

TEACHER-CONDUCTED TRIAL-BASED FUNCTIONAL ANALYSIS

---

A Thesis  
Submitted to  
The Temple University Graduate Board

---

In Partial Fulfillment  
Of the Requirements for the Degree  
Masters of Education in Applied Behavior Analysis

---

by  
Kristin LeFevre  
December 2017

Thesis Approvals:

---

Matthew Tincani, Ph.D., BCBA-D, College of Education

## ABSTRACT

Problem behavior often occurs in individuals with autism spectrum disorder (ASD). Functional Analysis (FA) is a method used to identify the function of challenging behavior. Preliminary research has demonstrated that results from Trial Based Function Analysis (TBFA) conducted in natural settings often match the results obtained when conducting standard FAs in analogue settings. The effects of a training package on TBFA implementation fidelity were evaluated using a multiple baseline design across teachers. Three teachers in a special education setting were trained to implement the TBFA during role-plays and classroom probes with the students. All three teachers maintained high fidelity across each condition and over time. The results of which are then used to developed an individualized function-based treatment plan to examine the effects of the plan on reducing problem behavior of one individual with ASD. Results indicated positive effects of the function-based intervention on decreasing challenging behavior.

*Keywords:* functional analysis, trial-based functional analysis, Autism Spectrum Disorder, problem behavior

## DEDICATION

This paper is dedicated to the students and teachers that I have the privilege of working with.

To the students: Thank you for inspiring me every day to keep pushing forward to continue to find a way to better serve you.

To the teachers: Thank you for all of your hard work and dedication you do on a daily basis to serve our students with compassion and high quality care.

## ACKNOWLEDGEMENTS

I would like to begin thanking Matthew Tincani for his guidance and support throughout this project. I would also like to thank Elizabeth Dayton for the high quality supervision she has provided me over the past several years. I am also so grateful for all of my colleagues at Melmark whom provided me with encouragement throughout this project. Last, I would like to thank my friends and family for the constant love and support.

TABLE OF CONTENTS

ABSTRACT ..... ii

DEDICATION ..... iii

ACKNOWLEDGMENTS ..... iv

LIST OF FIGURES ..... vi

CHAPTER

1. TRIAL-BASED FUNCTIONAL ANALYSIS .....1

    Traditional Functional Analysis ..... 1

    Abbreviated Functional Analysis .....2

    Trial-Based Functional Analysis.....3

2. METHODS .....9

    Participants.....9

    Materials and Setting ..... 10

    Dependent Measures .....10

    Inter-observer Agreement .....11

    Procedural Fidelity .....11

    Social Validity .....12

3. EXPERIMENTAL DESIGN .....13

    Procedures .....13

    Baseline.....13

    Intervention .....14

    Function-Based Treatment.....16

Trail-Based Function Analysis .....	16
Experimental Procedures .....	17
Attention Condition .....	17
Tangible Condition .....	18
Demand Condition .....	18
Performance Feedback .....	18
4. RESULTS .....	20
TBFA Training Results.....	20
TBFA Results.....	21
Treatment Analysis Results .....	22
5. DISCUSSION.....	23
Limitations .....	25
Summary.....	26
GRAPHS.....	28
REFERENCES CITED.....	31
APPENDICES .....	34
A. Procedural Fidelity Checklist.....	34
B. TBFA Data Sheet.....	35
C. Social Validity Questionnaire .....	36

## LIST OF FIGURES

Figure	Page
1. A line graph depicting the percent of steps in a TBFA implemented correctly for Sarah, Katie, and Tina during baseline, post-training, and classroom probes.....	25
2. A bar graph depicting the percentage of trials with challenging behavior for Sarah's student.....	26
3. A bar graph depicting the percentage of trials with challenging behavior for Katie's student .....	26
4. A bar graph depicting the percentage of trials with challenging behavior for Tina's student .....	27
5. A line graph depicting responses per minute of challenging behavior during a treatment analysis for Katie's student .....	27

## CHAPTER 1

### TRIAL-BASED FUNCTIONAL ANALYSIS

#### Traditional Functional Analysis

The development of functional analysis (FA) methodology represents one of the most important advancements in the treatment of severe problem behavior (Beavers, Iwata, & Lerman, 2013). Skinner (1953) defined functional analysis as an examination of the functional relations between behavior and environmental events. The FA method developed by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) has been the most widely used, researched, and cited form of functional analysis thus far (Beavers et al., 2013; Hanley, Iwata, & McCord, 2003). It involves systematically manipulating environmental stimuli to identify potential antecedents and reinforcing consequences predicting and maintaining challenging behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994; Sigafos & Sagers, 1995).

Functional analyses have been described in the literature as occurring across a variety of settings, although a common approach is to conduct standard conditions in a setting that is separate from the environment in which problem behavior is typically observed (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011). This approach has been referenced as a “standard functional analysis” which involves systematic manipulation of environmental stimuli to identify potential antecedents and reinforcing consequences which maintain challenging behavior (Iwata, Dorey, Slifer, Buaman, & Richman, 1994).

Standard functional analyses offer practitioners the potential benefits of identifying the variables that maintain aberrant behavior (Fisher, Hanley, & Piazza, 1996). However, some limitations of this approach are that the assessment process can be lengthy and

individuals are put in potentially aversive situations for an extended period of time. The use of analog environments may not resemble naturally occurring events that relate to the target behavior (Iwata et al, 1982). Standard FAs also require multiple resources, such as the high level of technical expertise needed to implement a standard FA (Matson & Minshawi, 2007). Also, the assessment process may temporarily strengthen, or increase the target behavior due to repeated exposure. This could put the therapist or individual at risk of injury, especially if the targeted behavior is very severe (Durand, 1997). Despite the standard FA being viewed as the gold standard FBA technique, there is little evidence that it is the most highly used procedure. A statewide survey in Massachusetts assessed 205 practitioners use and perception of the utility of FAs. Results found that although the majority (67.8%) of practitioners believed that FAs were the most informative assessment tool for identifying functions of problem behavior, only 34.6% indicated that they use them (Roscoe, Phillips, Katie, Faber & Dube, 2015).

#### Abbreviated Functional Analyses

Northup, Wacker, Steege, Cigrand, Cook & DeRaad (1991) conducted a brief functional analysis to isolate the function of aggression in three individuals. The length of session time was reduced during the test and control conditions from 10 to 5 minutes in length. During the initial analogue assessments, each of the participants engaged in high rates of aggression during one condition. A reversal phase was then used to evaluate the use of an alternative response such as a mand, in decreasing aggression. Results indicated that during the contingency reversal phase, each of the participants displayed an increase in appropriate responding and a decrease in the target behavior. The total duration of the

outpatient evaluation was 90 minutes. However, researchers speculated that clearer results would have occurred with a longer assessment duration.

### Trial-Based Functional Analysis (TBFA)

There has been more recent research conducted on the use of Trial-Based Functional Analysis (TBFA) as an alternative when the traditional FA cannot be conducted. The TBFA involves a series of control and test conditions based on the hypothesized functions described by Carr (1977): social-positive reinforcement (e.g., attention), social-negative reinforcement (e.g., escape from non-preferred activities), or automatic reinforcement (e.g., sensory stimulation). The TBFA includes a single opportunity for the targeted behavior to occur per trial. During test trials, once the targeted behavior occurs, the programmed consequence is provided and then the trial ends (Bloom et al, 2013). The therapist, or teacher, identifies a time when the target behavior will most likely occur and conducts trials under those conditions. The TBFA is designed to capture relevant contextual variables that affect challenging behavior within the individual's natural environment (Rispoli, Ninci, Burke, Zaini, Hatton, and Sanchez, 2015).

