FURTHER EVALUATION OF THE TRIAL-BASED FUNCTIONAL ANALYSIS

A Thesis
By
CASSANDRA M. STANDISH

Submitted to the Graduate School
at Appalachian State University
in partial fulfillment of the requirements for the degree of
MASTERS OF ARTS

August 2014
Department of Psychology

FURTHER EVALUATION OF THE TRIAL-BASED FUNCTIONAL ANALYSIS

A Thesis
By
CASSANDRA M. STANDISH
August 2016

APPROVED BY:

_____
Cynthia M. Anderson, Ph.D.
Chairperson, Thesis Committee

_____
Rose Mary Webb, Ph.D
Member, Thesis Committee

_____
Ken Steele, Ph.D.
Member, Thesis Committee

_____
James C. Denniston, Ph.D.
Chairperson, Department of Psychology

_____
Max Poole, Ph.D.
Dean, Cratis Williams Graduate School

Abstract

FURTHER EVALUATION OF THE TRIAL-BASED FUNCTIONAL ANALYSIS

Cassandra M. Standish
B.A. Appalachian State University
M.A., Appalachian State University

Chairperson: Cynthia M. Anderson, Ph.D.

Prior studies suggest that trial-based functional analysis (TBFA) can be used to identify the function of problem behaviors for individuals with intellectual and developmental disabilities. To date, there have been 20 published studies using TBFA and documenting adequate reliability and validity. Procedures have varied somewhat across studies with regard to the order of segments in the TBFA and the duration of segments. The purpose of this study was to (a) examine patterns of responding in pre- and post-control segments to determine if either or both are necessary and (b) examine within-session patterns of responding to assess relative effects of 1 min versus 2 min segments. This study is distinguished from prior studies in that primary caregivers implemented the TBFA in the homes of the children or community centers. Three children diagnosed with autism spectrum disorder participated in this study. The results of this study tentatively suggest that carryover effects are present in post-control segments, thus TBFAs should only include a pre-control segment. Additionally, the results of this study suggest that identical functions of problem behavior can be identified when segments last for 1 min and 2 min, thus segment duration should last up to 1 min.

Acknowledgements

First and foremost I would like to express my gratitude to my mentor and committee chair, Dr. Cynthia Anderson, for the continued support and guidance she has provided. I have looked at her as a mentor since first the day that I entered her research lab as an undergraduate student. She introduced me to my truest passions and has helped open a world of opportunities for me that I never knew possible. Words cannot express how grateful I am to her for the patience and guidance she has shown me, especially throughout this research endeavor. I would also like to thank Dr. Rose Mary Webb and Dr. Ken Steele for their unfailing patience and diligent reviews. Lastly, I would like to thank Cecilia Smith for the endless hours she dedicated to help this project. Not only did she assist in key aspects of the implementation of this project, she did so with such positivity and support.

Dedication

I would like to dedicate this work to my friends and family that have supported throughout this process. Jennifer Lowman has provided unrelenting support and encouragement for me to fight through the storms to achieve my dreams. Emily Mohr provided a level of understanding and support throughout this process that I never knew possible. My brother, Eric Standish, challenged me entirely along the way, ensuring I stayed true to my path. My parents, Lisa and Peter Standish, served as my inspiration for pursuing my educational goals and provided endless support throughout my pursuit.

Table of Contents

List of Tables

List of Figures

Further Evaluation of the Trial-Based Functional Analysis

Cassandra M. Standish

Appalachian State University

Abstract

Prior studies suggest that trial-based functional analysis (TBFA) can be used to identify the function of problem behaviors for individuals with intellectual and developmental disabilities. To date, there have been 20 published studies using TBFA and documenting adequate reliability and validity. Procedures have varied somewhat across studies with regard to the order of segments in the TBFA and the duration of segments. The purpose of this study was to (a) examine patterns of responding in pre- and post-control segments to determine if either or both are necessary and (b) examine within-session patterns of responding to assess relative effects of 1 min versus 2 min segments. This study is distinguished from prior studies in that primary caregivers implemented the TBFA in the homes of the children or community centers. Three children diagnosed with autism spectrum disorder participated in this study. The results of this study tentatively suggest that carryover effects are present in post-control segments, thus TBFAs should only include a pre-control segment. Additionally, the results of this study suggest that identical functions of problem behavior can be identified when segments last for 1 min and 2 min, thus segment duration should last up to 1 min.

Further Evaluation of the Trial-Based Functional Analysis

It is estimated that between 1.5% and 4.2% of the population meet criteria for intellectual and developmental disabilities (Boyle et al., 2011; Emerson, 2010; Larson et al., 2000). Individuals with intellectual and developmental disabilities (IDD) are at a higher risk for engaging in problems behavior than their typically developing peers (Cooper et al., 2009; Totsika, Hastings, Emerson, Berridge, & Lancaster, 2011). Examples of problem behavior include aggression, destruction of property, disruption, pica, and self-injurious behaviors (SIB). Individuals with IDD who engage in problem behavior are at risk for negative outcomes including injury to self or others, lower academic performance, social exclusion, increased use of pharmacologic intervention, and increased risk of placement in restrictive environments, such as self-contained classrooms or institutions (Cooper et al., 2009; Crocker et al., 2006; Tyrer et al., 2006). Problem behavior can also have negative effects on family members of individuals with IDD. It has been shown that problem behavior is positively correlated with reports of increased stress in family members (Families Special Interest Research Group of IASSIDD, 2014; Hartley, Sikora, & McCoy, 2008; Totsika et al. 2011; Williamson & Perkins, 2014).

Prior to the development and widespread use of functional assessment (described next), problem behaviors often were treated by attempting to replace existing, but unknown, reinforcement contingences maintaining problem behavior with arbitrary contingencies of punishment or reinforcement (Hanley, Iwata, & McCord, 2003). For example, problem behavior may have been treated by providing access to leisure activities or food contingent on the absence of problem behavior, or by delivering an aversive stimulus (e.g., a noxious odor) contingent on problem behavior. Such interventions often were ineffective (Carr,

1977), resulting in heavy reliance on mechanical and medical restraints (Hanley et al., 2003). With the emergence of functional behavior assessment (FBA) technology in the 1970s and 1980s, a shift occurred in the design of interventions, moving away from the manipulation of arbitrary contingencies and moving towards altering the antecedent and consequent variables of which problem behavior was a function and teaching new skills that served the same function as problem behavior (Cooper, Heron, & Heward, 2007; Hanely et al., 2003).

Understanding Behavioral Functions

All human and non-human behavior can be classified as either respondent (i.e., classically conditioned) or operant. Respondent behaviors are elicited by environmental stimuli and are not particularly sensitive to response contingencies (Cooper et al., 2007). In classical conditioning a previously neutral stimulus occurs in temporal relation with an unconditioned stimulus and comes to elicit the same or similar response. For example, Watson and Rayner (1920) showed that a previously neutral stimulus (e.g., a rat) can become a conditioned stimulus by pairing the presentation of the neutral stimulus with an unconditioned stimulus (e.g., a loud noise), resulting in a conditioned response (i.e., fear). In contrast, operant behaviors— which are the focus of this review— are sensitive to consequences (Cooper et al., 2007). In operant conditioning, some consequences increase response strength (i.e., reinforcers), while other decrease response strength (i.e., punishers). Response strength refers to the intensity, duration, frequency, or latency of the response. A response is considered reinforced if the intensity increases (e.g., an individual hits his head harder), the duration increases (e.g., a tantrum lasts longer), the frequency increases (e.g., an individual hits his head more often in a given amount of time), or the latency until the

response occurs decreases (e.g., the latency to the first instance of aggression following a prompt is reduced). There are several important aspects of these consequences that are worth noting: (1) the closer in time that the consequence occurs after the behavior, the more likely the consequence will be effective as a reinforcer or punisher, (2) the magnitude of the consequence affects the likelihood of it being effective, (3) consequences can only affect future behaviors, not behavior that occurred prior to its application, and (4) individuals do not have to be consciously aware of the consequence for it to have an effect on future behavior (Cooper et al., 2007).

There are two broad types of reinforcement: positive and negative reinforcement. Positive reinforcement occurs when a stimulus is presented after a behavior, and negative reinforcement occurs when a stimulus is removed after a behavior occurs— both increase response strength (Cooper et al., 2007; Iwata & Smith, 2007). For example, if a child eats all of the vegetables on his plate at dinner, his mother may reward him for doing so by either giving him a dessert after dinner (positive reinforcement) or telling him he does not have to help clear off the table after dinner (negative reinforcement). If either results in an increased probability of eating vegetables at dinner in the future, then reinforcement would have occurred.

In the above examples, reinforcement is socially mediated. Non-socially-mediated reinforcement is called automatic reinforcement and can occur via positive and negative reinforcement (Cooper et al., 2007; Iwata & Smith, 2007). Positive automatic reinforcement occurs when an individual engages in a behavior that produces an effect that leads to an increased probability of the individual engaging in said behavior in the future (Cooper et al., 2007; Iwata & Smith, 2007). For example, when a blind man presses on his eyes, bursts of

colors are produced. The man pressing his eyes would be considered positive automatic reinforcement if the probability of him engaging in this behavior increases as a result of seeing the bursts of colors. Negative automatic reinforcement occurs when an individual engages in a behavior that results in a reduction of an effect leading to an increased probability of the individual engaging in said behavior (Cooper et al., 2007; Iwata & Smith, 2007). For example, a woman has a headache and takes an aspirin, resulting in the headache diminishing. Taking aspirin would be considered to be negative automatic reinforcement if the removal of the headache increases the probability of the woman taking aspirin in the future when she has a headache.

