in six of out the seven (85.7%) total functions identified. These results are slightly higher than those reported in the literature, as previous studies have found correspondence in 60% - 83% of the cases (e.g., Bloom et al., 2011; LaRue et al., 2010). Lack of correspondence between the assessments was observed for participant 5, for whom the session-based FA failed to identify a specific function. From the sampled literature comparing these two FAs, this is the third time such an outcome has been reported (Rispoli, Davis, et al., 2013; Rispoli et al., 2014). Lastly, the results of the interventions verified the functions identified for all participants who were involved in this part of the study. For a more in-depth discussion of these results, it may help to dissect these findings and explore them individually.

First, the results of this study are consistent with recent studies evaluating the effectiveness of treatments designed from the outcomes of trial-based FAs in a variety of settings (e.g. Chezan, 2014; Lambert et al., 2012; Schmidt et al., 2013). In addition, these treatments were implemented in the classrooms, during routines that were likely to evoke the problem

behavior. It is important to note that treatment sessions were intended as a verification of the assessment results, rather than a way to completely resolve problem behaviors in the classrooms. For this reason, generalization sessions were not conducted. However, based on the treatment results, the researchers made extensive treatment recommendations to the teachers and parents. Both types of FAs corresponded for three out of the four participants who were involved in the treatment verification portion of this study. The participant for whom the assessments did not correspond received an intervention based on the outcomes of the trial-based FA, as the session-based FA yielded almost no occurrences of the problem behavior in any test conditions by the end of the assessment. The results of the intervention evaluation sessions indicate that although the FAs did not match, the function identified by the trial-based FA was indeed correct. This is a critical finding, as non-correspondence between the session-based and trial-based FAs is typically explained as false positive or false-negative results yielded by the trial-based FA (e.g. Bloom et al., 2011), rather than the session-based FA perhaps not capturing the relevant EOs necessary to evoke problem behaviors for specific individuals during relevant conditions (e.g. Lloyd et al., 2014; Rispoli et al., 2013). It is important to note that, for all participants, the session-based FA was tailored to match the natural environments as much as possible in an attempt to capture all the variables that could evoke the problem behavior. For example, for participant 5, the demands placed were identical to the ones used in the classroom, during the trial-based FA, and during treatment evaluation conditions. The attention provided mimicked the tone and phrases used by the teacher (e.g., "Put you hands down"), and in the absence of problem behavior in the tangible condition when using the items identified as most preferred by the preference assessments, the researchers used items that the participant was already interacting with in the classroom. One possible explanation for the inconclusive results yielded

by the session-based FA for participant 5 may be that the empty classroom used for the assessment may have served as an S-delta for problem behavior. Students at the school were generally removed to this classroom when they were disruptive, unsafe, or needed a safe place to calm down. Although this participant had not been specifically taken to this room before, he did have a history of being removed from the classroom to calm down when he engaged in disruptive problem behaviors. Therefore, it is possible that being removed to the empty classroom during the session-based FA may have served as an S-delta for problem behavior or as an S^D for incompatible behavior that previously resulted in escape from such a room.

Overall, the results of the treatment verification sessions are consistent with existing literature (e.g. Bloom et al., 2013; Lambert et al., 2012) in that interventions designed from the functions identified by the trial-based FA are effective at reducing problem behavior. Given these outcomes, it is possible that comparison between assessment methodologies is not necessary, and the effectiveness of these assessment strategies lies with their ability to inform effective treatment (Mace, 1994). This is a promising approach, especially for practicing behavior analysts looking to integrate research and practice. Having to verify the validity of one assessment method with the results of another assessment method can be time consuming, and possibly unnecessary, especially if both assessments are equally valid. For example, there were several students who were nominated as participants for this study, but whose problem behaviors were so severe that waiting for the completion of two separate assessments was not acceptable. If verification of function is necessary or desired, then the treatment verification condition in this study can be proposed as a possibility. In a sense, the baseline sessions in the treatment evaluation served as a functional analysis test condition by establishing the environmental contingencies that evoked the problem behavior and the consequences that maintained it. The

treatment conditions served as a control, as the contingency for problem behavior was absent and reinforcement was provided for an alternative response. Ultimately, if the functional analysis approach is to be considered a process, then perhaps the process itself, rather than a specific set of procedures, should be considered the "gold standard." This represents a strategic approach that suggests the assessment procedures, as long as they are designed to establish a functional relationship, can be individualized to fit the individual, the practitioner, and the setting (Hanley, 2012).

One criticism of functional analyses is the need for additional resources, including an analogue setting, which is not always available (e.g. Hanley, 2012). However, an important characteristic of this study was the use and adaptability of the session-based and trial-based FAs to a school where completely empty rooms were not readily available (until the last two participants) and all toys could not be removed from the participating students' classrooms. As a barren room was not accessible to conduct the session-based FA for participants 1-3, an analogue setting was created by using the available room space, removing as many toys, games, and sensory items as possible, and finding creative solutions for the items that needed to remain in the room. For example, one of the sessions for participant 3 failed because he noticed his reflection in the large TV located in the room, which seemed to compete with problem behavior. The session was stopped and the TV screen was covered for the subsequent session. One of the sessions for participant 1 failed because he used one of the chairs in the room to climb onto the counter and jump off the counter. The session was stopped and the chair was placed away from the counter for the following session, as it was too big to remove from the room. Although this analogue scenario was less than ideal based on the standards proposed in previous research, we still managed to obtain correspondence between assessments at rates that are higher than those

previously reported. This is an exiting finding, as one common theme in the area of functional analysis is to increase the usefulness and contextual fit of these strategies in multiple settings (e.g. Moore et al., 2002; Lang et al., 2010; Hanley et al., 2003).

Another finding worth discussing, and directly related to contextual fit, was the reactions exhibited by some of the participants and their classmates in relation to both types of assessments. As described above, participant 1 was a 5-year-old boy diagnosed with ASD. Although he communicated using short sentences and had limited vocabulary, he was substantially above level academically and learned the contingencies for assessment and treatment very quickly. However, participant 1 repeatedly stated during the session-based FA that he no longer liked the room in which the assessment took place, and once his participation was over, he refused to go into the assessment room with other staff. Several sessions were required to re-condition the room as a neutral space. Similar reactions were observed from participant 2, a 6-year-old boy also diagnosed with ASD, ODD, and ADHD. Although participant 2 engaged in very severe problem behaviors, he had a communicative repertoire akin to that of a neurotypical child his age. He was also on grade level academically. Participant 2 experienced, strong, negative emotional responses to the session-based FA and refused to go with the researchers a few times. Once in the room he would say things such as "Why are you doing this to me? Why are you messing with me? I know you are messing with me and I don't like that? You are being rude. You want me to be nice but you are messing with me. I'm asking for my things nicely, but you won't give them to me. " Upon returning to the classroom, he also expressed frustration and dislike towards the researchers to his teachers. Furthermore, some of the students' peers noticed the researchers working with the students and began to imitate what they observed. For example, imitating the contingency from the tangible test condition, one

student approached participant 4, removed the crayon she was using, waited for her to engage in screaming, and then told her, “Here you go, you can have it back.” A similar interaction was observed following the treatment sessions, as the same student approached participant 4, removed the item she was interacting with, and told her that she should say “give it back” if she wanted it back. Once participant 4 engaged in the response, the student gave her back the crayon, and they both laughed. These observations further support the need for functional analyses to evolve in order to encompass a larger group of students with and without disabilities and varying functioning levels (Gable 1999; Quinn et al., 2001; Sugai, 1996). Austin et al. (2015) reported similar findings and suggested developing more natural ways to deliver consequences as the next step in integrating functional analyses into classroom settings.