One of the biggest differences between standard FAs and TBFAs are that the standard FAs involves a control condition and multiple test conditions ranging from 5 to 15 minutes each. During test conditions, every instance of target behavior results in a specific programmed response. The consequence is provided contingent on the target behavior for usually thirty seconds then the establishing operation for the putative reinforcer is re-presented. This allows for multiple opportunities for the behavior to occur throughout the session (Bloom et al, 2013). The establishing operation is abolished during control conditions and there are no programmed consequences provided after its

occurrence. Standard FA's allow for repeated measures whereas during the TBFA, once the target behavior occurs the scheduled consequence is provided and the trial ends. In standard FAs, the target behavior is typically graphed by responses per minute whereas TBFA's are measured by percentage of trials with challenging behavior (Bloom et al, 2013).

Another difference between standard FAs and TBFA is the context in which sessions or trials are conducted. Standard FAs are typically conducted in separate rooms with specialized features, such as one-way mirrors and padded surfaces, which may not be available in some service settings. Also, sessions are typically conducted one after the other in a controlled environment over the course of a few hours whereas during the TBFA, trials are conducted one at a time and typically in a classroom setting. Lastly, during standard FAs, sessions are conducted one at a time during normally scheduled activities in between, over the course of a few days or weeks (Bloom, Lambert, Dayton, & Steveaha, 2013).

Sigafoos and Sagers (1995) were the first to use a TBFA to identify the function of aggression in two boys with autism spectrum disorder (ASD). They conducted ten trials across four conditions; attention, task, ignore and tangible. Trials were conducted by teachers during naturally occurring opportunities during the school day. The results indicated a clear differentiation across conditions for both subjects, allowing for further research on a trial based approach for functional analysis. LaRue, Lenard, Weiss, Bamond, Palmieri, and Kelley (2010) compared the results of ten TBFA's and ten traditional FAs with five children with ASD. During the TBFA, a 1-min test trial was followed by a 1-min control trial, similar to Sigafoos and Sagers (1995). These trials

were conducted in a separate controlled environment. Results were consistent on function for four of the subjects and partially consistent with one when compared to the results of standard FAs. This further supported that TBFAs are a valid alternative to traditional FAs.

Bloom, Iwata, Fritz, Roscoe, and Carreau (2011) also compared the results of TBFAs and standard FAs with ten children with ASD. Trials were conducted by teachers in the student's assigned classroom throughout natural opportunities during the school day. Trials were conducted by running 2-min control trials, followed by a 2-min test trials, followed by a 2-min control trials. Six out of the ten cases showed correspondence and one with partial correspondence. There was no correspondence in the other cases. They suggested not having a second 2-min control to save time on the assessment.

Lambert, Bloom, and Irvin (2012) conducted the TBFA to identify challenging behavior with three students with ASD. Attention, escape, tangible, and ignore trials consisted of 2-min control followed by 2-min test, except the ignore condition consisted of two 2-min tests which did not end even if the targeted behavior occurred. Once the function of the targeted behavior was identified, Functional Communication Training (FCT) was introduced resulting in a decrease in challenging behavior across the three subjects.

Bloom, Lambert, Dayton, and Steveaha (2013) taught three teachers to conduct TBFAs to identify functions of challenging behavior with three boys with ASD. Once the functions were determined, five function-based interventions were developed and conducted, such as the use of differential reinforcement and extinction. The interventions produced reductions in challenging behavior for all subjects and an increase in alternative

behavior. Results demonstrate again that TBFA is an alternate method of function analysis.

Rispoli, Ninci, Burke, Zaini, Hatton and Sanchez (2015) trained three Head Start teachers to conduct TBFAs with three students with ASD during classroom routines. The purpose was to evaluate a professional development package which focused on training teachers to conduct TBFAs. The effects of function-based interventions were assessed and compared with the effects of non-function-based interventions using an A-B-A-C-D design. A represented baseline, B and C were function-based and non-function-based interventions, and D represented teacher implementation of the most effective intervention. The function-based intervention produced reductions in challenging behavior and an increase in appropriate communication for all three subjects.

Finally, Rispoli, Burke, Hatton, Ninci, Zaini and Sanchez (2015) examined the effects of Head Start teachers implementing TBFAs using a teacher-training package. These teachers all recently began implementing Program Wide Positive Behavior Support (PWPBS) and were trained to implement TBFA as part of ongoing research at their center. The training package was designed to provide training on social functions of challenging behavior, principles of operant conditioning, the logic of the FBA process, the purpose of each TBFA condition, the two-component structure of trials within the TBA, and the TBFA task analysis. Teachers were trained using verbal and written instructions, video examples, modeling, prompting, and immediate verbal performance feedback. The four teachers in this training program were able to implement TBFAs with 100% fidelity.

A concurrent multiple baseline design across teachers with three phases was used to evaluate the effects of the training program. The three phases included baseline, post training, and classroom conditions. Fidelity was measured for data collection by using a point-by-point method (Gast, 2010). Fidelity was measured for TBFA implementation using a task analysis checklist. Teachers probed each condition until they received 100% fidelity. Therefore, the number of trials was based on teacher performance rather than clarity of the data which served as a major limitation.

Rispoli et al (2015) suggested further research to explore modifications to their TBFA training package in order for teachers to better understand the rationale of the TBFA model and the procedures within. Also, they suggested further research to explore teacher's perceptions of TBFA after the assessment has been linked to function-based interventions.

Previous research suggests that the TBFA is a promising alternative to the standard FA. Also, it is a promising approach for increasing implementation of function-based interventions by teachers (Rispoli 2015). Previous studies have evaluated function-based treatment plans based on the results of TBFA resulting in decreases in the target behavior (e.g., Bloom et al., 2013).

The purpose of the study was to evaluate effects of a training package on teacher's implementation fidelity of TBFAs. Following the TBFA process, a function-based intervention was evaluated for reducing problem behavior for one of the students. First, teachers were trained to implement the TBFA, replicating the training package introduced by Rispoli et al. (2015). Teachers conducted multiple trials of each TBFA condition to determine consistency of performance and maintenance of fidelity over time. Also, the

teachers continued to conduct trials until the child's data indicates clear functions. Based on the results of the TBFA, one teacher designed and implemented a function-based treatment plan to evaluate the effect in reducing the target behavior.

## CHAPTER 2

### METHODS

#### Participants

The participants in this study were three teachers from a private special education school. One student from each teacher's classroom was selected to participate in this study. Each student displayed challenging behavior that interfered with his or her daily learning. Quinn was a 15-year old male and his teacher's name was Katie. Katie has been a teacher at this school for 6 years. She was a certified Special Education teacher and was also taking coursework in ABA. This is her first school she has worked in as a special education teacher. Jessica was a 15-year old female and her teacher's name was Tina. Tina had been a teacher at this school for 2 years. She had her bachelor's degree and was currently pursuing her teaching certifications. She is currently in a substitute position at this school. Steve was a 17-year old male and his teacher's name was Sarah. Sarah was a certified Special Education teacher and has been a teacher at this school for 1 year. This is also Sarah's first teaching position as a special education teacher. All the students were previously diagnosed with autism spectrum disorder and were funded for one-to-one ABA services.

Teachers were trained to conduct a TBFA and one teacher designed a function-based treatment based on functions they identified. The teachers had little to no prior experience implementing TBFAs or designing treatments. However, they all had experience implementing function-based treatment plans, which a Board Certified Behavior Analyst designed.