Similarly, there are two types of punishment: positive and negative punishment. Whereas reinforcement always increases response strength, punishment always decreases response strength. Positive punishment occurs when a stimulus is added following a response, whereas negative punishment occurs when a stimulus is removed, both of which result in a reduction in the response strength (Cooper et al., 2007). For example, if a child throws a tantrum, his mother may scold the child (i.e., positive punishment assuming a reduction in the future probability of tantrums) or remove a favorite toy for 5 minutes (i.e., negative punishment assuming similar reduction).

In addition to punishment, response strength can be reduced through the process of extinction. Extinction occurs when a previously reinforced behavior is no longer reinforced, resulting in a reduction of the response strength (Cooper et al., 2007). Consider a child who often throws tantrums when his mother tells him he cannot have a piece of candy. A mother may respond to these tantrums by allowing him to have the piece of candy (i.e., positive reinforcement). If his mother wants to stop her child from throwing tantrums when she tells

him “no,” she can extinguish the behavior by no longer giving him the candy after he throws a tantrum.

The likelihood that a consequence will affect responding is partially a result of motivating operations (Michael, 1982; 1993; 2007). There are two types of motivating operations: establishing operations (EO) and abolishing operations (Michael, 1993; 2007). Both temporarily affect the value of a consequence. An establishing operation temporarily increases the value of a reinforcer (Michael, 1993). For example, hunger will temporarily strengthen the value of food as a reinforcer. Alternatively, an abolishing operation temporarily decreases the value of a reinforcer (Michael, 1993). For example, eating a large meal will temporarily weaken the value of food as a reinforcer.

Discriminative stimuli are another type of antecedent that may affect responding. Unlike motivating operations, discriminative stimuli have an effect due to their relation with certain consequences. Discriminative stimuli signal that a certain consequence is more or less likely to occur due to a differential history with that consequence in the presence of a discriminative stimulus (Cooper et al., 2007; Michael, 1982). For example, the presence of friends may signal to a child that teasing another child will result in praise and attention from his peers, whereas the presence of a teacher may signal to the same child that teasing another student may result in being sent to the principal’s office.

In sum, antecedents set the stage for a behavior to occur due to their relation with a given consequence, and consequences influence the future strength of a response (Cooper et al., 2007; Michael, 1982; 1993; 2007). The relationship among the antecedents, the behavior, and the consequences is referred to as the function of the behavior and FBA is the process

used for identifying antecedents and consequences affecting the occurrence of problem behavior.

Functional Behavior Assessment

Prior to an intervention being put in place, it is recommended that the function of the behavior be first identified (Anderson & St. Peter, 2013; Beavers, Iwata, & Lerman, 2013; Carr, 1977; Hanley, 2012; Iwata, Dorsey, Silfer, Bauman, & Richman, 1994). This can be accomplished by conducting a FBA. In fact, FBAs are regarded as best practice with individuals with disabilities who engage in problem behaviors (Anderson & St. Peter, 2013; Beavers et al., 2013; Hanley, 2012; Hanley et al., 2003; Iwata et al., 1994). Further, federal legislation requires that FBAs be conducted for students with disabilities that engage in problem behavior prior to moving to a more restrictive placement due to problem behavior (P.L. 99-142; Individuals with Disabilities Education Act). Functional behavior assessments are used to identify the environmental variables (i.e., antecedents and consequences) of which a behavior is a function. There are three categories of FBAs: indirect assessments, descriptive assessments, and experimental methods (i.e., functional analyses).

Indirect FBAs involve gathering information about the problem behavior via the opinion of another person, instead of observing the behavior. Indirect methods of FBAs include interviews, questionnaires, and rating scales (Kelley, LaRue, Roane, & Gadaire, 2011). A limitation of indirect assessment lies in the fact that there is often poor inter-rater reliability (Betz & Fisher, 2011). Further, the results of some studies suggest that indirect FBAs correlate poorly with the outcomes of experimental FBAs suggesting poor external validity (Hanley et al., 2003).

Descriptive assessments are conducted in a manner in which the problem behavior is directly observed and recorded in the context(s) in which the behavior typically occurs. Examples of descriptive assessments include structural analysis and ABC assessments (Anderson, Rodriguez, & Campbell, 2015; Betz & Fisher, 2011; Hanley, 2012). Descriptive assessments tend to be conducted by trained observers and consequently tend to be more costly and labor intensive than indirect assessment (Betz & Fisher, 2011; Thompson & Borrero, 2011). However, descriptive assessments do tend to produce more accurate depictions of the frequency of problem behavior relative to indirect assessments (Betz & Fisher, 2011). A limitation of descriptive assessments lies in the fact that it is a non-experimental assessment (Anderson et al., 2015; Hanley, 2012; Hanley et al., 2003). Therefore, causal relations between problem behavior and environmental variables cannot be identified via descriptive assessments.

Although descriptive and indirect assessments have limitations as a result of their non-experimental nature, the use of both types of these FBAs can assist in defining the problem behavior and creating a hypothesis for a possible function of the behavior (Anderson & St. Peter, 2013; Thompson & Borrero, 2011; Wacker, Berg, Harding, & Cooper-Brown, 2011).

Functional Analysis

Functional analyses (FAs) are experimental, and consequently allow for an experimental demonstration of how environmental variables affect problem behaviors (Betz & Fisher, 2011; Hanley, 2012; Wacker et al., 2011). There are several different types of functional analyses, however, all involve experimental manipulation of the antecedents, the

consequences, or both using a single-subject design such that a casual relation between environmental events and problem behavior can be identified.

In single-subject design, each participant serves as his or her own control, and a specific experimental design is used to evaluate functional (i.e., experimental) control (Byiers, Reichle, & Symons, 2012; Cooper et al., 2007; Johnston & Pennypacker, 1980). Functional control is documented to the extent that a causal relation is demonstrated between the independent variable and the dependent variable. Data are graphed to depict responding across time— typically a line graph is used (Byiers et al., 2012; Cooper et al., 2007; Johnston & Pennypacker, 1980). The most widely used method of functional analysis is the traditional (or analog) FA developed by Iwata et al. (1994; Anderson et al., 2015). As shown in Table 1, there are between three and five conditions conducted in the traditional functional analysis. The level, trend, and variability of responding in a test condition are compared to responding in the control condition. Each condition is designed to test a specific hypothesis.

The attention condition, also referred to as social disapproval, is designed to test whether problem behavior is maintained by positive reinforcement in the form of attention from others. In this condition, the putative establishing operation is attention deprivation. If the individual engages in problem behavior, brief corrective attention is delivered (e.g., "don't do that!").

The escape condition (also referred to as demand or academic) is designed to assess whether problem behavior is maintained by negative reinforcement via escape from demands placed on the individual. In this condition, the putative establishing operation is a prompt to engage in a task that is typical of something the individual is asked to perform (e.g., object identification, sorting, matching). A sequential, three-step prompting procedure is used. This

procedure consists of verbal, model, and physical prompts. If compliance occurs, the individual is praised. If problem behavior occurs, prompts are terminated for a set amount of time (e.g., 30 s).

The tangible condition is designed to test whether problem behavior is maintained by social positive reinforcement in the form of access to a preferred item. In this condition, the putative establishing operation is removal of a preferred item. Prior to beginning this condition, the individual is allowed access to a preferred item for 2-3 min which is removed once the condition begins. If the individual engages in problem behavior, the individual is allowed access to the preferred item for 30 s.

The alone condition is design to simulate an austere environment and is conducted if there is evidence to suggest that problem behavior might not be not socially mediated. Although the alone condition does not explicitly test whether the problem behavior is maintained by automatic reinforcement, occasioned by a lack of stimulation, one might expect higher rates of problem behavior to occur in this condition (relative to others) if the function of the behavior is automatic reinforcement.

The control condition, also referred to as unstructured play, is designed to serve as a control condition within which putative establishing operations and contingencies manipulated in other conditions are absent. Attention is delivered in a fixed-time (FT) 30-s schedule, meaning that the therapist will interact with the client every 30 s. Additionally, prompting does not occur, and the individual is allowed access to preferred items. Unless the function of the problem behavior is automatic reinforcement, one would expect low rates of problem behavior in this condition due to the stimulating environment provided to the

individual. Therefore, this condition is used as a point of comparison for the rates of problem behaviors in the other conditions.

The traditional functional analysis has been used in of hundreds of studies since the first publication documenting this method in 1982 (for recent reviews, see: Anderson et al., 2015; Beavers et al., 2013; Hanley, 2012). There are, however, several limitations that may affect its utility, including (a) the necessity of highly trained professionals to conduct the assessment, (b) the use of a controlled setting in which to conduct the assessment, (c) potentially limited external validity/treatment utility, (d) extensive time required to conduct the assessment, and (e) the high potential of harm to self or others during the assessment (Anderson & St. Peter, 2013; Hanley, 2012).