An additional way in which FAs can be integrated into the classroom settings is to use characteristics of both the trial-based and the session-based FA to identify the function of problem behavior that occur within this context. Several studies have included session-based FAs in the classroom, however, most of the time it was accomplished by creating an analogue setting within the larger room (e.g. Rispoli et al., 2013; Moore et al., 2002). It is possible that session-based functional analysis can be conducted similar to the way in which the treatment sessions in the present study were conducted. Short, rapidly alternating conditions can be embedded within the naturally occurring classroom routines that are relevant to each function. Instances of problem behaviors would result in access to the respective reinforcer and no programmed consequences would be provided for other behaviors. This way, the FA is still capturing the relevant EOs that may be essential for obtaining valid data, while preserving the rigor necessary to demonstrate a functional relationship.

One natural evolution for the trial-based FA is developing more specific criteria for identifying the presence or absence of a function in the trial-based FA. Although visual data analysis is the method typically used in most research to select if a function is present, Hagopian et al. (1997) developed a set of structured criteria that can be used to further analyze the outcomes of the session-based FA. However, similar procedures are not yet available for the trial-based FA, making the results more sensitive to multiple interpretations. At the present time, it is unclear from the existing literature which percentage of trials with problem behaviors relative to control constitutes the presence of a function. For example, Rispoli et al. (2013) reported clear functions although problem behaviors were only observed in 20% of test segments for one participant, whereas other studies have reported a function when problem behavior occurred in at least 40% of all trials or showed a 20% difference with the control (e.g. Bloom et al., 2011; LaRue et al., 2010). For this study, the researcher and major professor decided a priori that a function was identified if problem behavior occurred in at least 40% of test sessions, and/or, there was at least a 40 point difference between the test and control sessions, which alludes to the following discussion point. If problem behavior is present in both test and control segments for the same condition, how many more test segments with problem behaviors are required to show clear evidence of a function? Bloom et al. (2011) did not identify an access function for one participant (Brandon), as the difference between the test trials relative to the control trials was only 20%. However, 20% is the same point difference observed between test and control in the demand trials for another participant (Liv), although for this participant, an escape function was identified (It should be noted that information from the attention condition was considered in deciding on the escape function). In LaRue et al. (2010) an access function was identified for Evan (participant 4), with a 30-point difference between the test and control

trials. An obvious next step in the area of trial-based FAs would be to systematically analyze the different response patterns and objectively identify when a function is or is not present.

An additional way in which the trial-based FA could evolve, and encourage further integration within classroom contexts is to evaluate the types and number of trials, and the way in which these results are graphed. Lloyd et al. (2014) conducted trial-based FAs in an elementary school with students diagnosed with developmental disabilities. Lloyd et al. designed the trials based on the hypothesized functions identified by initial interviews conducted by the teachers and paraprofessionals, and direct observations in the classrooms during times when the target behaviors were most likely to occur. The authors also tailored the number of trials per condition based on clear differentiated responding across trials. The number of trials ranged from 5-12. Although a fixed number of 10 trials per condition was conducted in the present study, further analysis of the trial-by-trial data is warranted. Generally, session-based functional analysis results are depicted using a line graphs, which facilitates visual analysis. However, trial-based FA results are generally depicted as a percentage in a bar graph, which impedes visual analysis of within-condition patterns. Analyzing these patterns may help select how many trials are necessary in each condition (Rispoli et al., 2014). Trial-by-trial results for all participants are illustrated in figures 1-5. Although the within-condition patterns are different for each participant, a few conclusions can be drawn from these data. For most participants, a function could have been identified with fewer than 10 trials. For example, as the criterion that was set for this particular study was at least 4 trials (or 40%) with problem behaviors, the escape condition for participant 1 (figure 1) and participant 2 (figure 2) could have been stopped at the 6th trial, and the access condition for participant 2 could have been stopped at the 4th trial. Similarly, a non-function could have also been identified with fewer than 10 trials. For example, keeping the

same criterion of at least 4 trials with problem behavior, the ignore condition for participant 1 (figure 1) and the attention condition for participant 2 (figure 2) could have been stopped at the 7th trial. Trials in which problem behavior does not occur last 4 min each, just three fewer trials would save 12 min. This is important because it has the potential to save valuable time and resources. For example, one difficulty encountered by the researcher when completing the trial-based FAs was capturing the right opportunity to conduct the trial. As students were not always expected to sit and the classrooms were full of toys and sensory items, it was very difficult to set up a control condition, exactly 2 min before the test condition, which isolated the correct environmental variable, without introducing additional extraneous variables. In this sense, escape sessions were especially difficult to design because students were generally allowed to move around the classroom, but in order to keep the integrity of the assessment, they could not have access to any items, which was not the norm in these classrooms, and the trial had to be stopped if they did obtain an item or the researcher had to block them from obtaining an item. There were quite a few times in which the researcher was present in the classroom, but the right opportunity to conduct the trials did not present itself, resulting in lost time. Although a specific number of trials cannot be determined for each participant prior to the start of the assessment, it is the hallmark of data-based decision making to allow the data to determine how many sessions are necessary before formulating conclusions about the data. Perhaps a rubric for visual analysis of the data paths can be used for the trial-by-trial data or specific parameters can be investigated to determine when fewer sessions would yield valid results.

Although the major focus of this study was the comparison of FA procedures and treatment evaluation to validate the results, the study also compared the results of the FAST and direct observation assessment to the FA results. The finding from this study is that the FAST was

not a useful assessment procedure as it suggested 2 to 4 functions for each of the five participants when the FA procedures identified one function for four participants and two functions for one participant. The FAST did not appear to have much treatment validity in this study. Furthermore, the direct observation results did not match the FA results in most cases. Although the direct observation suggested an automatic reinforcement function consistent with the FA results for participant 4, the results did not match or only partly matched for the other four participants. These results suggest the direct observation did not have much treatment validity in this study.

Although the results of this study are consistent with previous research, present some new findings, and highlight some exiting avenues in the area of functional analysis, a few limitations warrant discussion. First, the use of the trial-based FA seems to be shifting from a researcher or clinician implemented approach to a teacher or natural caregiver implemented approach (e.g. Bloom et al., 2013; Kunnavatana et al., 2013; Sigafoos and Saggers, 1995). In this study, the researcher implemented all the assessment and treatment sessions. As one purpose of this study was to compare assessments, it was important to ensure a high degree of treatment integrity by having a trained researcher conduct all the sessions. However, it is unclear whether the same degree of correspondence would have been obtained if the teachers or familiar staff had conducted the assessments instead. It is certainly a possibility that for participant 5, the session-based FA would have yielded differentiated responding if the demands, tangibles, or attention had been removed or delivered by known individual, perhaps someone with a history or reinforcing problem behaviors.

Second, the entire study took place within a school that specializes in students with a range of disabilities and behavioral disorders. As most of the research in this area has focused on this population, the generality of these findings is unknown. As suggested by Lewis and Sugai

(1996), it is possible that functional analyses may be reactive for students without disabilities, who possess average or above average intelligence, and have more complex behavioral repertoires. A possible example of this is the negative emotional responses exhibited by participants 1 and 2 as a result of being exposed to the session-based FA.

Third, only participants who engaged in problem behaviors that occurred with high enough frequency were included in this study. In addition, participants whose problem behaviors could cause severe harm to themselves or others over the course of the study were excluded. As practicing clinicians are faced with low-rate and severe problem behaviors over their course of practice, additional studies focusing on the best way to use the trial-based FA, if appropriate to use at all, should be conducted.