## Materials and Settings

All sessions were conducted in the student's assigned classroom or surrounding areas in the school. The TBFA and the treatment sessions were implemented throughout the school day during typical instruction and daily routines. Each classroom held approximately 5-6 students, a lead teacher, and classroom staff. The teacher worked one-to-one with the student and collected TBFA data with a data sheet and pen. The TBFA data sheet in which the teachers used to track the occurrence or non-occurrence of the target behavior in the TBFA can be found in Appendix B. The training sessions took place in a private office located in the school. Training materials included PowerPoint handout and a procedural fidelity checklist. The procedural fidelity checklist can be found in Appendix A. Session materials such as the high and moderately preferred items were kept in the individual's assigned classroom.

## Dependent Measure

Fidelity implementation data for the TBFA were collected on a prepared data sheet designed by the ABA Master's student and can be found in Appendix A. Each data sheet had spaces to score the occurrence or non-occurrence of the target behavior during each condition and within each segment. There was also a space next to each trial for comments such as potential confounds or mistakes that were made by the teacher. Fidelity data on the TBFA were collected used by a point-by-point system as described by Rispoli et al. (2015). It consisted of a task analysis checklist for the test and control segments within each trial (attention, demand, tangible and alone). A step was scored as correct if the teacher implemented the step accurately throughout the whole trial. If an error occurred, the step was scored as incorrect. The number of steps implemented

correctly for each trail were divided by the total number of steps within the condition and multiplied by 100 to demonstrate the percentage of steps implemented accurately.

#### Inter-observer Agreement

Inter-observer agreement (IOA) data were collected by the graduate student used the same data sheet that the teacher will use. IOA data were collected for each teacher and each condition. IOA was calculated by dividing the number of trails with agreements by the total number of trails and converted into percentage of agreements. For Sarah, IOA was collected 12.5% of attention trials, 33% of tangible trials and 50% of escape trials. For Katie, IOA was collected 10% of attention trials, 20% of tangible trials and 20% of escape trials. For Tina, IOA was collected 30% of attention trials, 50% of tangible trials and 40% of escape trials.

#### Procedural Fidelity

Procedure fidelity checklists were used to evaluate teacher implementation for each condition and can be found in Appendix A. These were the same checklists that are used in the initial training. The checklists consisted of each condition and were divided into control and test segments. The teachers were observed throughout the entire trials and scored for each condition as correct or incorrect. The scores were calculated by percentage of steps implemented correctly. During treatment, procedural fidelity checks were conducted each day. The trainer observed the teacher implementing the treatment plan and scored if they implemented each component of the plan accurately or not. Following each observation, the trainer debriefed with the teacher and went over the results of the fidelity check and provide any necessary feedback.

## Social Validity

Following the study, the three teachers who participated in this study were asked to complete an 18-item Likert scale questionnaire, modified from the Treatment Acceptability Rating Form- Revised (TARF-R, Reimers et al. 1992) which can be found in Appendix C. The scale ranged from one to six with one being “strongly disagree” and six being “strongly agree”. Aspects of the TBFA process that the teachers reported on included (a) the importance of identifying the functional of challenging behavior for the development of interventions, (b) their willingness to carry out a TBFA for other students in the future, (c) the limited amount of time needed to implement the TBFA, and (d) their willingness to change classroom routines in order to call out the TBFA. During the open ended comment section, one teacher stated that she was worried about the time constraints needed to carry out a TBFA. Another teacher stated that the TBFA works if other people can assist with implementation but having to work with other students at the same time while running the TBFA would be challenging.

## CHAPTER 3

### EXPERIMENTAL DESIGN

A multiple baseline design across teachers was used to measure the effectiveness of the of the TBFA training on teacher implementation fidelity (Cooper, Heron & Heward, 1987). During Baseline, teachers were asked to role play each condition of the TBFA with them acting as the teacher and the researcher acting as the student. Then, the experimenter trained the teachers to implement the TBFA using the procedures described below. During post training probes, the teacher again role played each condition of the TBFA with them acting as the teacher and the researcher acting as the student. During classroom probes, the teacher implemented the TBFA with their student in the natural environment while the researcher observed for treatment fidelity.

Data were collected in vivo using paper and pen data sheets to measure teacher's fidelity. The dependent variable was teacher's implementation fidelity and was measured as percentage of steps implemented correctly during each phase using the point-by-point method (Gast, 2010).

During the treatment phase, an AB design was used to evaluate the effects of the function-based intervention, functional communication training, on reducing the target behavior for one student. This treatment was to address the functions identified through the results of the TBFA.

#### Procedures

##### Baseline

All baseline training sessions occurred in a private office in the school after school hours. During baseline, the teacher was asked to demonstrate each condition of a

TBFA through a role play, while the trainer used a procedural fidelity checklist to record whether each step was correctly performed. This procedure fidelity checklist is shown in Appendix A. There was no prior training or information given on how to implement a TBFA. The trainer asked the teacher to act out each condition in a role play with the teacher acting as the teacher and the researcher acting as the student. No other prompting, guidance or feedback were provided. Following the demonstrations, the teacher reviewed the procedure fidelity checklist and began the formal training process.

### Intervention

TBFA Training sessions were conducted by the researcher who is an applied behavior analysis (ABA) master's student, supervised by a Board Certified Behavior Analyst. A PowerPoint handout was used to cover the principles of ABA and the components of a TBFA. The trainer provided an overview of the rationale for conducting an FA, benefits and limitations of FAs, and an overview of a TBFA and each condition. A thorough description of the three conditions was provided: attention, tangible, and escape. Modeling and repeated practice was utilized during all training sessions.

During the post training probes phase, role plays were used until teacher procedural fidelity reached 100% for each condition, which replicated the training package designed by Rispoli et al. (2015). Teachers were asked again to role play each condition of the TBFA with them acting as the teacher and the researcher acting as the student. The teachers in this study were trained until they were able to demonstrate each condition with 100% fidelity. If an error occurred throughout the post training probes, corrective feedback was given following the end of the trial. Their treatment fidelity pre and post training scores were graphed and displayed to the teachers by the trainer

following each day the TBFA was implemented. The procedure fidelity checklist can be found in Appendix A.

The TBFA consisted of multiple trials until clear functions were identified. Data were analyzed using percentage of trials with problem behavior during the test and control segments of each condition. The percentage of test trials in which the target behavior occurred were graphed. Once each teacher completed their TBFA, the trainer and teacher met to discuss the results and analyze the graphs. Data from when the teachers implemented the TBFA is displayed in Figure 1 in the classroom probes condition. The trainer reviewed different function-based interventions for problem behavior. Several interventions and replacement behaviors were reviewed using a PowerPoint presentation with corresponding printed handouts of the slides. Treatment fidelity checks were conducted during treatment implementation. The trainer reviewed the treatment fidelity checklist following each day fidelity checks were conducted and provided any necessary feedback. Teachers were allowed the opportunity to ask any questions they had. Positive feedback in the form of descriptive verbal praise was provided to the teacher from the research for conducting trials correctly.

Once functions were identified, one of the teachers, Kelly, began a treatment analysis for her student to evaluate the effects on decreasing targeted behavior. During baseline sessions, the function-based treatment was not present and the target behavior was reinforced. During treatment sessions, the function-based treatment was taught to the individual by the teacher. Baseline and treatment conditions will consist of five minute sessions. Responses per minute of problem behavior during baseline and intervention sessions were used to display and analyze the data.

## Function-Based Treatment

Due to time scheduling conflicts and other responsibilities that took priority, only one of the teachers moved into the intervention phase of this study. This teacher, Katie, met with the researcher of this study to review different function-based interventions. Katie designed and implemented a function-based treatment based off the results she obtained through the TBFA with the support and guidance from the researcher. The intervention included FCT using an AB design. Even though a reversal design would have been a stronger method to display experimental control, the teacher felt that it was unsafe to return back to baseline due to the severity of other topographies of challenging behavior.