As a result of the necessity for precise manipulation of antecedent and consequent variables, individuals who wish to conduct traditional functional analyses must be trained extensively (LaRue et al., 2010; McDonald, Moore, & Anderson, 2012; Rispoli, Davis, Goodwyn, & Camargo, 2013). Consequently, reviews of the literature document that the traditional functional analysis is far more likely to be conducted by researchers than by parents or educators (Anderson, et al., 2015; Hanley, 2012). Because traditional functional analysis is designed to minimize effects of extraneous variables, it is typically conducted in isolated settings, such as empty rooms or clinics (Anderson et al., 2015; Hanley, 2012). Another limitation is that the repeated measures nature of the traditional functional analysis can require a minimum of a week, if not longer, to conduct – particularly in outpatient settings where a behavior analyst may not have access to a child and control over the environment multiple times per day (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011; LaRue et al., 2010). Finally, since individuals are exposed to conditions for an extended period of time,

typically 10 to 20 min, there is a risk of injury for the self and others (Betz & Fisher, 2011; Bloom et al., 2011; Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011). Trial-based functional analysis (TBFA) was designed to address these limitations (Sigafoos & Saggers, 1995).

Trial-Based Functional Analysis

Trial-based functional analysis (TBFA) differs from the traditional functional analysis in several ways, including (a) shorter session durations, and (b) the use of test and control segments within trials. Further, TBFA was designed to be conducted by caregivers and embedded in ongoing routines (Sigafoos & Saggers, 1995). Trial-based functional analyses consist of trials that are made up of at least one control and one test segment. The control and test segments typically last 1 to 2 min. The putative establishing operation is absent in the control segment and present in the test segment. The test segment ends immediately after the first instance of problem behavior, thus potentially reducing the likelihood of negative effects of the problem behavior (i.e., danger to self or others).

As shown in Table 2, TBFAs consist of four test conditions: attention, demand, tangible and ignore. The attention condition is designed to assess whether the problem behavior is maintained by positive reinforcement in the form of attention from others. In this condition, the putative establishing operation is attention deprivation. If problem behavior occurs in the test segment, attention in the form of verbal concern is delivered to the individual and the segment is immediately terminated. The demand condition is designed to assess whether problem behavior is maintained by negative reinforcement in the form of escape from demands. The putative establishing operation is a prompt for the individual to engage in a task that is typical for the individual to perform. A sequential, three-step

procedure is used. If compliance occurs, the individual is praised. If problem behavior occurs, the test segment is immediately terminated. The tangible condition is designed to assess whether the problem behavior is maintained by positive reinforcement via access to a preferred item. If problem behavior occurs in the test segment, the item is immediately given back to the individual and the test segment is terminated. The ignore condition is designed provide an environment with minimal stimulation and is conducted if the putative function of the problem behavior is automatic reinforcement. Although the ignore condition does not explicitly test whether the problem behavior is maintained by automatic reinforcement, one would expect to see low rates, if any, of problem behavior in this condition unless the function of the problem behavior is automatic reinforcement.

Although the TBFA is conducted using a multi-element design (i.e., conditions alternate across time) results are typically graphed in a bar graph, instead of the more common line graph (Rispoli et al., 2014) because the dependent variable is recorded as occurring or not occurring (instead of using continuous recording). Using a bar graph, the percentage of trials in which problem behavior occurred is graphed for each condition. Data for each condition is then evaluated separately by first conducting a within-condition comparison of the percentage of trials in which responding occurred in the test versus control segments and then conducting an across-condition comparison of responding across conditions.

To date, TBFA has been reported in 20 peer-reviewed publications, spanning 55 participants. See Table 3 for a detailed description of the number of participants per study. Of the 20 studies, 5 focused on training only and thus did not include actual data collection using TBFA (Kunnavatana, Bloom, Samaha, & Dayton, 2013; Kunnavatana, Bloom, Samaha,

Lingugariris-Kraft, et al., 2013; Lambert, Bloom, Kunnavatan, Collins, & Clay, 2013; Lambert, Lloyd, Staubitz, Weaver, & Jennigs, 2014; Rispoli, Burke et al., 2015). All of the TBFAs were conducted in classrooms. Researchers directed the conduct of the TBFA (determined conditions to be conducted, graphed and analyzed data, provided training) across studies. Teachers or other educational professionals interacted with participants during the TBFA in ten studies, both researchers and teachers interacted with participants in three studies, and researchers interacted with participants during the TBFA in one study. This information was not reported in one study. See Table 4 for a detailed description of implemented the TBFAs per study.

The number of trials conducted in the TBFAs varied across studies and ranged from a high of 20 trials (in four studies) to a low of three trials (in one study) per condition. See Table 5 for a detailed description of the number of trials conducted per condition for each study. The number of trials was determined before the TBFA was conducted in 11 studies. In the remaining 4 studies the researchers conducted the TBFA with a participant until a stable pattern of responding emerged (as judged via visual inspection of the data).

Results were compared to the traditional functional analysis in three of the studies, as a means of assessing the reliability of the TBFA. In these studies, exact correspondence was found for 10 of the 17 participants (i.e., all functions identified in the TBFA were the same as all of the functions identified in the traditional FA), partial correspondence was reported for one participant (i.e., two functions were identified using the TBFA, one of which matched with the single function identified in the traditional FA), and there was no correspondence for six participants. For two of these six participants, there was no clear function identified in the traditional functional analysis to which the function identified by the TBFA could be

matched to. See Table 6 for a detailed description of reliability outcomes per study. Results of the TBFA were used to develop interventions for participants, and the efficacy of the intervention was evaluated. Interventions were found to be effective for 30 of the 30 participants, meaning that the problem behavior was significantly reduced after the intervention. See Table 7 for a detailed description of intervention outcomes per study.

The body of literature on TBFA suggests that the TBFA is both a reliable and valid method of FBA that is useful for developing efficacious interventions (for a recent review of the TBFA literature, see: Rispoli et al., 2014). Across the studies, there were a number of methodological variations, but it remains unclear whether one method may be better than another overall or for a particular individual. Variations include (a) the order of the test and control segments and (b) segment duration.

Order of the Test and Control Segments

Trials conducted in TBFAs always include a single test segment, and one or two control segments. Of the 20 studies, 17 studies included a single control segment and test segment. See Table 8 for a detailed description of the order of trial segments in TBFAs for each study. In these 17 studies, the control segment was conducted after the test in eight studies and before the test segment in eight. In the remaining study, the order was determined randomly. Two control segments— one prior and one after the test segment— were used in TBFAs in the remaining three studies.

The relative effect of placement of the control segment has been evaluated in one study to date. Bloom et al. (2011) compared the proportion of test and control segments in which problem behavior occurred per condition. The results of this evaluation revealed that

there was more responding in the post-control segments than the pre-control segments for 5 of the 10 participants. This suggests that responding in the post-control segments may have been a result of carryover effects. In other words, responding in the post-control segments may not have been a result of the environmental contingencies established in the post-control segments (i.e., EO absent). Rather, responding in the post-control segments may have been a result of the environmental contingencies established in the test segments (i.e., EO present). This is problematic because— as noted earlier—data collected in TBFAs are evaluated by comparing responding in the test segments (i.e., putative EO present) to responding in the control segments (i.e., putative EO absent), however, this comparison cannot be accurately represented if the problem behavior occurred as a result of the EO being present or absent if carryover effects are present. Consequently, Bloom et al. chose to remove the data collected from the post-control segments. Although these results show a potential problem with conducting a post-control segment, more studies are needed to determine whether this is a limitation.

Duration of Segments

The duration of the control and test segments also varied across studies. See Table 9 for a detailed description of the duration of trial segments in the TBFA for each study. Of the 20 studies, one TBFA consisted of segments that lasted up to 30 s, eight TBFAs consisted of segments that lasted up to 1 min, eight TBFAs consisted of segments that lasted up to 2 min, and three TBFAs consisted of segments that varied in duration. Chezan, Drasgow, and Martin (2014) used 1-min control and test segments for the tangible condition for a single participant, and used 2-min control and test segments for all other conditions and

participants. Flynn and Lo (2016) used 1-min control segments, and 3-min test segments. Schmidt, Drasgow, Halle, Martin, and Bliss (2014) used 1-min control segments for all conditions, 1-min test segments for tangible conditions, and 3-min test segments for attention and escape. For all of the studies, the test segments were conducted for the allotted time or until problem behavior occurred.

Statement of the Problem

The purpose of this study was to (a) examine patterns of responding in pre- and post-control segments to determine whether one might be superior, and (b) examine within-session patterns of responding to assess relative effects of 1-min versus 2-min segments on response patterns. This study is distinguished from prior studies in that primary caregivers implemented the TBFA in the homes of the children or community centers.

Method

Participants and Setting

This study was approved by the Institutional Review Board (IRB) on December 10, 2014. See Appendix A for a copy of the acceptance form from the IRB. Three children diagnosed with autism spectrum disorder who engaged in problem behaviors were recruited for this study. Nikola was a 9-year-old boy referred to the study by the school district for treatment of self-injurious behavior. Nikola had co-occurring IDD. Nikola had no means of communicating his wants and needs. He used a few signs; however, they were not used functionally and seemed more echolalic. Nikola’s parents identified Jesse as Nikola’s primary caregiver. Jesse was a 24-year-old man employed as a direct care staff member for

Nikola. Jesse worked for a local agency providing respite and community-based care for individuals with IDD. At the time of the study he had been employed by the agency for 3 months. Prior to working with Nikola, Jesse had never worked with an individual with IDD or an individual who engaged in problem behavior. Jesse worked with Nikola for approximately 40 hours per week, picking him up after school and caring for him until bedtime Monday through Friday. During that time, Jesse was responsible for all aspects of Nikola's care, which included assistance in self-help skills (e.g.., bathing, feeding, bedtime rituals) and implementation of functional living skills training programs developed by the agency he worked for.