Lastly, as previously mentioned, the purpose of the treatment evaluation was exclusively a way to verify the outcomes of the functional analyses. The degree to which these interventions would have been effective at producing long-term reductions in problem behavior and acquisition of replacement behaviors is unclear. However, as these treatment verification sessions did take place in the classroom settings, the teachers had several opportunities to observe and ask questions related to the procedures and could have likely incorporated them into their routines if desired. After all, one of the students in participants 4's classroom was independently and without any training, able to implemented at least one trial-based FA and treatment session with participant 4.

The results of this study further support the existing literature in functional analysis by comparing the outcomes of the trial-based and the session-based FA. Furthermore, this study extends the literature by including a treatment component to validate the outcomes of both FAs and by restructuring the way in which trial-based FAs are graphed as an additional way to

analyze these data. Finally, this study proposes additional ways in which research can expand and move forward in the area of functional analysis, both in school settings and general practice.

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Table 1. Brief description of functional analysis procedures.

Types of FA	Description of the procedure	Design	Common Features	Differences
Session-based FA	Participant is exposed to a series of test and control conditions in an analogue setting.	Multi-element graph	Test conditions include EO and reinforcer for problem behavior. Control condition consists of AO and no reinforcer for problem behavior.	• Sessions typically conducted in analogue settings. • Multiple test conditions compared to the same test condition. • Session length varies. • Typically conducted by individuals with behavioral training. • More comprehensive as multiple reinforcement contingencies are tested.
Trial-based FA	Discrete trials with test and control conditions embedded into everyday routines.	Bar graph	Test conditions include respective EO. Manipulation of SDs	• Trials embedded into naturally occurring activities. • Each test condition is compared to its corresponding control condition. • Trials last a maximum of 4 min. • Total length of time varies. May or may not take longer than the session-based FA. • Intended to be conducted by teachers under the supervision of a behavior analyst.

Table 2. Target behaviors and operational definitions

Participant	Target Behavior	Definition
1 & 4	Screaming	High-pitched vocalizations occurring at a volume above that which was appropriate for the context. It was important to include contextual fit within this definition as several of the assessment sessions took place in the classroom during leisure activities when it was appropriate to speak at a volume that was higher than typical conversation. If this was the case, it was not considered screaming.
2	Physical Aggression	Making contact with another person's body using a closed fist, open hand, or foot.
3	Mouthing Play Doh	Contact between the mouth or teeth and Play Doh.
5	Self-injury	Contact between the mouth and the back of the hand or between the head and a hard surface.

Table 3. Direct observation results for all participants.

Participant	Antecedent	Behavior	Consequence	Possible Function	Percentage of Occurrence
1	- No adult or peer attention provided.	Screaming	- Scolding, questioning.	Attention	11/11, 100%
	- Access to item in the classroom.		- Continued access to the item.	Access	7/11, 63%
	- Demand presented.		- Does not have to complete task.	Escape	2/11,18%
2	- No adult or peer attention provided.	Physical Aggression	- Scolding, questioning.	Attention	4/9, 44%
	- Access to item in the classroom.		- Continued access to the item.	Access	5/9, 55%
	- Demand presented.		- Does not have to complete task.	Escape	3/9, 33%
3	- No adult or peer attention provided.	Mouthing Play Doh	- Scolding.	Attention	3/14, 21%
			No observable consequence	Auto function	11/14, 78%

Table 3. Continued

4	- No adult or peer attention provided. - Access to item in the classroom. - Demand presented.	Screaming	- Scolding, questioning. - Continued access to the item. - Does not have to complete task.	Attention Access Escape	9/11,81% 3/11,27% 1/11, 9%
5	- No adult or peer attention provided. - Access to item in the classroom. - Demand presented.	Self-Injury	- Scolding, questioning. - Continued access to the item. - Does not have to complete task.	Attention Access Escape	1/12,8% 9/12,75% 5/12, 41%

Table 4. FAST results for all participants.

Participants	Social Positive Percentage	Social Negative Percentage	Auto Positive Percentage	Auto Negative Percentage
1	50%	75%	25%	0%
2	100%	100%	75%	50%
3	75%	66%	75%	0%
4	75%	75%	75%	25%
5	75%	75%	75%	25%

Table 5. Assessment results for all participants

Participants	FAST	Direct Observations	Trial Based FA	Session Based FA	Treatment Validation
1	Social Positive Social Negative	Attention Access	Escape Access	Escape Access	Escape Access
2	All functions	Attention Access Escape	Escape Access	Escape Access	N/A
3	Social Positive Social Negative Auto Positive	Auto	Auto	Auto	Auto
4	Social Positive Social Negative Auto Positive	Attention	Access	Access	Access
5	Social Positive Social Negative Auto Positive	Access Escape	Access	None	Access

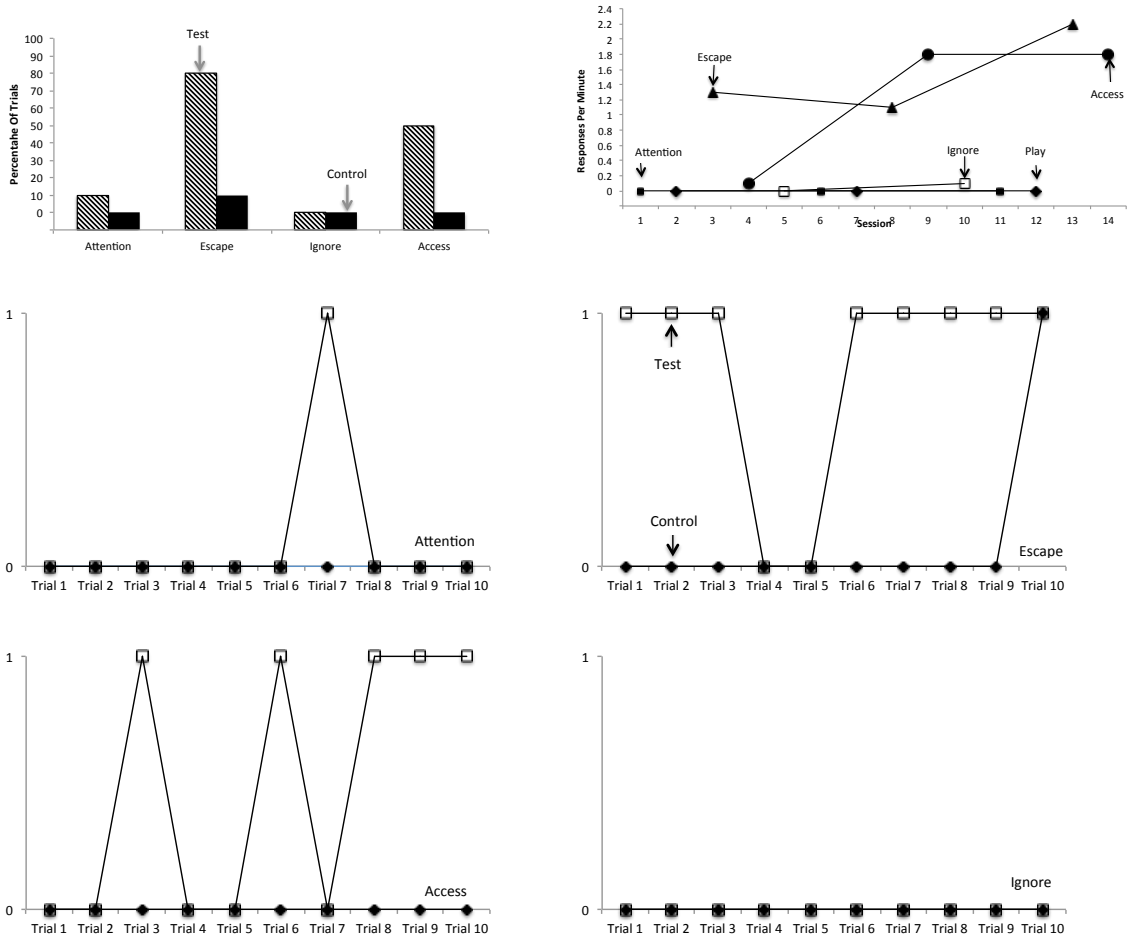

Figure 1. Results of trial-based (top left) and session-based (top right) FA for participant 1. Trial-by-trial analysis for each condition of the trial-based FA (bottom 4 graphs).