The session lengths were five minutes each and the target behavior was calculated by responses per minute. During baseline, the student was prompted to transition from a high preferred activity (i.e. computer time) to academic demands. Contingent upon the target behavior, the demand to transition to the academic work was removed and the student was allowed access to the high preferred activity for an additional one minute. Following the one-minute access, this procedure repeated.

## Trial Based Functional Analysis

TBFAs were implemented by three teachers on one of their students in their classroom. Multiple trials for each condition (i.e., attention, demand, tangible and ignore) were conducted throughout the school day. Trials were conducted based on naturally occurring opportunities. For example, conducting escape trials during academic work times or conducting tangible trials during times when the student is engaging in a high preferred activity.

Trials consisted of a 2-min control condition followed by a 2-min test condition. During the control condition, the student accessed the putative reinforcer. If the target behavior occurred during the control condition, the session ended and the test condition began. During the test condition, the putative reinforcer was only delivered contingent on the targeted behavior. Results displayed clear functions if there was a differentiation between the control and test conditions. If responding occurred in several conditions, then the behavior could be multiply maintained. If results were undifferentiated in the control and test conditions, then an automatic function would be suggested.

### Experimental Procedures

Prior to beginning the TBFA, a multiple stimulus without replacement (MSWO) preference assessment (DeLeon & Iwata, 1996) was conducted to identify moderately preferred items to include in the attention condition and highly preferred items to include in the tangible condition.

### Attention Condition

During the first 2-min of the attention control condition, the individual was provided with moderately preferred leisure items. The therapist provided brief verbal and physical attention throughout the segment. Following the 2-min control, the 2-min test immediately began. The therapist would state, "I have to do work," while beginning to attend to another activity (e.g. paper work). Contingent upon the target behavior the therapist would immediately turn back towards the individual and provide a statement of concern (e.g., "don't do that") and then the trial ended.

### Tangible Condition

During the first 2 min of the tangible control condition, the individual was seated in the classroom with access to a highly preferred item. Following the 2-min control segment, the 2-min test segment immediately began by the therapist removing the preferred items from the individual. The therapist held the items so they were still in view of the individual but was kept out of reach for the duration of the test segment. All attempts to access the items were blocked and all appropriate requests were ignored. Contingent upon the target behavior, the item was immediately returned to the individual and the trial ended.

### Demand Condition

During the first 2-min of the demand control condition, the individual was seated in the classroom without access to demand materials. Following the 2-min control segment, the 2-min test segment immediately began by the therapist stating “it’s time to do work.” The therapist then immediately began delivering academic and gross motor demands while utilizing a three-step graduated prompting hierarchy (i.e., verbal, model physical). Brief natural praise (e.g., “good job) was delivered contingent upon compliance. Contingent upon the target behavior, the therapist would then immediately remove the demand materials and state “Okay, you don’t have to do work” and then the trial would end.

### Performance Feedback

The trainer checked in following each day that sessions were ran and provided any necessary feedback. The trainer provided praise for accurate implementation and constructive feedback for any errors that occurred. Treatment fidelity checklists were

reviewed with the teachers during the feedback time. Data were displayed and analyzed and the teachers were able to ask questions or address any concerns during that time.

## CHAPTER 4

### RESULTS

#### TBFA Training Results

Figure 1 displays the percentage of steps of the TBFA the teachers implemented correctly during baseline, post-training probes, and classroom probes for Sarah, Katie and Tina. The y-axis displays the percentage of steps implemented and the x-axis displays the sessions. The closed triangle displays attention conditions, the closed squares display escape conditions, and the closed circled display tangible conditions. Challenging behavior data from the results of the TBFA for Sarah, Katie and Tina's students are displayed in Figures 2, 3 and 4. Data from Katie's treatment analysis are displayed in Figure 5. Following training sessions, all three teachers increased the amount of steps implemented correctly to 100% and a functional relationship was demonstrated between training and implementation of the TBFA.

Baseline average responding for Sarah was 22% of steps implemented correctly and ranged from 0% to 55%. Baseline average responding for Katie was 44% of steps implemented correctly and ranged from 33% to 55%. Baseline average responding for Tina was 18.2% of steps implemented correctly and ranged from 11% to 22%.

Post training probe average responding for Sarah was 100% of steps implemented correctly. Post training probe average for Katie was 95.2% of steps implemented correctly and ranged from 88% to 100% of steps implemented correctly. Post trainingprobe average for Tina was 91.8% of steps implemented correctly and ranged from 66% to 100% of steps implemented correctly.

Classroom probe average responding for Sarah was 100% of steps implemented correctly. Classroom probe average for Katie was 100% of steps implemented correctly. Classroom probe average for Tina was 95.2% of steps implemented correctly and ranged from 88% to 100% of steps implemented correctly.

#### TBFA Results

Figure 2 displays the percentage of trials with the target behavior for Sarah's student. There were eight trials conducted in the attention condition, 12 in the tangible condition, and six in the escape condition. The student engaged in the target behavior 12.5% of trials in the attention test condition and 0% in the attention control condition, 16% of trials in the tangible test condition and 0% in the tangible control condition, and 0% in the escape test condition and 0% in the escape control condition. Undifferentiating responding across conditions suggested that additional trials might have produced clearer outcomes.

Figure 3 displays the percentage of trials with the target behavior for Katie's student. There were ten trials conducted condition in the attention, tangible and escape conditions. The student engages in the target behavior 10% of trials in the attention test condition and 0% in the attention control condition, 100% of trials in the tangible test condition and 0% in the tangible control condition, and 100% of trials in the escape condition and 0% in the escape control condition. These results indicate that Katie's student's target behavior was maintained by social positive reinforcement in the form of access to tangible and social negative reinforcement in the form of escape from demands.

Figure 4 displays the percentage of trials with the target behavior for Tina's student. There were ten trials conducted in the attention, tangible and escape conditions.

The student engaged in the target behavior 10% of trials in the attention control condition and 40% in the attention test condition, 30% in the tangible control condition and 10% in the tangible test condition, and 20% in the escape control condition and 10% in the escape test condition. Results display the largest differentiation between the control and test conditions within the attention condition with 30% differentiation. Therefore, the target behavior was maintained by social positive reinforcement in the form of access to attention.

### Treatment Analysis Results

Figure 5 displays the treatment analysis for Katie's student. During baseline sessions, the target behavior occurred at stable responding and averaged 1.8 responses per minute across three sessions.

During treatment conditions, the teacher prompted the student to transition from the high preferred activity to academic work. A separate therapist immediately prompted the student to activate a "More Time" request utilizing a speech output device. Prompts were faded utilizing most to least prompting (full physical, partial physical, gesture, independent) following successful prompt at the target prompt level. Following two consecutive unsuccessful prompts at the target prompt level, a more intrusive prompt was made. Contingent upon the student emitting the FCT response, the demand to transition to the academic work was removed and one-minute access to the preferred activity was delivered. When the intervention was introduced the target behavior initially maintained then extinguished to zero levels and independent responding increased to 100%.

## CHAPTER 5

### DISCUSSION

The purpose of this study was to assess a training package for teachers to implement TBFA in their classrooms. Once functions of problem behavior were identified, the teachers were expected to develop function-based interventions for their students based on the knowledge they gained from additional training. This study expanded previous findings on the effects of training packages on teacher TBFA implementation in classroom settings (Rispoli et al., 2016). All three teachers were trained to implement TBFA with 100% of fidelity across each condition during post training probes and during classroom probes. These findings were consistent with previous research which determined that teachers can be trained to implement TBFA with high integrity (Bloom et. al, 2013). Previous research suggested further investigation of teacher's fidelity to determine consistency of maintenance over time (Rispoli, 2015). This study conducted several fidelity checks of teacher implementation while conducting the TBFA in the classrooms across all conditions and over several days.