Leo was a 4-year-old boy who engaged in aggressive and disruptive behaviors. Leo did not have co-occurring IDD and was able to communicate his wants and needs verbally, in an age-appropriate manner. Leo's parents sought services at Appalachian Psychological Services for Kids (APS4KIDS) where they learned about the study and asked to participate. Leo's mother, Bethany, participated in the study. Beyond caring for Leo, she had no training in working with individuals with autism or IDD.

Paxton was a 14-year-old boy who engaged in self-injurious and aggressive behaviors. Paxton suffered from persistent seizures and comorbid neurological disorders. Paxton was able to communicate some of his wants and needs verbally; however, his vocabulary was subpar compared to his age group. Paxton's mother sought services at APS4KIDS, where she learned about the study and asked to participate. Paxton's mother identified Lindsay as Paxton's primary caregiver. Lindsay was a 23-year-old woman employed as a direct care staff member for Paxton. Lindsay worked for a local agency providing respite and community-based care for individuals with IDD. At the time of the

study, she had been employed by the company for 9 months. At the time of the study, Lindsay was working on getting her Master's degree online in special education. Previously, Lindsay had obtained a Bachelor's degree in psychology. Prior to working with Paxton, Lindsay had never worked with an individual who engaged in self-injurious behaviors. Lindsay worked with Paxton for approximately 40 hours per week, caring for him from the time that he would wake up in the morning until bedtime Monday through Friday. During that time, Lindsay was responsible for all aspects of Paxton's care which included assistance in self-help skills (e.g., bathing, feeding, bedtime rituals) and, implementation of functional living skills training programs developed by the agency she worked for. Lindsay would also occasionally care for Paxton overnight at her home on weekends. Lindsay was not compensated for doing so.

All caregivers were trained to conduct the TBFAs for their respective child in a clinical research lab situated at the Psychology Department Clinic of Appalachian State University. For Nikola, 95% of the TBFAs trials were conducted in his home. The remaining 5% of the TBFA trials were conducted at a local country club Nikola and Jesse frequented. For Leo and Paxton, 100% of the TBFAs trials were conducted in their respective homes.

Data Collection, Inter-Observer Agreement, and Procedural Integrity

Response Definition. Either the principal investigator or a graduate student recorded all observations. Some observations were coded in-vivo using pen and paper recording; others were videotaped and scored later using a computerized data collection system. Data were collected on latency to problem behavior for 100% of trials for all participants.

Problem behaviors for all participants were ideographically defined based on a functional assessment interview conducted with the primary caregiver and informal observation conducted in the child's home. For Nikola, self-injurious behavior was defined as biting his hands or arms (i.e., any mouth to body contact in which Nikola's jaw was observed to close down) and hitting his hands, arms, legs, head, or neck (i.e., any hand-to-head-contact or hand-to-body contact in which Nikola's hand was observed moving back a minimum of 7 cm prior to contact).

For Leo, aggressive behavior was defined as hitting others (i.e., any hand-to-head contact or hand-to-body contact in which Leo's hand was observed moving back a minimum of 7 cm prior to contact), kicking others (i.e., any foot-to-head-contact or foot-to-body contact in which Leo's foot was observed moving back a minimum of 7 cm prior to contact), as well as hitting others with tangible objects (i.e., any time an object left Leo's hand resulting in said object making contact with another person). Disruptive behavior for Leo was defined throwing tantrums (i.e., visible crying; and throwing self against any furniture, walls, or the floor).

For Paxton, self-injurious behavior was defined as hitting his hands, arms, legs, head, or neck (i.e., any hand-to-head-contact or hand-to-body contact in which Paxton's hand was observed moving back a minimum of 7 cm prior to contact), head-banging (i.e., any head-to-object contact), strangulation (i.e., any hand-to-throat contact), and scratching (i.e., any fingernail-to-skin contact). Aggressive behaviors were defined as hitting others (i.e., any hand-to-head-contact or hand-to-body contact in which Paxton's hand was observed moving back a minimum of 7 cm prior to contact), kicking others (i.e., any foot-to-head-contact or foot-to-body contact in which Paxton's foot was observed moving back a minimum of 7 cm

prior to contact), scratching others (i.e., any fingernail-to-skin contact), and biting others (i.e., any mouth to body contact in which Paxton's jaw was observed to close down).

Data Collection. Data for this study were collected by the principal researcher, and graduate and undergraduate research assistants. Data collectors were trained by the principal researcher. Training was comprised of two parts. First, the data collectors were given an overview of the TBFA procedures used in this study via didactic instruction and modeling, followed by a 25-question quiz consisting of true/false, multiple choice, fill-in-the-blank, and short answer questions. See Appendix B for a copy of the quiz that was given to data collectors. If data collectors received a grade of less than 92% correct, the principal researcher reviewed parts of the training relevant to the incorrect responses with the data collector and the quiz was re-administered. This process continued until a data collector scored at least 92% correct on the quiz. Of the six data collectors, four scored a 92% or higher on their first attempt and two took the quiz two times prior to scoring a 92% or higher. In the second part of the training, the data collectors were taught how score data by hand and with a computerized data collection system. The data collectors were then shown videos of TBFAs and practiced coding using videotaped observations of previous TBFA observations. Practice continued until exact agreement (defined below) between the principal researcher and an observer was above 90% for all codes in each condition across three consecutive observations.

Inter-Observer Agreement. Inter-observer agreement (IOA) was collected on latency to problem behavior. Two observers independently collected data for 35.00% to 41.67% of all TBFA trials across participants. To calculate IOA we compared the observers' records of the first instance of problem behavior in a given segment. Responses that were

scored within 5 s of one another were scored as an agreement and responses that were greater than 5 s apart (or if scored by only one observer) were scored as a disagreement. Agreements were summed and divided by the total number of agreements plus disagreements within a segment and then multiplied by 100 to obtain a percentage agreement. Inter-observer agreement was recorded for 38.75%, 41.67%, and 35.00% of trials for Nikola, Leo, and Paxton respectively. For Nikola, mean IOA was 98.92% (range 66.67%-100%). For Leo, IOA was 100% for all sessions. For Paxton, IOA was 100% for all sessions.

Procedural Fidelity. Data were also collected on procedural integrity (i.e., the extent to which TBFAs were conducted correctly). To do so, data were collected on child and caregiver responses. All behaviors were scored (a) by hand; (b) using a real time, computerized data collection system; or (c) both. Additional child responses coded included contact with tangible items and compliance. Contact with preferred tangible items (identified in the preference assessment) was scored when the participant was touching the item (e.g., holding a toy) or engaged with the item indicated through eye contact (e.g., watching a video). Tangible contact was scored as a duration measure using a real time, computerized data collection. Compliance was defined as following a verbal or model prompt within 5-s. Compliance was scored as a frequency measure using a real time, computerized data collection.

The following caregiver behaviors were scored: prompts (correct and incorrect), attention delivery, and tangible delivery. Prompts were defined as any instructions not in response to problem behavior that occurred in a specified sequence. Three types of prompts were taught and scored: verbal (e.g., “place the ball in the cup”), gestural (e.g., showing the child how to place the ball in the cup), and physical (e.g., guiding the child’s hand through

the process of placing the ball in the cup). A list of activities to be included in demand segments were developed prior to the TBFA. For Nikola, tasks included matching, sorting, and clapping. For Leo, tasks included clean-up rituals (e.g., putting toys away), sorting, and writing. For Paxton, tasks included academic tasks (e.g., addition, subtraction, writing). Prompts were scored as a frequency measure using a real time, computer data collection. Caregivers were taught a sequential prompting procedure consisting of (1) a verbal prompt, (2) a gestural prompt, and finally, 3) a physical prompt. The next prompt in the sequence was delivered if compliance did not occur in 5 s. Prompts that followed this sequence were scored as correct. Any other prompts or prompts delivered out of sequence were scored as incorrect prompts. Attention delivery was defined as any verbal statement directed to the participant that was not a prompt (e.g., "you are funny," "don't hit me, that hurts") or physical interaction with the participant that was not a part of a prompt (e.g., pat on the back), including eye contact. Attention delivery was scored as a duration measure during the attention condition, and as a frequency measure in the demand, tangible, and ignore conditions using a real time, computerized data collection system. Tangible delivery was defined as the caregiver allowing the participant access to the identified preferred tangible item and was scored independent of whether the participant engaged with the item. Tangible delivery was scored using a real time, computerized data collection system as a duration measure.

Any trials in which procedural fidelity was scored as incorrect were conducted again and were excluded from the final analysis. This was done to ensure that any responding in trials were a true reflection of the environmental conditions associated with each trial segment, and not a result of unaccounted environmental variables. For Nikola, eight trials

were scored as incorrect. For Leo, one trial was scored as incorrect. For Paxton, three trials were scored as incorrect.

Experimental Design and Procedures

A functional assessment interview and informal observation were conducted prior to the TBFA for all participants. The functional assessment interviews were conducted with the primary caregiver either in research lab at Appalachian State University for all participants. The informal observations were all conducted in the participant's home. The TBFA was conducted in a multi-element design. For Nikola, 80 trials were conducted to fidelity (20 attention trials, 20 demand trials, 20 tangible trials, and 20 ignore trials). For Leo, 12 trials were conducted to fidelity (4 attention trials, 4 demand trials, and 4 tangible trials). For Paxton, 60 trials were conducted to fidelity (20 attention trials, 20 demand trials, and 20 tangible trials). The order of the conditions for the TBFA was randomized.