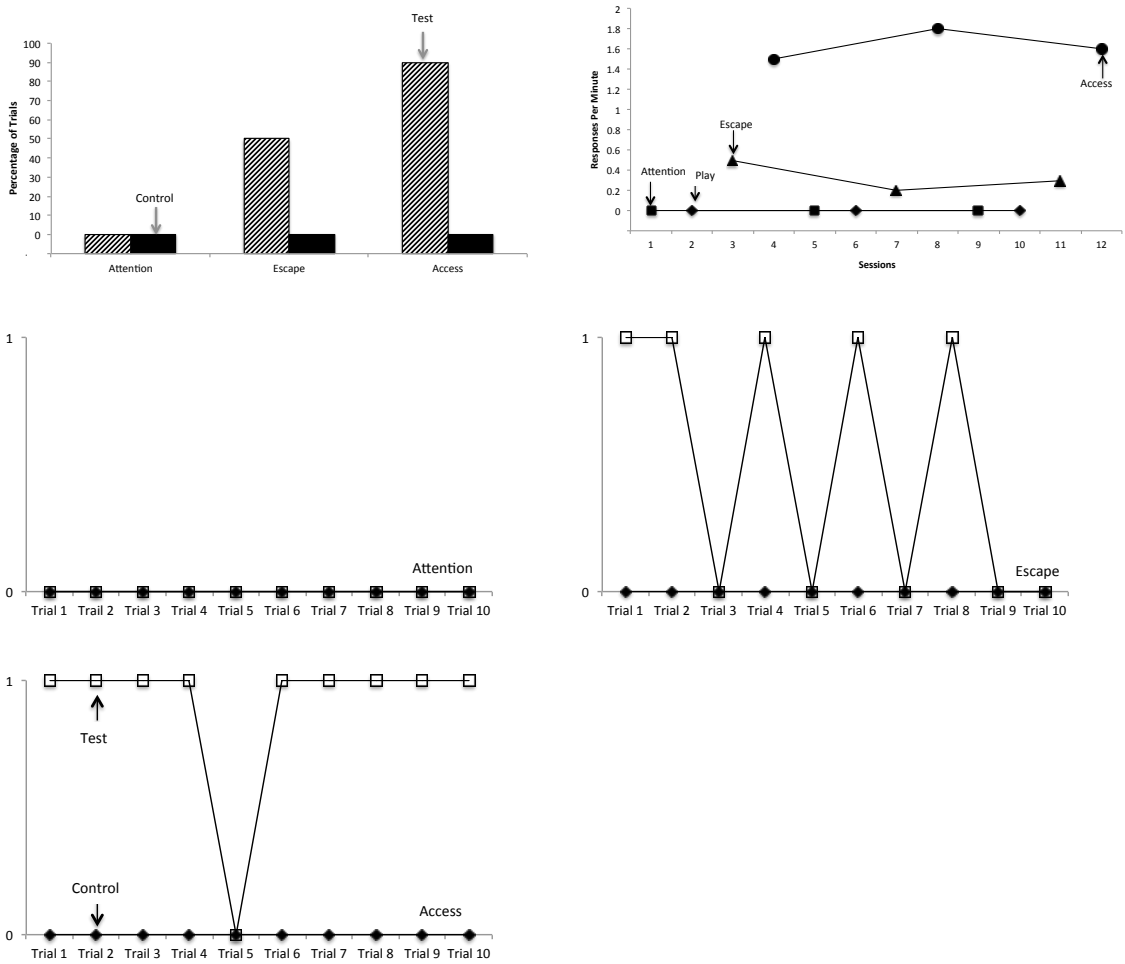

Figure 2. Results of trial-based (top left) and session-based (top right) FA for participant 2. Trial-by-trial analysis for each condition of the trial-based FA (bottom 3 graphs).

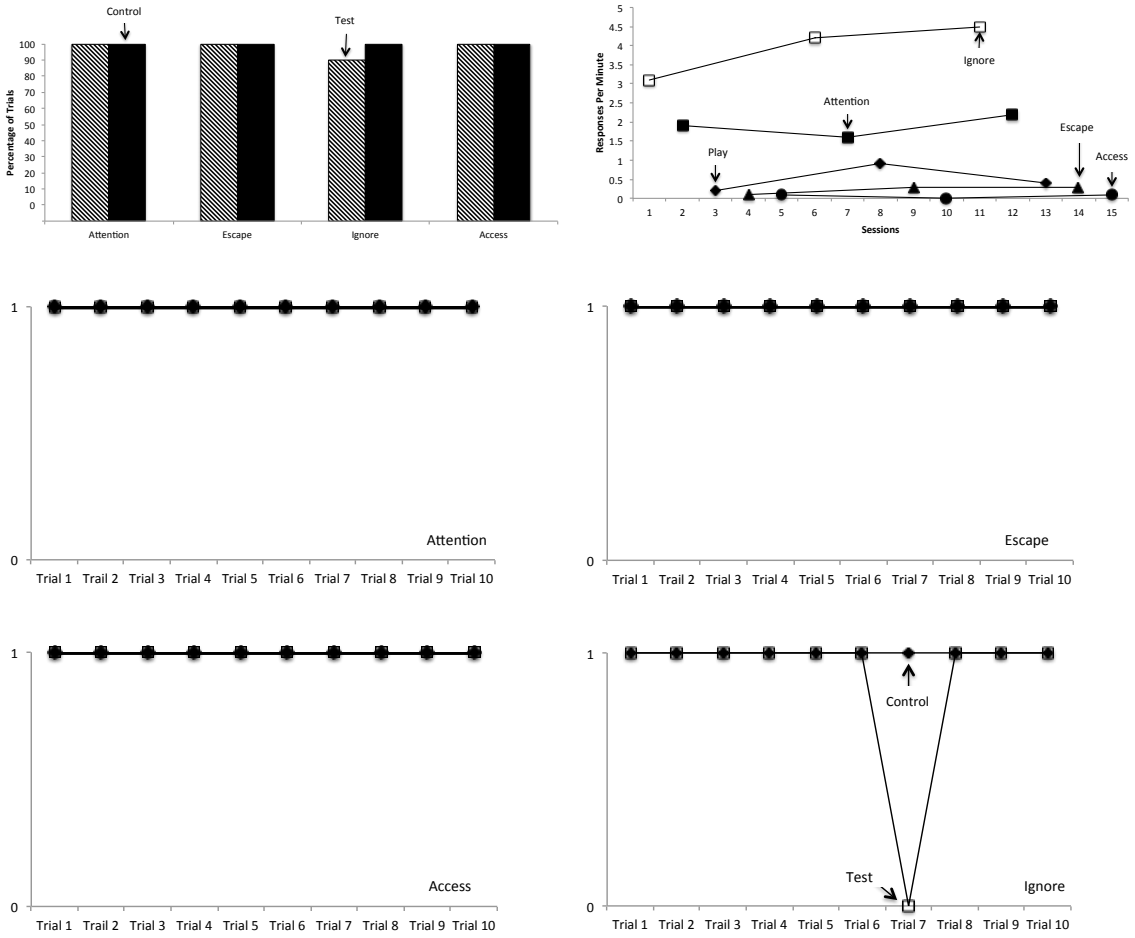

Figure 3. Results of trial-based (top left) and session-based (top right) FA for participant 3.Trial-by-trial analysis for each condition of the trial-based FA (bottom 4 graphs).