The second question was to evaluate whether the accuracy of the TBFA could display clear functions of challenging behavior. Previous studies have demonstrated that latency-based FAs produce meaningful results of identifying functions of problem behavior (Thomason-Sassi, Iwata, Neidert, & Roscoe, 2011). In addition, TBFA have been successful in producing patterns in which responding in during the test segments were higher than the control segments (Bloom et. al., 2011, Bloom et. al, 2013, Rispoli et. al, 2014). This resulted in evidence of the function being present in that type of trial.

Two of the three TBFA's in this study resulted in differentiating responding across conditions. One teacher, Sarah, did not complete the average of ten trials per condition which has been suggested in previous research (Bloom et. al, 2013). This was due to her transferring to another position within the organization. Teachers also were able to implement the TBFA while simultaneously collecting data on the child behavior which has reported to be a limitation within other studies (Rispoli et. al, 2015). The teacher recorded the occurrence or nonoccurrence of the target behavior, while the researcher took reliable data for IOA purposes.

The third question investigated whether teachers could design a function-based treatment based on the results identified through the TBFA. Previous research suggested that teachers should be more involved in the FBA process and indicated that they valued determining the function of challenging behaviors which can lead to more effective interventions (Rispoli et. el., 2016). Only one of the three teachers from this study designed and implemented a treatment analysis following the TBFA. This specific teacher was also the most educated on behavior analytic concepts and principles due to ABA coursework. Previous researchers discussed the level of expertise necessary to design function-based interventions and whether teachers versus specialist should take on these responsibilities. Results from this study would agree that a team approach in which at least one team member is a professional in developing function-based interventions is necessary. However, this study also supports that teachers may play an important role in the FBA process as TBFA implementers. Also in this study, teachers were trained to collect, analyze, and help make data-based decisions based on the results of the TBFA, which served as a limitation in other studies.

Few studies have focused on the range of challenging behaviors assessed. This study allowed teachers to carry out TBFA on severe topographies of challenging behavior (e.g., self-injury), without direct support of a professional (Lambert et. al, 2013). Teachers from this study have students in their classroom that are currently admitted into a Residential Treatment Facility to address severe challenging behaviors. In contrast, teachers from other studies did not have as strong as history working with students with more behavioral issues, but rather, worked in programs such as Head Start (Rispoli et. al, 2015).

### Limitations

There were several limitations occurred in this study that highlight additional areas for further research. In some conditions, IOA was not taken for at least 30% of trials. This was due to the researcher not always being present when trials were implemented. Teachers were trained to implement the TBFA during natural occurring opportunities throughout the student's day. Therefore, teachers took initiative on conducting trials without the direct support of the researcher. Further research should explore other ways to ensure that IOA is taken by possibly training more teachers or staff within the school setting.

Second, not all the teachers designed a function-based treatment based off the results they obtained through the TBFA. There were several factors that contributed to teachers not designing and implementing function-based treatments. For example, other responsibilities that took priority such as creating Individual Education Plans (IEP), supervision of staff, and implementing academic assessments. Future research is necessary to explore the utility of the TBFA in developing function-based interventions

in the natural environment, with an emphasis on the teachers or other non-experts as the developers.

Third, the researcher did not provide any written instruction on how to implement a TBFA prior to baseline. In Rispoli et. al., (2015) study, teachers were asked to read the article written by Bloom et al. (2013) prior to the first session. Also, teachers were provided with a four to five sentence scenario of a specific individual and asked to conduct a simulated TBFA of the child's specific target behavior. In this current study, no information was given to the teachers by the researcher prior to baseline trials. Teachers were not given any information on TBFAs or how to implement them.

Last, procedure fidelity of the researcher's training during the training phase of the TBFA was not conducted. The researcher used the treatment fidelity checklist as a guide to ensure a full training of each component of each trial was made clear. There was not a separate observer present to conduct a treatment fidelity check on the research during these training sessions. Further research suggests fidelity checks during training and feedback sessions.

### Summary

In practice, indirect assessments such as interviews or rating scales are most used in the natural setting when high level expertise is not available. However, these type of FBA procedures risk producing inconsistent or inaccurate results (Alter et al., 2008). Direct manipulation of environmental events (Hanley et al., 2003) such as TBFAs, are more reliable and produce more accurate FBA results. Training teachers to participate in the TBFA process allows for more accurate identification of environmental variables which maintain challenging behavior and lead to developing more effect function-based

interventions. Results from this study suggest that teachers can be trained to implement TBFA's with 100% fidelity. However, further research is needed to determine high quality function-based interventions designed by teachers and evaluated in the natural environment.