Training. Prior to training, caregivers were given a written copy of the procedures for the TBFA. Training was comprised of two segments. The first segment consisted of didactic instruction, and the second segment comprised various role-playing sessions. During the instructional phase, caregivers were given an instruction manual that included definitions of key concepts, procedural steps of the TBFA, and how the function of a problem behavior is identified. See Appendix C for a copy of the instruction manual caregivers received. All content in the manual was reviewed with the caregivers by the either the principal investigator or a graduate student. Caregivers were also shown videos of a graduate student conducting each TBFA condition correctly and incorrectly with another graduate student acting as the child. At the end of this segment, caregivers were given the option to ask

questions concerning any of the information provided. Before advancing to the second segment of the training, caregivers were given a 25-question quiz on the TBFA. The caregiver's quiz was identical to the quiz distributed to the data collectors. See Appendix B for a copy of the quiz caregivers and data collectors received. Feedback was given to the caregivers for any incorrect responses. Caregivers were required to answer a minimum of 92% of the questions correctly before continuing on to the next phase of training. If a caregiver did not answer 92% of the questions correctly, material relevant to the incorrect responses was reviewed with the caregiver. Jesse correctly answered 80% of the questions correctly on his first attempt, 88% of the questions on his second attempt, and 100% on his third attempt. Bethany correctly answered 100% of the questions on her first attempt. Lindsay correctly answered 88% of the questions on her first attempt and correctly answered 96% of the questions on her second attempt.

The second segment of training consisted of role-playing conditions in the TBFA. Initially, the principal researcher acted as the therapist and the caregiver acted as the child. Role-playing sessions were conducted for each of the four conditions. The caregiver was then asked to implement each of the four conditions with a confederate acting as the child. The caregiver determined the order of the conditions. Immediate feedback was given by the principal researcher if any errors occurred. The caregiver was assessed on fidelity for each condition separately, and then as whole. For each condition, the caregiver was required to complete three consecutive trials without errors or feedback. If an error occurred within a trial, it was considered to be a failed trial, and all prior trials were not counted towards reaching fidelity. Errors in one condition did not affect fidelity measures on other conditions (e.g., if the caregiver failed to correctly implement a demand trial, the caregiver was required

to repeat the demand trials, but not the other conditions). Caregivers were considered to have met fidelity for conducting the TBFA when the caregiver had reached fidelity for all four conditions.

Preference Assessment. Prior to conducting the TBFA, the principal researcher conducted a multi-stimulus-without-replacement (MSWO) (DeLeon & Iwata, 1996) preference assessment. The MSWO was conducted in the clinic. The room contained one table and two chairs. Caregivers were instructed to bring seven items that the participant typically engaged with and appeared to enjoy for the MSWO. The items were spread evenly apart from one another on the table. The principal researcher recorded the order of items selected by the participant. The principal researcher sat in one chair at the table and instructed the participant to sit in the other chair. The researcher instructed the participant to select one item off the table. The participant had 30 s to select an item. Any physical contact with an item was considered the participant selecting that item. If multiple items were touched by the participant, the first item contacted was be considered the item selected. The participant was allowed 30 s of access to the selected item. After 30 s, the item was removed from the participant's possession and placed out of sight. The principal researcher asked the participant to select an item from those left on the table and given 30 s access to the item selected. This process continued until either all items had been selected or the participant did not select an item. The principal researcher completed five separate MSWOs, and the data were compiled across MSWOs to determine highly-preferred and moderately preferred items. For each item, the number of times the item was selected was divided by the number of instances the item was presented as an option to select. The item that had the highest proportion associated with it was considered to be the most highly-preferred item and was

used in the tangible conditions of the TBFA. Items used in the tangible condition were books (Nikola), an iPad (Leo), and TNT firework poppers (Paxton). The items with the second highest proportions associated with them were considered moderately preferred items and were used in the attention condition. These included bouncy balls (Nikola), toy trucks (Leo), and toy cars (Paxton).

Trial-Based Functional Analysis

The TBFA consisted of attention, demand, and tangible conditions across participants. An ignore condition was also included for Nikola. Each condition consisted of three segments: pre-control, test, and post-control. The duration of the pre- and post-control segments was 2 min regardless of whether problem behavior occurred. With the exception of the ignore condition, the duration of the test segment was 2 min or until the first instance of problem behavior. In the ignore condition the duration of the test segment was 2 min regardless of occurrence of problem behavior.

Attention. During the pre- and post-control segments, the caregiver remained in close proximity (1 m) to the child, who had access to moderately preferred items. The caregiver delivered continuous attention throughout this trial, defined as no more than 5 s without attention delivered to the child. If problem behavior occurred, the caregiver responded to the behavior in a similar manner to how the caregiver typically responded to the problem behavior outside of TBFA. At the end of the pre-control segment, the caregiver initiated the test segment by stating, “I have work to do” and diverted attention away from the child, including eye contact. If the child engaged in the problem behavior, the test segment ended and the post-control segment began with the caregiver turning towards the child, verbally

expressing concern to the child about the behavior exhibited (e.g., “don’t hurt yourself!”), and delivering gentle physical contact (e.g., touching the participant’s arm).

Demand. During the pre- and post-control segments, the caregiver remained in close proximity (1 m) to the child with no preferred items available. The caregiver did not deliver attention and any occurrences of problem behavior were ignored. At the end of the pre-control segment, the caregiver initiated the test segment by stating, “it is time to work.” Caregivers used the sequential prompting procedure to request the child complete pre-determined activities. The caregiver provided positive attention (e.g., “good job!”) if the child completed the task without physical guidance and neutral attention (e.g., “that’s how we do it”) if the child completed the task with physical guidance. There was a 5-s break given between each new prompt. If problem behavior occurred, the test segment ended, and the caregiver initiated the post-control session by stating, “okay, you don’t have to do that.”

Tangible. During the pre- and post-control segments, the caregiver remained in close proximity to the child (1 m), who had access to a highly preferred item. If the child initiated interaction with the caregiver, the caregiver responded accordingly. If no interactions were initiated by the child, the caregiver delivered neutral or positive attention every 30-s (e.g., “That toy looks really fun”). Problem behavior was ignored in this segment. At the end of the pre-control segment, the caregiver initiated the test segment by stating, “it’s my turn” and took the item away from the child. The caregiver did not deliver attention during this segment, including eye contact. If problem behavior occurred, the test segment ended and the post-control session began with the caregiver returning the item to the child.

Ignore. In this condition, the test segment was conducted in the same manner as the pre- and post-control segments. During each segment, the caregiver remained in close

proximity (1 m) to the child, who did not have access to preferred items. The caregiver did not deliver attention in this condition. If the problem behavior occurred, the caregiver did not respond to the child.

Data Analysis

Latency to problem behavior per trial segment was recorded for all participants. If problem behavior did not occur in a given segment, latency was recorded as 120 s to indicate that the segment was conducted to its entirety. The proportion of trial segments per condition in which problem behavior occurred was calculated. We developed hypotheses about operant function in the manner outlined by Bloom, Lambert, Dayton, and Samaha (2013) and Sigafoos and Saggers (1995). First, data for the ignore condition were analyzed by comparing responding in the post-control segments to the test segments, as well as the pre-control segments. If responding was observed across all segments, and the proportion of trials in which problem behavior occurred in the post-control segment was equal to or higher than the proportion of trials in which problem behavior occurred in the first segment, automatic reinforcement was identified as a possible function of the problem behavior. Data for the remaining conditions were analyzed by comparing the proportion of test segments in which problem behavior occurred to the proportion of control segments in which problem behavior occurred. If the proportion of test segments in which problem behavior occurred was higher than the proportion of control segments in which problem behavior occurred, the EO for that condition was identified as a possible function of problem behavior.

Pre- vs. Post-Control Segment. To evaluate the occurrence of problem behavior in control segments, the proportion of trials in which problem behavior occurred was calculated

for the pre-control and post-control segments per condition. This evaluation was conducted to determine whether either control segment had a higher proportion of trials in which problem behavior occurred.

Segment Duration. To evaluate the relative effects of 1-min vs. 2-min segment duration, two bar graphs will be created per participant. The first graph is identical to the graphs depicted in Figure 1. The second graph depicts responding that occurs within the first 60 s of trial segments. Each graph was evaluated in a manner to identify possible functions of behavior (see Data Analysis section). Next, the functions identified in the 120 s and 60 s graphs were compared.

Results

Nikola

Pre- vs. Post-Control. Results for the pre-versus post-control comparison are depicted in Figure 1. As seen in the top panel of Figure 1, Nikola engaged in problem behavior in a larger proportion of post-control segments than pre-control segments in all conditions except the tangible condition. Specifically, problem behavior occurred in 55.00% of post-control segments in the demand condition compared to 35.00% of pre-control segments; problem behavior occurred in 57.14% of pre-control segments in the attention condition compared 42.86% of pre-control segments; problem behavior occurred in 36.84% of post-control segments in the ignore condition compared to 21.05% of pre-control segments; and problem behavior occurred in 10.00% of post-control segments compared to 15.00% of pre-control segments.