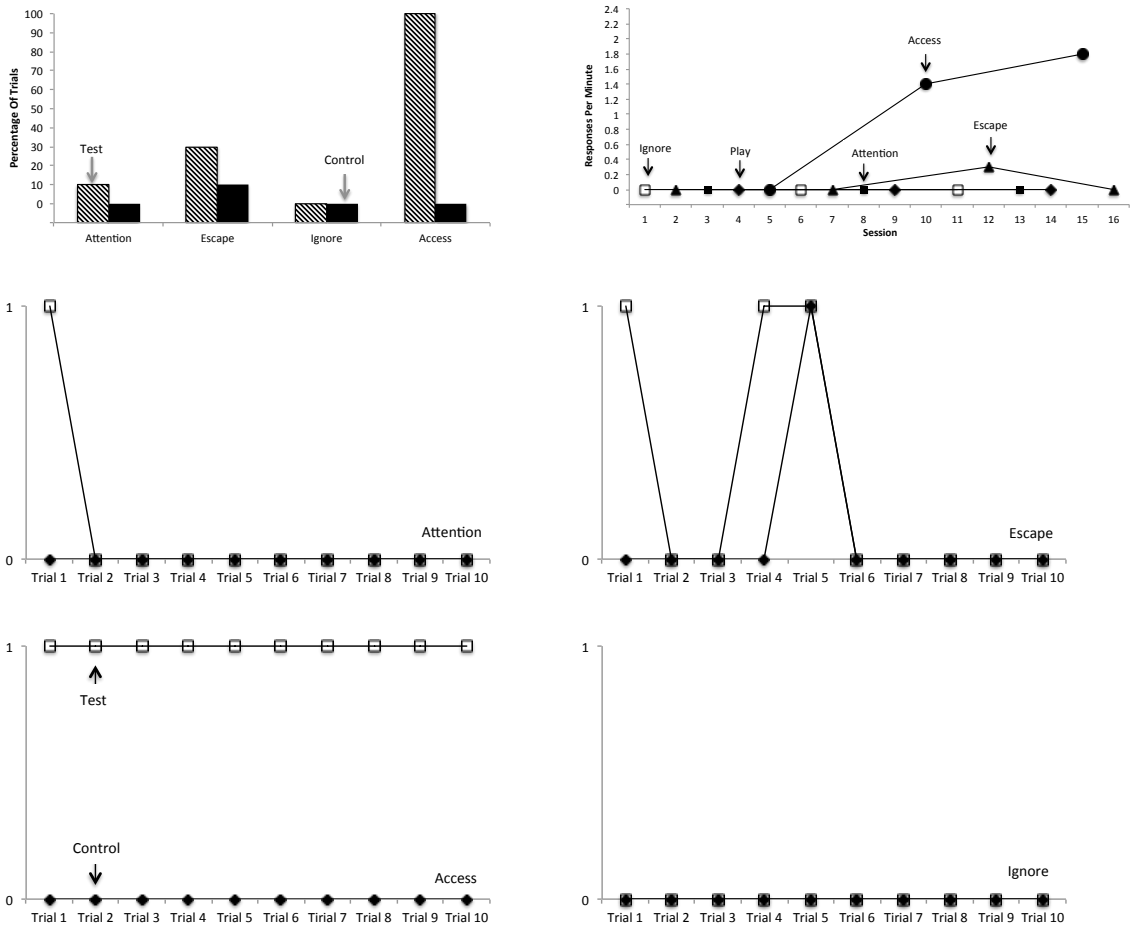

Figure 4. Results of trial-based (top left) and session-based (top right) FA for participant 4.Trial-by-trial analysis for each condition of the trial-based FA (bottom 3 graphs).

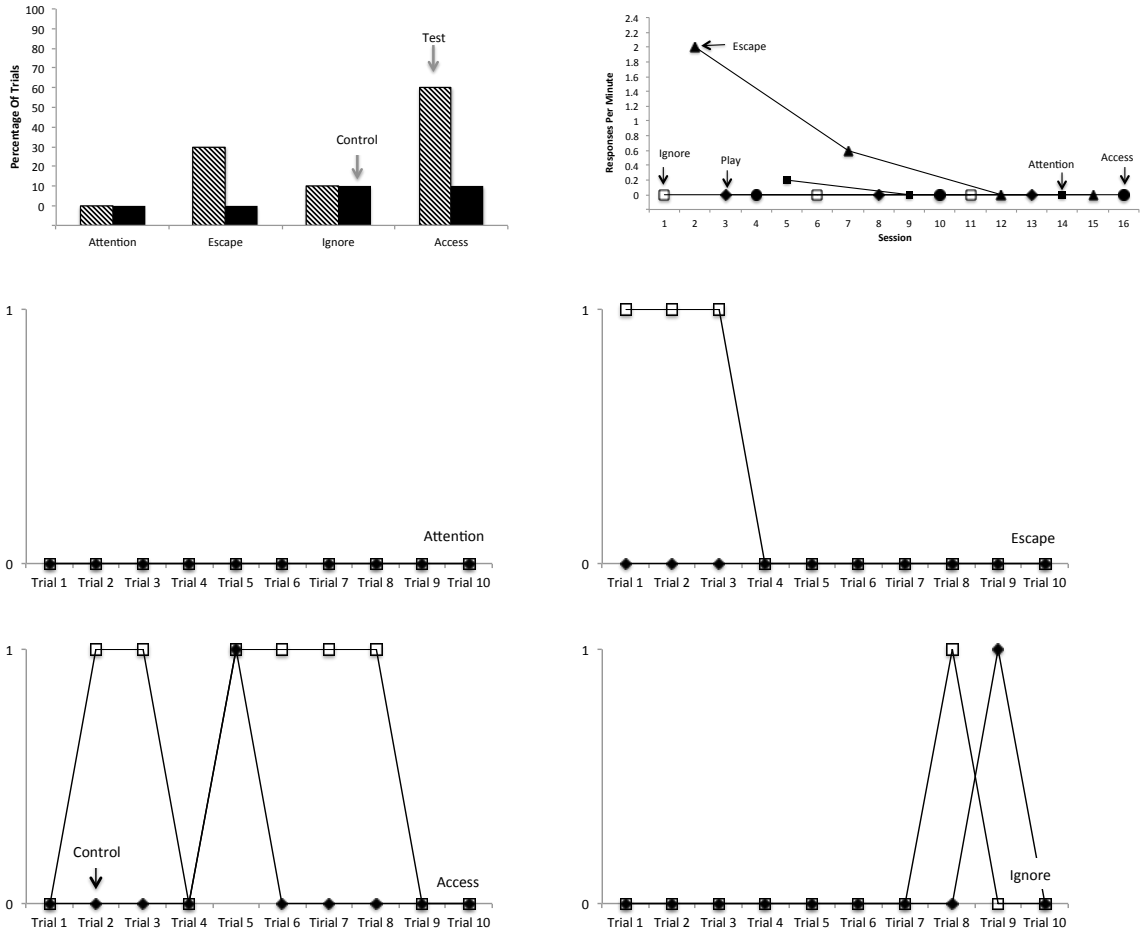

Figure 5. Results of trial-based (top left) and session-based (top right) FA for participant 5.Trial-by-trial analysis for each condition of the trial-based FA (bottom 3 graphs).