# GRAPHS

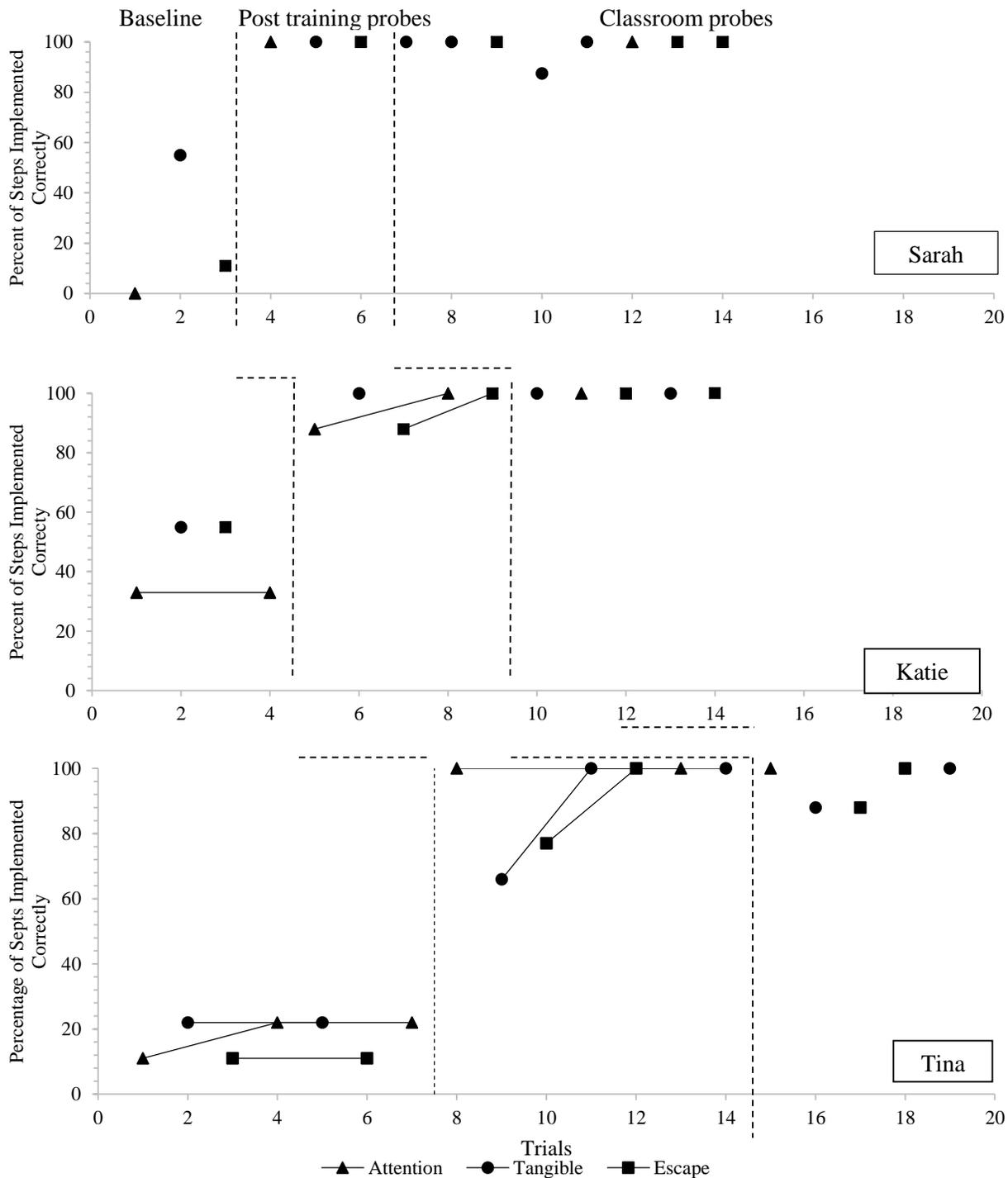


Figure 1. Training Teachers to Implement TBFA

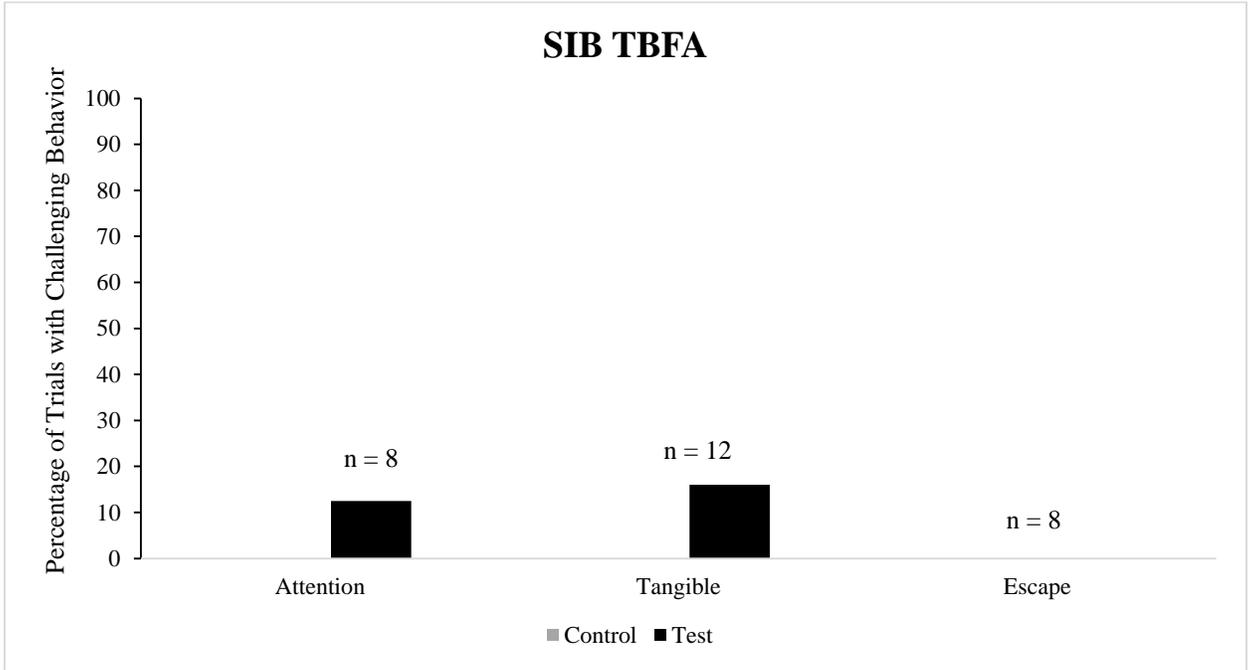


Figure 2. TBFA Results for Sarah

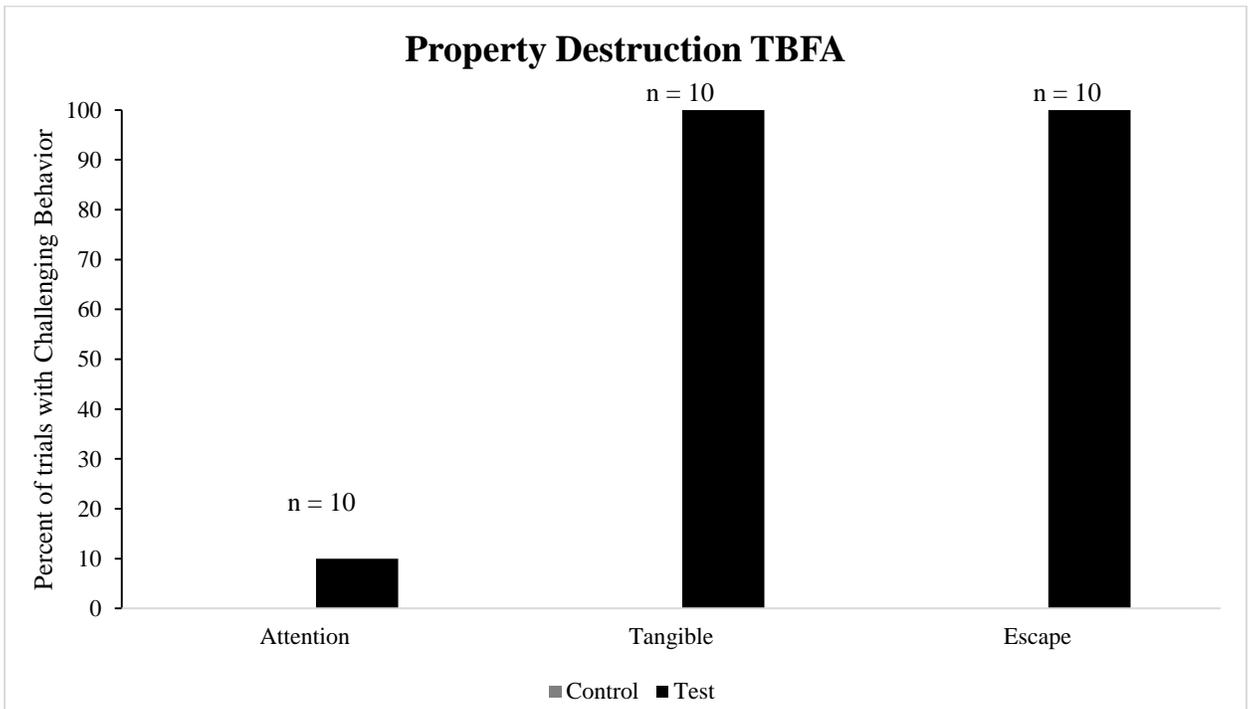


Figure 3. TBFA Results for Katie

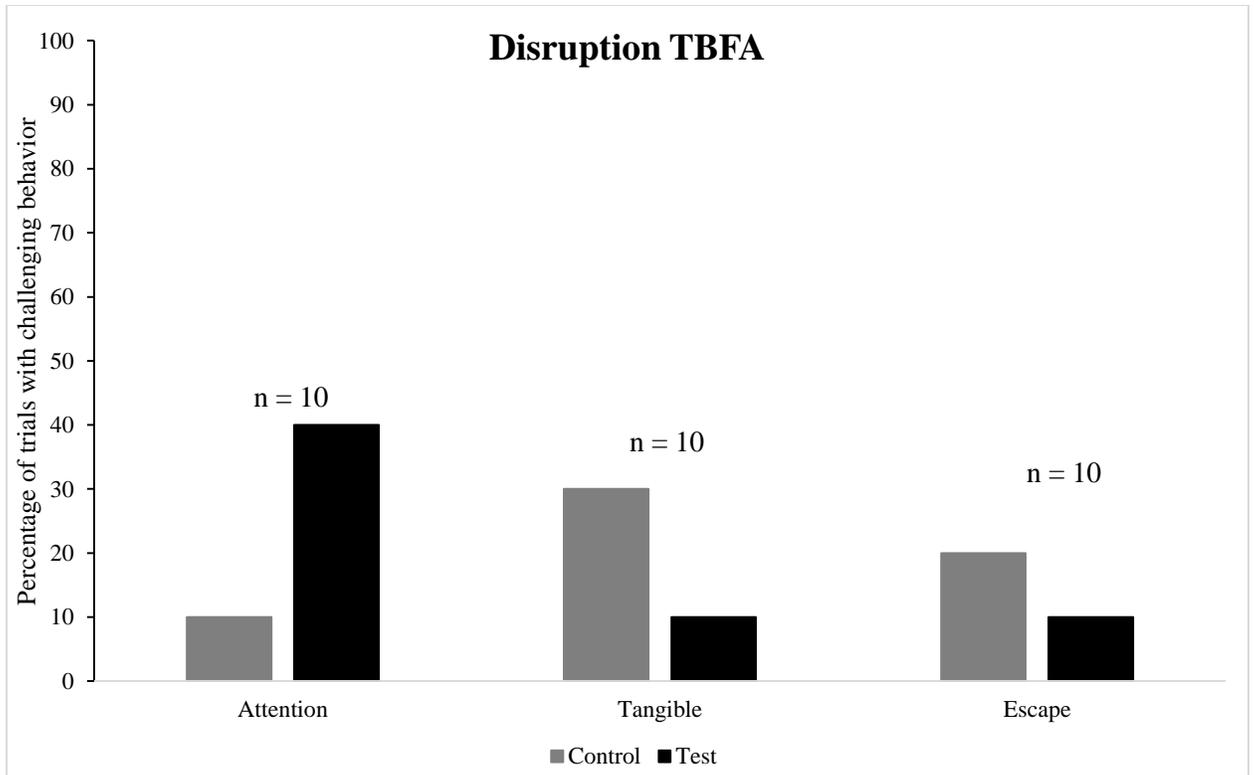


Figure 4. TBFA Results for Tina

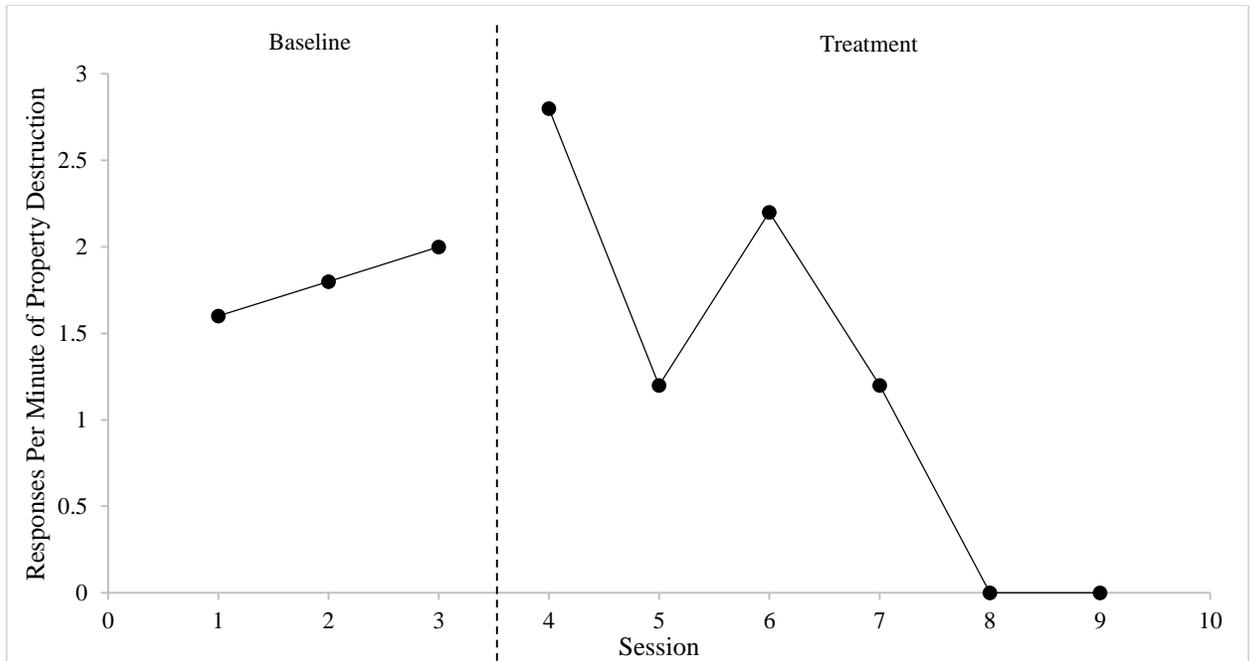


Figure 5. Treatment Analysis Results from Katie's student

## REFERENCES

- Beavers, G. A., Iwata, B. A., & Lerman, D. C. (2013). Thirty years of research on the functional analysis of problem behavior. *Journal of Applied Behavior Analysis, 46*, 1–21.
- Bloom, S. E., Iwata, B. A., Fritz, J. N., Roscoe, E. M., Carreau, A. B., & Zarcone, J. (2011). Classroom application of a trial-based functional analysis. *Journal of Applied Behavior Analysis, 44*, 19-31.
- Bloom, S. E., Lambert, J. M., Dayton, E., & Steveaha, A. L. (2013). Teacher-conducted trial-based functional analyses as the basis for intervention. *Journal of Applied Behavior Analysis, 46*, 208-218.
- Carr, E. G. (1977). The motivation of self-injurious behavior: A review of some hypotheses. *Psychological Bulletin, 84*, 800–816.
- Cooper, J.O., Heron, T.E., & Heward, W. L. (1987). *Applied behavior analysis*. Columbus: Merrill.
- Durand, V.M. (1997). Responses to Horner and Carr. *Journal of Special Education, 31*, 105-106.
- Gast, D. L. (Ed.). (2010). *Single subject research methodology in behavioral sciences*. New York, NY: Routledge.
- Hanley, G. P., Iwata, B. A., & McCord, B. E. (2003). Functional analysis of problem behavior: A review. *Journal of Applied Behavior Analysis, 36*, 147–185.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27*, 197–209.