Segment Duration. Similar response patterns were observed when segments were 120 s as when they were reanalyzed using only the first 60 s. With regard to test conditions, the percentage of trials with SIB was similar when latency was set at 60 s and 120 s, with the highest percentage of trials with SIB occurring in the demand condition followed by tangible, and then attention, and then ignore. Nikola also engaged in SIB during similar proportions of pre- and post-control segments when latency was set at 60 s and 120 s. For Nikola, response patterns across the 60-s segment duration and 120-s segment duration are consistent with an automatic reinforcement hypothesis.

Leo

As is shown in Figure 2, Leo did not engage in problem behavior during any trials of the TBFA. Thus, no conclusions regarding effects of pre-versus post- control or segment duration can be made. Anecdotally, Leo's mother reported that he was only engaging in problem behavior at home infrequently once the TBFA began. She also reported that she believed this change in behavior occurred as a result of Leo switching school systems.

Paxton

Pre- vs. Post-Control Segment. As is shown in the bottom panel of Figure 1, Paxton engaged in problem behavior during the tangible and demand conditions. Problem behavior never occurred in the pre-control segments of the tangible condition but did occur in the post-control segment. In contrast, problem behavior occurred in both pre- and post- control segments of the demand condition however occurred more often in the post-control segments. Specifically, Paxton engaged in problem behavior in 25% of post-control segments in the demand conditions compared to 5% pre-control segments.

Segment Duration. Similar response patterns were observed when data were re-analyzed with 60-s segments as when the duration of segments was 120 s. Paxton emitted problem behavior most often during the demand test condition, suggesting that problem behavior was evoked by requests and maintained by escape or avoidance.

Discussion

The purpose of this study was to (a) examine patterns of responding in pre- and post-control segments to determine if either or both are necessary and (b) examine within-session patterns of responding to assess relative effects of 1 min versus 2 min segments. Two of the three participants (Nikola and Paxton) in this study engaged in at least one instance of problem behavior during the TBFA. One participant (Leo) did not engage in any problem behavior after the first 12 trials of the TBFA, so the TBFA was consequently terminated. Each condition consists of trials in which the environmental contingencies are identical in the pre- and post-control segments. Consequently, one would expect to see similar responding in the pre- and post-control segments if environmental contingencies were solely responsible for responding. For participants who engaged in problem behavior, responding was more likely to occur in post-control segments than pre-control segments across conditions. This suggests that responding in the post-control segments may have been a result of carryover effects. The presence of carryover effects could be detrimental in that accurate functions may not be identified due to the methodology of analyzing TBFA results (i.e. comparing the proportion of trials in which problem behavior occurs in the test segment is compared to the proportion of trials in which responding occurs in the control segments). Therefore, it might be better that future TBFAs only include a pre-control segment.

The results of this study showed there were no differences in the operant functions identified when data were analyzed at 120 s and 60 s. This might suggest that 60 s is a sufficient duration for trial segments to ensure that accurate functions of problem behaviors can be identified. Utilizing segments with durations lasting up to 60 s rather than 120 s could potentially reduce the total time to conduct the TBFA by 80 min. Since TBFAs are intended to be time efficient, it might be best if the duration of trial segments in future TBFAs last up to 60 s.

Limitations

A limitation of this study is the small number of participants that were recruited. Additionally, because only two of our three participants emitted problem behavior during the TBFA, conclusions drawn in this study were a result of the data from only two participants. A second limitation of this study is that IOA was not calculated for procedural integrity. Although either the principal investigator or a highly trained graduate student observed all TBFAs to ensure that they were conducted to fidelity, it is possible that there were mistakes in the implementation of TBFAs that were not accounted for that may be been observed had there been a second person collecting data on procedural integrity.

Future Directions

Based on the results of this study, it appears as if TBFAs should be conducted in a manner in which segment durations last for a maximum of 1 min and should only include a pre-control segment. However, as noted in the limitation section, this study included a small number of participants. Therefore, it is recommended that future research continue to seek

the answers to the questions raised in this study with more participants to ensure that these results do extend to other TBFAs. It is also recommended that future researcher gathers IOA information concerning procedural integrity.

References

Anderson, C. M., Rodrigez, B. J., & Campbell, A. (2015). Functional behavior assessments in school: Current status and future directions. *Journal of Behavioral Education, 24,* 338-371 doi: 10.1007/s10864-015-9226-z

Anderson, C. M., & St. Peter, C. C. (2013). Functional analysis with typically developing children: Best practice or too early to tell?: In response to Hanley (2012). *Behavior Analysis in Practice, 6,* 62-76.

Austen., J. L., Groves, E. A., Reynish, L. C., & Francis, L. L. (2015). Validating trial-based functional analyses in mainstream primary school classrooms. *Journal of Applied Behavior Analysis, 48,* 274-288. doi: 10.1002/jaba.208

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. doi: 10.1002/jaba.30

Betz, A. M., & Fisher, W. F. (2011). Functional analysis: History and methods. In W. W. Fisher, C. C. Piazza, & H. S. Roane (Eds.), *Handbook of Applied Behavioral Analysis* (pp. 206-228). New York, NY: Guilford.

Bloom, S. E., Iwata, B. A., Fritz, J. N., Roscoe, E. M., & Carreau, A. B. (2011). Classroom application of a trial-based functional analysis. *Journal of Applied Behavior Analysis, 44,* 19–32. doi:10.1901/jaba.2011.44-19

Bloom, S. E., Lambert, J. M., Dayton, E., & Samaha, A. L. (2013). Teacher-conducted trial-based functional analyses as the basis for intervention. *Journal of Applied Behavior Analysis*, *46,* 208–218. doi:10.1002/jaba.21

Boyle, C. A., Boulet, S., Schieve, L. A., Cohen, R. A., Blumberg, S. J., Yeargin-Allsopp, M., & Kogan, M. D. (2011). Trends in the prevalence of developmental disabilities in US children, 1997-2008. *Pediatrics, 127,* 1034-1042. doi: 10.1542/peds.2010-2989

Byiers, B. J., Reichle, J., & Symons, F. J. (2012). Single-subject experimental design for evidence-based practice. *American Journal of Speech-Language Pathology*, *21,* 397-414. doi: 10.1044/1058-0360(2012/11-0036)

Carr, E. G. (1977). The motivation of self-injurious behavior: A review of some hypotheses. *Psychological Bulletin, 84,* 800-816.

Chezan, L. C., Dragow, E., & Martin, C. A. (2014). Discrete-trial functional analysis and functional communication training with three adults with intellectual disabilities and problem behavior. *Journal of Behavioral Education, 23,* 221-246. doi: 10.1007/s10864-013-9192-2

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied Behavior Analysis (2nd ed.)* (pp 374-391). Upper Saddle River, NJ: Pearson.

Cooper, S. A., Smiley, E., Jackson, A., Finlayson, J., Allan, L., Mantry, D., & Morrison, J. (2009). Adults with intellectual disabilities: Prevalence, incidence and remission of aggressive behavior and related factors. *Journal of Intellectual Disability Research, 53,* 217-232. doi: 10.1111/j.1365-2788.2008.01127.x

Crocker, A. G., Mercier, C., Lachapelle, Y., Brunet, A., Morin, D., & Roy, M. E. (2006). Prevalence and types of aggressive behaviour among adults with intellectual disabilities. *Journal of Intellectual Disability Research, 50,* 652–661. doi: 10.1111/j.1365-2788.2006.00815.x

DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis, 29,* 519-533. doi: 10.1901/jaba.1996.29-519

Emerson, E. (2010). Deprivation, ethnicity, and the prevalence of intellectual and developmental disabilities. *Journal of Epidemiology and Community Health, 66,* 218-224. doi: 10.1136/jech. 2010.111773

Families Special Interest Research Group of IASSIDD. (2014). Families supporting a child with intellectual or developmental disabilities: The current state of knowledge. *Journal of Applied Research in Intellectual Disabilities, 27,* 420-430. doi: 10.1111/jar.12078

Flynn, S. D., & Lo, Y. (2016). Teacher implementation of trial-based functional analysis and differential reinforcement of alternative behavior for students with challenging behavior. *Journal of Behavioral Education, 25,* 1-11. doi:10.1007/s10864-015-9231-2

Hanley, G. P. (2012). Functional assessment of problem behavior: Dispelling myths, overcoming implementation obstacles, and developing new lore. *Behavior Analysis in Practice, 5,* 54-72. doi: 10.1037/t24967-000

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. doi: 10.1901/jaba.2003.36-147

Hartley, S. L., Sikora, D. M., & McCoy, R. M. (2008). Prevalence and risk factors of maladaptive behaviour in young children with autistic disorder. *Journal of Intellectual Disability Research, 52,* 819-829. doi: 10.111/j.1365-2788.2008.01065.x

Individuals with Disabilities Education Act, 20 U.S. C. 33 (1997).

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. doi:10.1901/jaba. 1994.27-197 (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2,* 3-20, 1982)

Iwata, B. A., & Smith, R. G. (2007). Negative reinforcement. In J. O. Cooper, T. E. Heron, & W. L. Heward (Eds), *Applied Behavior Analysis (2nd ed.* pp 374-391). Upper Saddle River, NJ: Pearson.

Johnston, J. M., & Pennypacker, H. S. (1980). *Strategies and tactics for human behavioral research.* Hillside, NJ: Eribaum.

Kelley, M. E., LaRue, R. H., Roane, H. S., & Gadaire, D. M. (2011). Indirect behavioral assessments: Interviews and rating scales. In W. W. Fisher, C. C. Piazza, H.S. Roane (Eds.), *Handbook of Applied Behavioral Analysis* (pp. 182-190). New York, NY: Guilford.