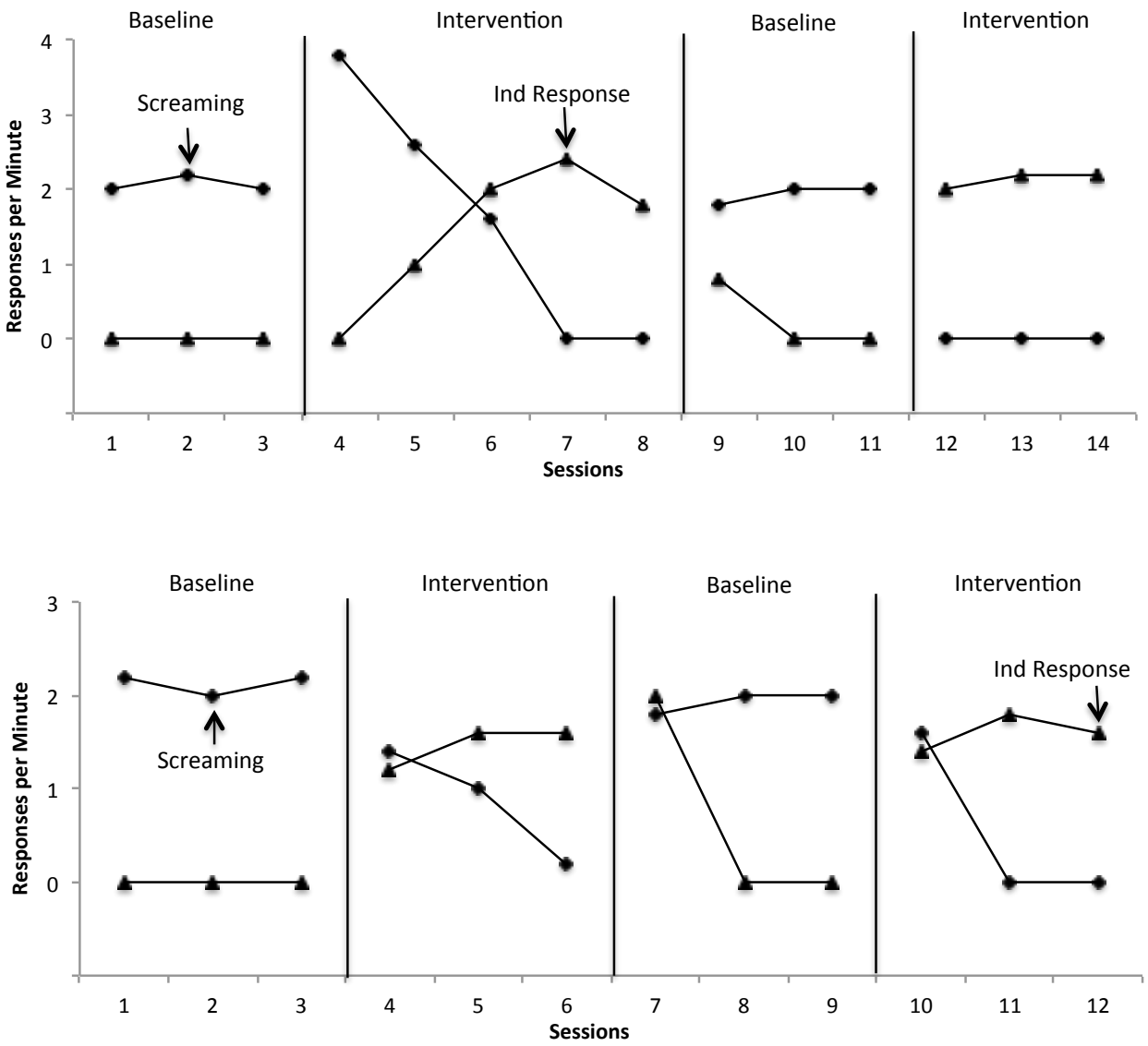

Figure 6. Results of escape (top) and access (bottom) treatment conditions for participant 1. "Ind Response" is an independent communication response.

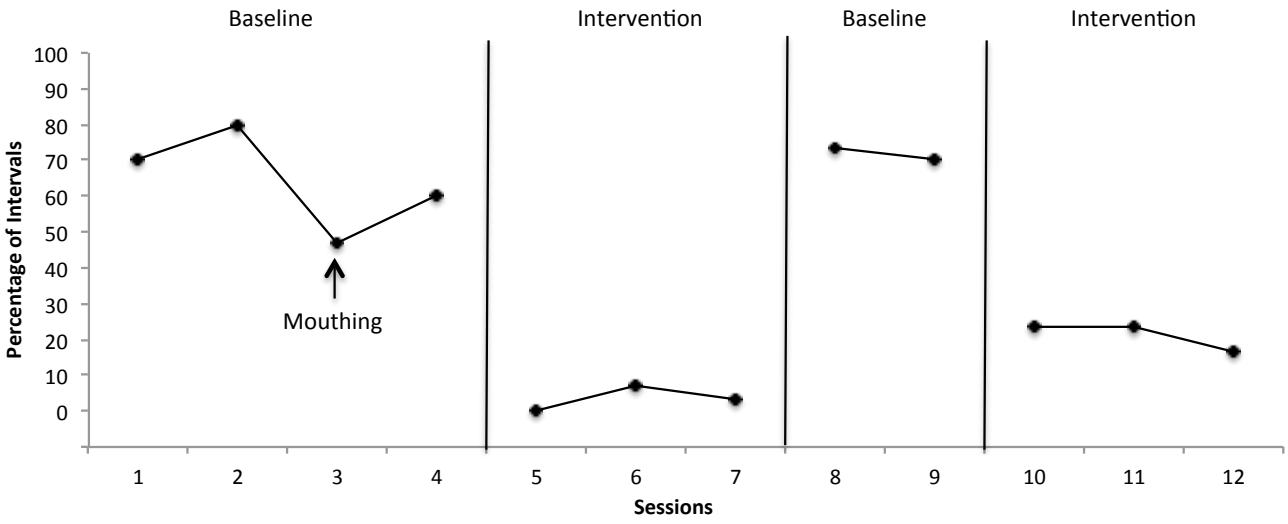

Figure 7. Results of the DRO treatment condition for participant 3.