- Lambert, J. M., Bloom, S. E., & Irvin, J. (2012). Trial-based functional analysis and functional communication training in an early childhood setting. *Journal of Applied Behavior Analysis, 45*, 579-584.
- LaRue, R. H., Lenard, K., Weiss, M. J., Bamond, M., Palmieri, M., & Kelley, M. E. (2010). Comparison of traditional and trial-based methodologies for conducting functional analyses. *Research in Developmental Disabilities, 31*, 480-487.
- Matson, J. L., & Minshawi, N. F. (2007). Functional assessment of challenging behavior: Toward a strategy for applied settings. *Research in Developmental Disabilities, 28*, 353–361.
- Piazza, C. C., Hanley, G. P., & Fisher, W. W. (1996). Functional analysis and treatment of cigarette pica. *Journal of Applied Behavior Analysis, 29*(4), 437-450.
- Reimers, T., Wacker, D., Cooper, L. J., & de Raad, A. O. (1992). Acceptability of behavioral treatments for children: Analog and naturalistic evaluations by parents. *School Psychology Review, 21*, 628–643.
- Rispoli, M., Burke, M. D., Hatton, H., Ninci, J., Zaini, S., & Sanchez, L. (2015a). Training head start teachers to conduct trial-based functional analysis of challenging behavior. *Journal of Positive Behavior Interventions*.
- Rispoli, M., Ninci, J., Burke, M. D., Zaini, S., Hatton, H., & Sanchez, L. (2015b). Evaluating the accuracy of results for teacher implemented trial-based functional analyses. *Behavior Modification*.
- Rispoli, M., Ninci, J., Neely, L., & Zaini, S. (2014). A systematic review of Trial-Based Functional Analysis of challenging behavior. *Journal of Developmental and Physical Disabilities, 26*, 271-283.