Kodak, T., Fisher, W. W., Paden, A., & Dickes, N. (2013). Evaluation of the utility of a discrete-trial functional analysis in early intervention classrooms. *Journal of Applied Behavior Analysis, 24,* 301-306. doi: 10.1002/jaba.2

Kunnavatana, S. S., Bloom, S. E., Samaha, A. L., & Dayton, E. (2013). Training teachers to conduct trial-based functional analyses. *Behavior Modification, 37,* 707–722. doi:10.1177/0145445513490950

Kunnavatan, S. S., Bloom, S. E. Samaha, A. L., Lingugariris-Kraft, B., Dayton, E., & Harris, S. K. (2013). Using a modified pyramidal training model to teach special education teachers to conduct trial-based functional analyses. *Teacher Education and Special Education, 36,* 267-285. doi: 10/1177/0888406413500152

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. doi:10. 1901/jaba.2012.45-579

Lambert, J. M., Bloom, S. E., Kunnavatan, S. S., Collins, S. D., & Clay, C. J. (2013). Training residential staff to conduct trial-based functional analyses. *Journal of Applied Behavior Analysis, 46,* 296–300. doi: 10.1002/jaba.17

Lambert, J. M., Lloyd, B. P., Staubitz, J. L., Weaver, E. S., & Jennings, C. M. (2014). Effect of an automated training presentation on pre-service behavior analysts' implementation of trial-based functional analyses. *Journal of Behavioral Education, 23,* 344-367. doi: 10.1007/s10864-014-9197-5

Larson, S., Lakin, C., Anderson, L., Kwak, N., Lee, J. H., & Anderson, D. (2000). Prevalence of mental retardation and/or developmental disabilities: Analysis of the 1994/1995 NHIS-D. *MR/DD Data Brief, 2,* 1-12.

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. doi: 10.1016/j.ridd.2009.10.020

Lloyd, B. P., Wehby, J. H., Weaver, E. S., Goldman, S. E., Harvey, M. N., & Sherlock, D. R. (2015). Implementation and validation of trial-based functional analyses in public elementary school settings. *Journal of Behavioral Education, 24,* 167-195. doi: 10.1007/s10864-014-9217-5

McDonald, J., Moore, D. W., & Anderson, A. (2012). Comparison of functional assessment methods targeting aggressive and stereotypic behavior in a child with autism. *The*

Australian Educational and Developmental Psychologist, 29, 52-65. doi: 10.1017/edp.2012.9

Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior, 37,* 149-155.

Michael, J. (1993). Establishing operations. *The Behavior Analyst, 16,* 191-206.

Michael, J. (2007). Motivating operations. In Cooper, J. O., Heron, T. E. & Heward, W. L. (Eds.), *Applied Behavior Analysis (2nd ed.* pp 374-391). Upper Saddle River, NJ: Pearson.

Rispoli, M. J., Burke, M. D., Hatton, H., Ninci, J., Zaini, S., & Sanchez, L. (2015). Training Head Start teachers to conduct trial-based functional analysis of challenging behavior. *Journal of Positive Behavior Interventions, 17,* 235-244. doi: 10.1177/1098300715577428jpbi.sagepub.com

Rispoli, M. J., Davis, H. S., Goodwyn, F. D., & Camargo, S. (2013). The use of trial-based functional analysis in public school classrooms for two students with developmental disabilities. *Journal of Positive Behavior Interventions, 15,* 180-189. doi: 10.1177/1098300712457420

Rispoli, M., Ninci, J., Burke, M. D., Zaini, S., Hatton, H., & Sanchez, L. (2015) Evaluating the accuracy of results for teacher implemented trial-based functional analyses. *Behavior Modification, 39,* 627-653. doi: 10.1177/0145445515590456

Rispoli, M. J., Ninci, J., Neely, L., & Zaini, S. (2014). A systematic review of trial-based functional analysis of challenging behavior. *Journal of Development and Physical Disabilities, 26,* 271-283. doi: 10.1007/s10882-013-9363-z

Schmidt, J. D., Drasgow, E., Halle, J.W., Martin, C. A., & Bliss, S. A. (2014). Discrete-trial functional analysis and functional communication training with three individuals with autism and severe problem behavior. *Journal of Positive Behavior Interventions, 16,* 44-55. doi:10.1177/1098300712470519

Sigafoos, J., & Meikle, B. (1996). Functional communication training for the treatment of multiply determined challenging behavior in two boys with autism. *Behavior modification, 20,* 60-84. doi: 10/1177/01454455960201003

Sigafoos, J., & Saggers, E. (1995). A discrete-trial approach to the functional analysis of aggressive behavior in two boys with autism. *Australia & New Zealand Journal of Developmental Disabilities, 20,* 287-297.

Thompson, R. H. & Borrero, J. C. (2011). Direct observation. In W. W. Fisher, C. C. Piazza, & H. S. Roane (Eds.), *Handbook of Applied Behavioral Analysis* (pp. 191-205). New York, NY: Guilford.

Totsika, V., Hastings, R. P., Emerson, E., Berridge, D. M., & Lancaster, G. A. (2011). Behavior problems at five years of age and maternal mental health in autism and intellectual disability. *Journal of Abnormal Child Psychology, 39,* 1137-1147. doi: 10.1007/s10802-011-9534-2

Tyrer, F., McGrother, C. W., Thorp, C. F., Donaldson, M., Bhaumik, S., Watson, J. M., & Hollin, C. (2006). Physical aggression towards others in adults with learning disabilities: Prevalence and associated factors. *Journal of Intellectual Disability Research, 50,* 295–304. doi: 10.1111/j.1365-2788.2005.00774.x

Wacker, D. P., Berg, W. K., Harding, & Cooper-Brown, J. C. (2011). Functional and structural approaches to behavioral assessment of problem behavior. In W. W. Fisher,

C. C. Piazza, H. S. Roane (Eds.), *Handbook of Applied Behavioral Analysis* (pp. 165-182). New York, NY: Guilford.

Watson, J. B., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology,* 3, 1-14.

Williamson, H. J., & Perkins, E. A. (2014). Family caregivers of adults with intellectual and developmental disabilities: Outcomes associated with U. S. services and supports. *Intellectual and Developmental Disabilities, 52,* 147-159. doi: 10.1352/1934-9556-52.2.147

Table 1

Conditions in the Traditional Functional Analysis

	Antecedent	**Consequence**
Attention		
	Attention deprivation	Brief corrective attention
Escape		
	Prompt to complete task	30-s escape
Control		
	Preferred items, no prompts, FT-30 s schedule of attention	No programmed consequence
Tangible		
	Removal of preferred items	30-s access to preferred item
Alone		
	Attention deprivation, no prompts, removal of preferred items	No programed consequence

Table 2

Conditions in the TBFA

	Control Segments	Test Segments
Attention		
	Continuous interaction	No interaction
	Moderately preferred items	
Demand		
	No interaction	Prompts to complete requests
	No preferred items	3-step prompting sequence
		Praise for compliance
Tangible		
	Preferred items available	Preferred item removed
	Interaction occurs every 30 s or if facilitated by child	No interaction
Ignore		
	No interaction	Identical to control
	No items available	

Table 3

Number of Individuals per Study Who were the Subjects of a TBFA

One	**Two**	**Three**	**Four**	**Five**	**Six**	**Ten**	**N/A**
McDonald et al., 2012	Rispoli et al., 2013	Austen , Groves, Reynish, & Francis, 2015	Lloyd et al., 2015	Kodak, Fisher, Paden, & Dickes, 2013	Flynn & Lo, 2016	Bloom et al., 2011	Kunnavutana, Bloom, Samaha, & Dayton, 2013
	Sigafoos & Meikle, 1996	Bloom et al., 2013		LaRue et al., 2010			Kunnavutana, Bloom, Samaha, Lingugariris-Kraft et al., 2013
	Sigafoos & Saggers, 1995	Chezan et al., 2014					Lambert et al., 2013
		Lambert, Bloom, & Irvin, 2012					Lambert et al., 2014
		Rispoli, Ninci et al., 2015					Rispoli, Burke et al., 2015
		Schmidt et al., 2014					

Table 4

Professions of Individuals Who Conducted TBFA Procedures across Studies

Researcher Only	**Teacher**	**Researcher and School Staff**	**Unspecified**
Bloom et al., 2011	Austen et al., 2015	Chezan et al., 2014	McDonald et al., 2012
	Bloom et al., 2013	Rispoli et al., 2013	
	Flynn & Lo, 2016	Schmidt et el., 2014	
	Kodak et al., 2013		
	Lambert et al., 2012		
	LaRue et al., 2010		
	Lloyd et al., 2015		
	Rispoli, Ninci et al., 2015		
	Sigafoos & Meikle, 1996		
	Sigafoos & Saggers, 1995		

Note. Studies focusing only on training are excluded from this table.

Table 5

Total Number of Trials Conducted per Condition across Non-Training Studies

Three Trials	**Ten Trials**	**Sixteen Trials**	**Twenty Trials**	**Variable Number of Trials**
McDonald et al., 2012	Austen et al., 2015	Sigafoos & Meikle, 1996	Bloom et al., 2011	Flynn & Lo, 2016*
	Bloom et al., 2013		Kodak et al., 2013	LaRue et al., 2010**
	Chezan et al., 2014		Rispoli et al., 2013	Lloyd et al., 2015*
	Lambert et al., 2012		Sigafoos & Saggers, 1995	Schmidt et al., 2014
	Rispoli, Ninci et al., 2015			

* Conducted TBFA until a clear pattern of behavior emerged.
** Conducted 10 to 20 trials per condition.