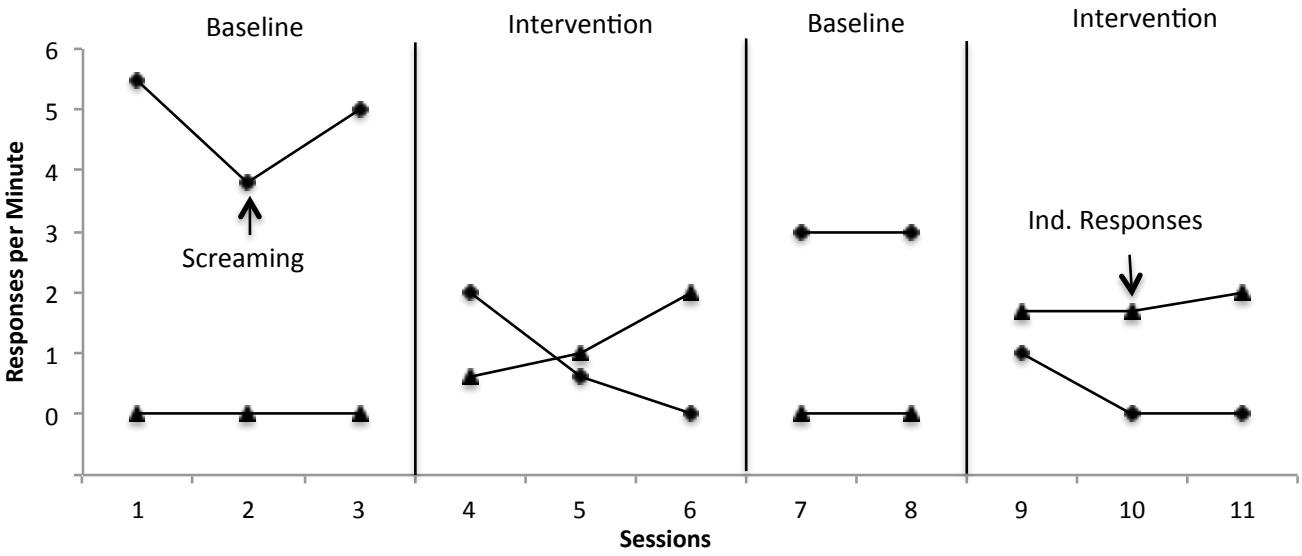

Figure 8. Results of the access treatment condition for participant 4. "Ind Response" is an independent communication response.

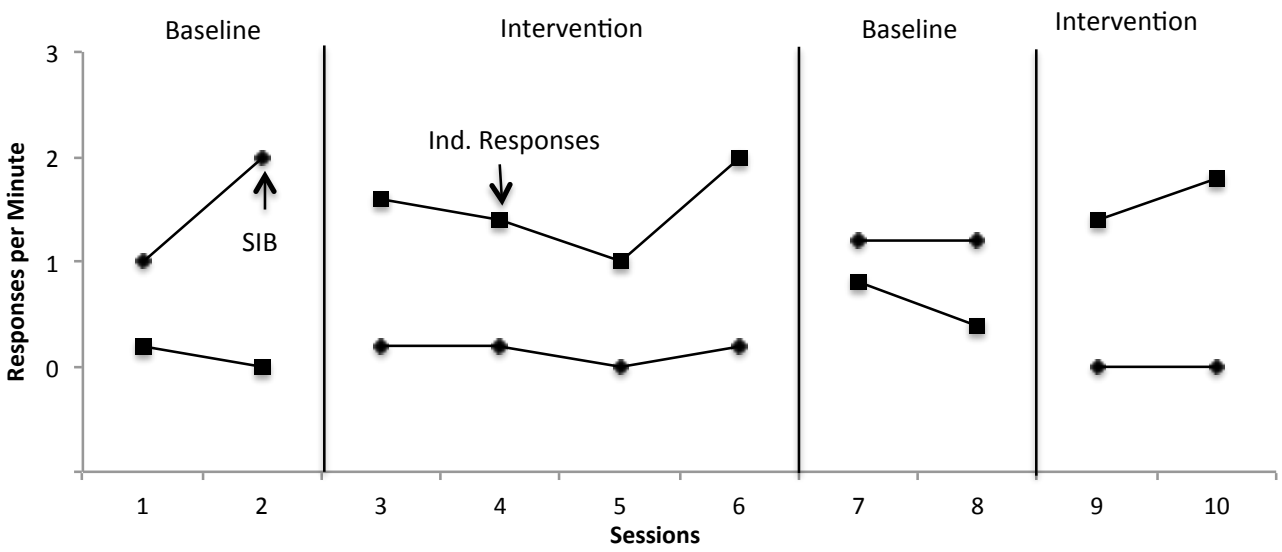

Figure 9. Results of the access treatment condition for participant 5. "Ind Response" is an independent communication response.

Appendices

Appendix A

Trial-based FA checklist (Lambert, Lloyd, Staubitz, Weaver, & Jennings, 2014)

Attention

Participant #: _____ Trial #: _____
Actor initials: _____ Date: _____ Prim/Reli: _____

Segment	Step	Yes	No	N/A
Control	Therapist provided continuous, contextually appropriate (e.g., responded to questions), attention (no more than 10 s between interactions) to the student until the student engaged in target problem behavior or until 2 min elapsed			
	Therapist ignored non-target problem behavior			
	Therapist did not present demands or questions			
	Therapist allowed access to moderately preferred items			
Test	Therapist turned away from student and stopped providing attention (and did not issue any demands) within 5 s of target problem behavior or after 2 min elapsed in control segment			
	Therapist allowed access to moderately preferred items			
	Therapist ignored student until the student engaged in target problem behavior or 2 min elapsed			
	If target problem behavior occurred, therapist made statement of concern within 5 s			
	Therapist ended the trial after statement of concern or after 2 min elapsed			
Data	Therapist collected data that corresponded with observer's data			
	CORRECT STEPS:	/		
	% OF CORRECT STEPS:			

Tangible

Participant #: _____ Trial #: _____
Actor initials: _____ Date: _____ Prim/Reli: _____

Segment	Step	Yes	No	N/A
Control	Therapist allowed student to interact with all available materials and made highly preferred items available until the student engaged in target problem behavior or until 2 min elapsed			
	Therapist delivered attention at least once every 30 s and never withheld attention if the student initiated conversation			
	Therapist did not present demands or questions			
	Therapist ignored non-target problem behavior during control segment			
Test	Therapist removed materials within 5 s of target problem behavior or after 2 min elapsed in control segment			
	Therapist delivered attention at least once every 30 s and never withheld attention if the student initiated conversation			
	Therapist did not present demands or questions.			
	Therapist ignored non-target problem behavior during test segment			
	Therapist kept materials out of student's reach for 2 min unless student engaged in target problem behavior			
	If the student engaged in target problem behavior, therapist returned materials to student within 5 s			
	Therapist ended the trial after materials were returned or after 2 min elapsed			
Data	Therapist collected data that corresponded with observer's data			
	CORRECT STEPS:	/		
	% OF CORRECT STEPS:			

Escape

Participant #: _____ Trial #: _____
Actor initials: _____ Date: _____ Prim/Reli: _____

Segment	Step	Yes	No	N/A
Control	Therapist did not present demands or questions			
	Therapist responded appropriately if the student initiated conversation			
	Therapist did not allow access to highly or moderately preferred leisure materials			
	Therapist ignored non-target problem behavior			
Test	Therapist delivered a demand within 5 s of target problem behavior or after 2 min elapsed in control segment			
	Therapist provided instruction and prompts (including model and physical, if relevant) without delays over 5 s between demands, prompts, or ongoing work			
	Therapist did not allow access to highly or moderately preferred leisure materials			
	Therapist ignored non-target problem behavior			
	If the student engaged in target problem behavior, therapist removed materials and gave the student a break within 5 s			
	Therapist ended the trial after providing a break or after 2 min elapsed			
Data	Therapist collected data that corresponded with observer's data			
	CORRECT STEPS:	/		
	% OF CORRECT STEPS:			

Ignore

Participant #: _____ Trial #: _____
Actor initials: _____ Date: _____ Prim/Reli: _____

Segment	Step	Yes	No	N/A
Test 1	Therapist did not interact with the student			
	Therapist did not allow access to any materials			
	Therapist did not provide a consequence if student engaged in target problem behavior			
	Therapist did not end test segment before 2 min elapsed			
Test 2	Therapist did not interact with the student			
	Therapist did not allow access to any materials			
	Therapist did not provide a consequence if student engaged in target problem behavior			
	Therapist did not end test segment before 2 min elapsed			
Data	Therapist collected data that corresponded with observer's data			
	CORRECT STEPS:	/		
	% OF CORRECT STEPS:			