- Roscoe, E. M., Phillips, K. M., Katie, M. A., Farber, R. and Dube, W. V. (2015), A statewide survey assessing practitioners' use and perceived utility of functional assessment. *Journal of Applied Behavior Analysis*, 48: 830–844.
- Ruiz, S., & Kubina, R. M., Jr. (2017, March 2). Impact of Trial-Based Functional Analysis on Challenging Behavior and Training: A Review of the Literature. *Behavior Analysis: Research and Practice*. Advance online publication.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.
- Sigafoos, J., & Sagers, E. (1995). A discrete-trial approach to the functional analysis of aggressive behaviour in two boys with autism. *Journal of Intellectual and Developmental Disability*, 20, 287-297.
- Thomason-Sassi, J. L., Iwata, B. A., Neidert, P. L., & Roscoe, E. M. (2011). Response latency as an index of response strength during functional analyses of problem behavior. *Journal of Applied Behavior Analysis*, 44, 51–67.
- Wallace, M. D., & Iwata, B. A. (1999). Effects of session duration on functional analysis outcomes. *Journal of Applied Behavior Analysis*, 32, 175–183.

## APPENDICES

### APPENDIX A

Reviewer: \_\_\_\_\_ Educator: \_\_\_\_\_ Date: \_\_\_\_\_ Primary or Reli (Circle)

**Directions:** Circle “+” if the behavior is observed and a “-” if the behavior is not observed

	<b>Attention</b>	<b>Tangible</b>	<b>Demand</b>
<b>Control</b>	<p>Sets a 2-min timer + / -</p> <hr/> <p>Educator provides low to moderate preferred leisure items + / -</p> <hr/> <p>Educator does not provide any demands + / -</p> <hr/> <p>Educator orientated towards the student, provides eye contact, smiles, ect and continuous attention once at least every 15 seconds while commenting on the environment + / -</p>	<p>Sets a 2-min timer + / -</p> <hr/> <p>Educator sits near participant and provides unrestricted access to highly preferred items + / -</p> <hr/> <p>Attention is provided at least every 30 seconds or honored upon requests + / -</p> <hr/> <p>Educator does not provide any demands + / -</p>	<p>Sets a 2-min timer + / -</p> <hr/> <p>Educator tells the student “You’re on break” and no demands are placed during this time + / -</p> <hr/> <p>Attention is provided at least every 30 seconds or honored upon requests + / -</p> <hr/> <p>No task materials or task demands are presented to child + / -</p>
<b>Test</b>	<p>Sets a 2-min timer + / -</p> <hr/> <p>Educator explains that he/she needs to complete some work and turns body away from participant. + / -</p> <hr/> <p>Educator does not speak or look at participant for unless participant engages in target challenging behavior. + / -</p> <p>Contingent upon challenging behavior, educator turns toward participant and provides verbal attention and statements of concern. + / -</p> <hr/> <p>The session will end following the occurrence of the target behavior or following 2-mins + / -</p>	<p>Sets a 2-min timer + / -</p> <hr/> <p>Educator tells participant “My turn”, “Not available” “You can have this later”, ect. + / -</p> <hr/> <p>Contingent upon challenging behavior, educator provides immediate access to preferred item. + / -</p> <hr/> <p>All appropriate requests for the item and other challenging behavior will be ignored + / -</p> <hr/> <p>The session will end following the occurrence of the target behavior or following 2-mins + / -</p>	<p>Sets a 2-min timer + / -</p> <hr/> <p>Educator presents task demands using least-to-most prompting (verbal, model, physical) with 3-5 seconds in between prompts + / -</p> <hr/> <p>Educator delivers praise (commenting or compliment) upon successful completion of a trial/task (regardless of the prompt level necessary to complete the task) + / -</p> <hr/> <p>Educator removes task demands and materials immediately if child engages in target challenging behavior. + / -</p> <hr/> <p>The session will end following the occurrence of the target behavior or following 2-mins + / -</p>
	Total = _____ / _____	Total = _____ / _____	Total = _____ / _____

Percentage Correct: \_\_\_\_\_

APPENDIX B

**Trial-based FA Data Sheet**

Client #: \_\_\_\_\_ Failed trials: \_\_\_\_\_

**Attention:**

Date	Obs.	Control	Test	TH	TX I?


**Escape:**

Date	Obs.	Control	Test	TH	TX I?


**Target behavior:**

Circle one: Primary/Reli

**Ignore:**

Date	Obs.	Test 1	Test 2	TH	TX I?


**Tangible:**

Date	Obs.	Control	Test	TH	TX I?


APPENDIX C

<p><b>Instructions:</b> Please circle the number that best answers the question according to the following scale:</p> <p>1            2            3            4            5            6</p> <p>Strongly Disagree   Slightly Disagree   Slightly Agree   Strongly Agree</p> <p>Disagree                      Disagree            Agree                      Agree</p>	<p><b>Trial-Based Assessment</b></p>	<p><b>Comments/Suggestions</b></p>
<p>1. Identifying the function of challenging behavior is important for intervention development.</p>	<p>1 2 3 4 5 6</p>	
<p>2. By identifying the function of the behavior using this assessment, I feel I can more easily develop an effective intervention plan.</p>	<p>1 2 3 4 5 6</p>	
<p>3. Given the student’s behavior problems, I find this assessment strategy acceptable.</p>	<p>1 2 3 4 5 6</p>	
<p>4. I am willing to carry out this assessment strategy for other students in the future.</p>	<p>1 2 3 4 5 6</p>	
<p>5. I think there might be disadvantages in using this assessment strategy.</p>	<p>1 2 3 4 5 6</p>	
<p>6. The amount of time needed to implement this assessment strategy is acceptable.</p>	<p>1 2 3 4 5 6</p>	
<p>7. I am confident that this assessment strategy will be effective in identifying the function of the student’s behavior.</p>	<p>1 2 3 4 5 6</p>	
<p>8. I believe this assessment strategy may lead to effective intervention for the student’s behavior.</p>	<p>1 2 3 4 5 6</p>	

9. I believe it will be disruptive to our school, classroom or other students to carry out this assessment strategy.	1 2 3 4 5 6	
10. The different trails were easy to implement within the classroom setting.	1 2 3 4 5 6	
11. I would be willing to use this assessment to identify other student's challenging behavior.	1 2 3 4 5 6	
12. I believe there will be undesirable side effects resulting from this assessment strategy.	1 2 3 4 5 6	
13. I believe the student will experience discomfort during this assessment strategy.	1 2 3 4 5 6	
14. I would be willing to change our classroom routines in order to carry out this assessment strategy.	1 2 3 4 5 6	
15. This assessment strategy will fit into our existing classroom routine.	1 2 3 4 5 6	
16. How much time will be needed to carry out this assessment? (1 little time – 6 much time)	1 2 3 4 5 6	
17. The training on how to complete this assessment was clear and effective.	1 2 3 4 5 6	
18. I felt supported by teams members when implementing this assessment.	1 2 3 4 5 6	

*Appendix C: Social Validity Questionnaire*