Session-based and single-test FA checklist

Participant #: Recorder: Researcher: Date:		
Attention Condition	**Yes**	**No**
1. Researcher sat next to student and directed him/her towards moderately preferred materials.		
2. Researcher told client he/she had word to do.		
2. Researcher turned away from client.		
3. Researcher did not respond to problem behavior.		
4. Researcher did not respond to other behavior.		
5. If problem behavior occurred, researcher turned toward client and provided a brief statement of concern and light physical touch.		
Correct # of steps:	/	
% of correct steps:		

Participant #: Recorder: Researcher: Date:		
Demand Condition	**Yes**	**No**
1. Have instructional materials ready at the table.		
2. Ask participant to sit on the table.		
3. If participant sits, sit next to participant.		
4. Do not praise participant for sitting.		
5. If participant does not comply with sitting instruction, use gestural prompt.		
6. If participant does not comply with gestural prompt, use physical prompt.		
7. Continue to use physical prompt.		
8. Remove demand upon any instance of problem behavior for 30 s. Say "ok, you don't have to….". Turn away during break.		
9. Once 30 s are up place a new demand.		
10. Continue to use 3-step prompting sequence if student does not comply with demand.		
Correct # of steps:	/	
% of correct steps:		

Participant #: Recorder: Researcher: Date:		
Play (control) Condition	**Yes**	**No**
1. Have preferred materials ready at the table.		
2. Make a brief statement, without placing any demands (e.g. wow, these toys are so cool)		
3. Continue to deliver praise on average every 30 s (e.g. what a nice shirt you're wearing).		
4. Do not respond to problem behavior.		
5. Acknowledge any interactions from the student.		
6. Do not place demands throughout the session.		
Correct # of steps:	/	
% of correct steps:		

Participant #: Recorder: Researcher: Date:		
Tangible Condition	**Yes**	**No**
1. Have preferred materials ready at the table.		
2. Allow client to briefly interact with materials before the start of the session.		
3. Once session starts, tell participant that you will need to remove the toys (e.g. "my turn").		
4. Keep toy until participant emits any problem behavior.		
5. Ignore any requests to return toy.		
6. Upon the first instance of problem behavior, return the toy for 30 s.		
7. Once the 30 s are up, ask participant for toy again.		
8. Continue same sequence.		
Correct # of steps:	/	
% of correct steps:		

Participant #: Recorder: Researcher: Date:		
Alone Condition	**Yes**	**No**
1. Guide participant into the room.		
2. Leave the room.		
3. Do not interact with participant while he/she is in the room.		
4. Do to respond to problem behavior.		
Correct # of steps:	/	
% of correct steps:		

Appendix B

FAST

Functional Analysis Screening Tool

Client:_____ Date:_____

Informant:_____ Interviewer:_____

To the Interviewer: The FAST identifies factors that may influence problem behaviors. Use it only for screening as part of a comprehensive functional analysis of the behavior. Administer the FAST to several individuals who interact with the client frequently. Then use the results to guide direct observation in several different situations to verify suspected behavioral functions and to identify other factors that may influence the problem behavior.

To the Informant: Complete the sections below. Then read each question carefully and answer it by circling "Yes" or "No." If you are uncertain about an answer, circle "N/A."

Informant-Client Relationship

1. Indicate your relationship to the person: ___Parent ___Instructor ___Therapist/Residential Staff _____(Other)
2. How long have you known the person? ____Years ____Months
3. Do you interact with the person daily? ____Yes ____No
4. In what situations do you usually interact with the person?
   ___ Meals ___ Academic training
   ___ Leisure ___ Work or vocational training
   ___ Self-care _____(Other)

Problem Behavior Information

1. Problem behavior (check and describe):
   __Aggression _____
   __Self-Injury _____
   __Stereotypy _____
   __Property destruction _____
   __Other _____
2. Frequency: __Hourly __Daily __Weekly __Less often
3. Severity: __Mild: Disruptive but little risk to property or health
   __Moderate: Property damage or minor injury
   __Severe: Significant threat to health or safety
4. Situations in which the problem behavior is most likely to occur:
   Days/Times_____
   Settings/Activities _____
   Persons present _____
5. Situations in which the problem behavior is least likely to occur:
   Days/Times_____
   Settings/Activities _____
   Persons present _____
6. What is usually happening to the person right before the problem behavior occurs?_____
   _____
   _____
7. What usually happens to the person right after the problem behavior occurs?_____
   _____
   _____
8. Current treatments_____
   _____
   _____
   _____
   _____

1. Does the problem behavior occur when the person is not receiving attention or when caregivers are paying attention to someone else?	Yes	No N/A
2. Does the problem behavior occur when the person's requests for preferred items or activities are denied or when these are taken away?	Yes	No N/A
3. When the problem behavior occurs, do caregivers usually try to calm the person down or involve the person in preferred activities?	Yes	No N/A
4. Is the person usually well behaved when (s)he is getting lots of attention or when preferred activities are freely available?	Yes	No N/A
5. Does the person usually fuss or resist when (s)he is asked to perform a task or to participate in activities?	Yes	No N/A
6. Does the problem behavior occur when the person is asked to perform a task or to participate in activities?	Yes	No N/A
7. If the problem behavior occurs while tasks are being presented, is the person usually given a "break" from tasks?	Yes	No N/A
8. Is the person usually well behaved when (s)he is not required to do anything?	Yes	No N/A
9. Does the problem behavior occur even when no one is nearby or watching?	Yes	No N/A
10. Does the person engage in the problem behavior even when leisure activities are available?	Yes	No N/A
11. Does the problem behavior appear to be a form of "self-stimulation?"	Yes	No N/A
12. Is the problem behavior less likely to occur when sensory stimulating activities are presented?	Yes	No N/A
13. Is the problem behavior cyclical, occurring for several days and then stopping?	Yes	No N/A
14. Does the person have recurring painful conditions such as ear infections or allergies? If so, list:_____	Yes	No N/A
15. Is the problem behavior more likely to occur when the person is ill?	Yes	No N/A
16. If the person is experiencing physical problems, and these are treated, does the problem behavior usually go away?	Yes	No N/A

Scoring Summary

Circle the number of each question that was answered "Yes" and enter the number of items that were circled in the "Total" column.

Items Circled "Yes"				Total	Potential Source of Reinforcement
1	2	3	4	____	Social (attention/preferred items)
5	6	7	8	____	Social (escape from tasks/activities)
9	10	11	12	____	Automatic (sensory stimulation)
13	14	15	16	____	Automatic (pain attenuation)

Appendix C

USF
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SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

4/19/2017

Sindy Sanchez, MA
ABA-Applied Behavior Analysis
6403 North Hubert Ave
Tampa, FL 33614

RE: **Expedited Approval for Initial Review**
IRB#: Pro00029632
Title: WTF: What's the Function? Assessing Correspondence Between Functional Analyses

Study Approval Period: 4/18/2017 to 4/18/2018

Dear Ms. Sanchez:

On 4/18/2017, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Protocol V1 4.12.17

Consent/Assent Document(s)*:
Child Written Assent.pdf
Parental Permission V1 4.12.17.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review

research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Research Involving Children as Participants: 45 CFR 46, Subpart D

This research involving children as participants continues to be approved under 45 CFR 46.404: Research not involving greater than minimal risk.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board