Table 6

TBFA Correspondence to the Traditional FA across Studies

	Exact Correspondence	**Partial Correspondence**	**No Correspondence**
Bloom et al., 2011	6 of 10 participants	0 of 10 participants	4 of 10 participants
LaRue et al., 2010	4 of 5 participants	1 of 5 participants	0 of 5 participants
Rispoli et al., 2013	0 of 2 participants	0 of 2 participants	2 of 2 participants

Note. Exact correspondence means that all of the functions identified in the TBFA and traditional FA are the same. Partial correspondence means that some of the functions identified in the TBFA are the same as the traditional functional analyses. No correspondence means that no functions identified in TBFA and traditional FA are the same.

Table 7

Effectiveness of Intervention Based on Function Identified in TBFA across Studies

	Effective Intervention	**Ineffective Intervention**
Austen et al., 2015	3 of 3 participants	0 of 3 participants
Bloom et al., 2013	3 of 3 participants	0 of 3 participants
Chezan et al., 2014	3 of 3 participants	0 of 3 participants
Flynn & Lo, 2016	6 of 6 participants	0 of 6 participants
Lambert et al., 2012	3 of 3 participants	0 of 3 participants
Lloyd et al., 2015	4 of 4 participants	0 of 4 participants
Rispoli, Ninci et al., 2015	3 of 3 participants	0 of 3 participants
Schmidt et al., 2014	3 of 3 participants	0 of 3 participants
Sigafoos & Meikle, 1996	2 of 2 participants	0 of 2 participants

Note. An intervention is considered to be effective if it results in a significant (i.e., 80% or more) decrease in the target behavior.

Table 8

Order of Test and Control Segments in TBFA across Studies

Pre-Control	**Post-Control**	**Randomized Order**	**Pre- & Post-Control**
Austen et al., 2015	Chezan et al., 2014	Kodak et al., 2013	Bloom et al., 2011
Bloom et al., 2013	LaRue et al., 2010		Lambert et al., 2013
Flynn & Lo, 2016	Lloyd et al., 2015		Lambert et al., 2014
Kunnavutana, Bloom, Samaha, & Dayton, 2013	McDonald et al., 2012		
Kunnavutana, Bloom, Samaha, Lingugariris-Kraft et al., 2013	Rispoli et al., 2013		
Lambert et al., 2012	Schmidt et al., 2014		
Rispoli, Burke et al., 2015	Sigafoos & Meikle, 1996		
Rispoli, Ninci et al., 2015	Sigafoos & Saggers, 1995		

Table 9

Duration of Trial Segments in TBFA across Studies

Up to 30-s	**Up to 1 min**	**Up to 2 min**	**Variable Duration**
Kodak et al., 2013	LaRue et al., 2010	Austen et al., 2015	Chezan et al., 2014
	Lloyd et al., 2015	Bloom et al., 2011	Flynn & Lo, 2016
	McDonald et al., 2012	Bloom et al., 2013	Schmidt et al., 2014
	Rispoli, Burke et al., 2015	Kunnavutana, Bloom, Samaha, & Dayton, 2013	
	Rispoli et al., 2013	Kunnavutana, Bloom, Samaha, Lingugariris-Kraft et al., 2013	
	Rispoli, Ninci et al., 2015	Lambert et al., 2012	
	Sigafoos & Meikle, 1996	Lambert et al., 2013	
	Sigafoos & Saggers, 1995	Lambert et al., 2014	

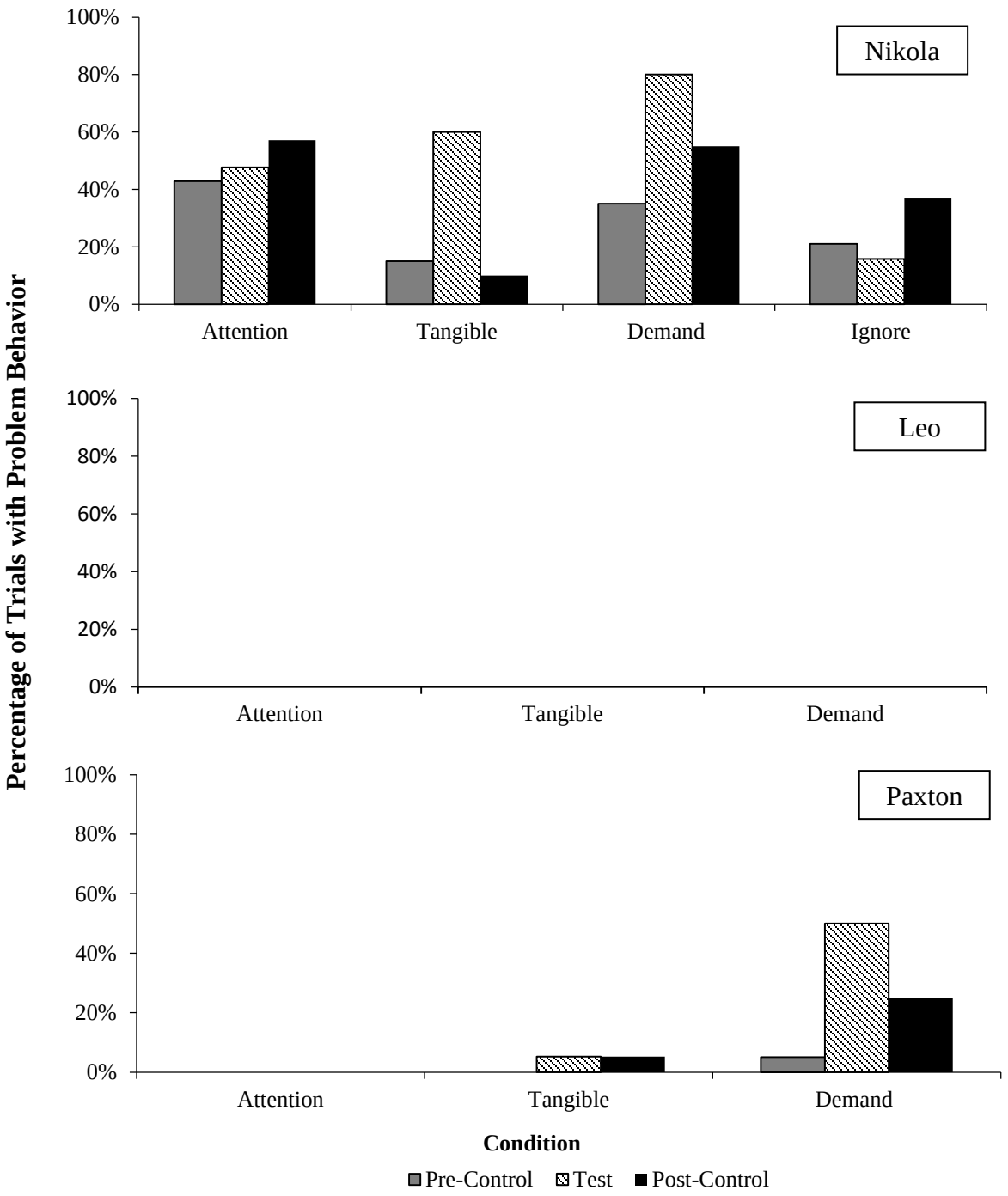
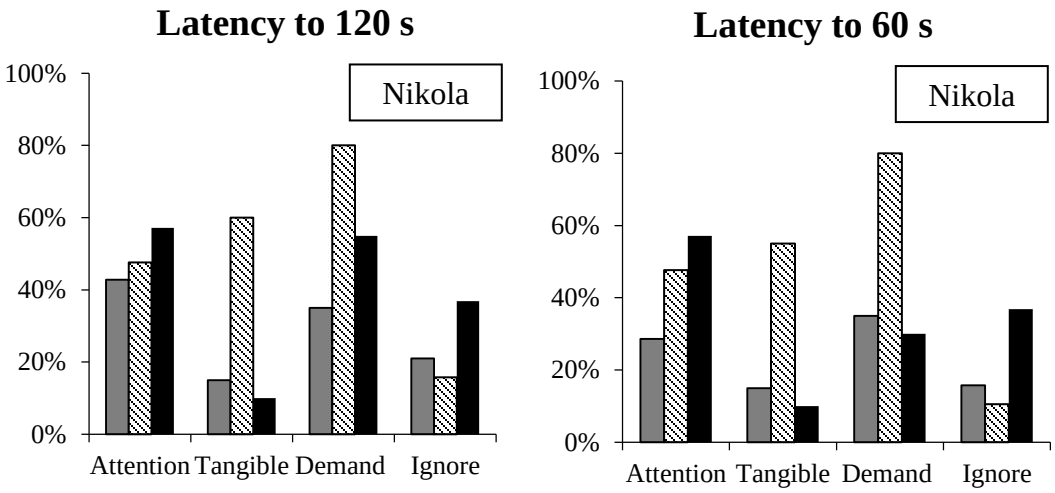


Figure 1. Proportion of trial segments in which problem behavior occurred.


Latency to 120 s
Nikola
100%
80%
60%
40%
20%
0%
Attention
Tangible
Demand
Ignore
Latency to 60 s
Nikola
100%
80%
60%
40%
20%
0%
Attention
Tangible
Demand
Ignore

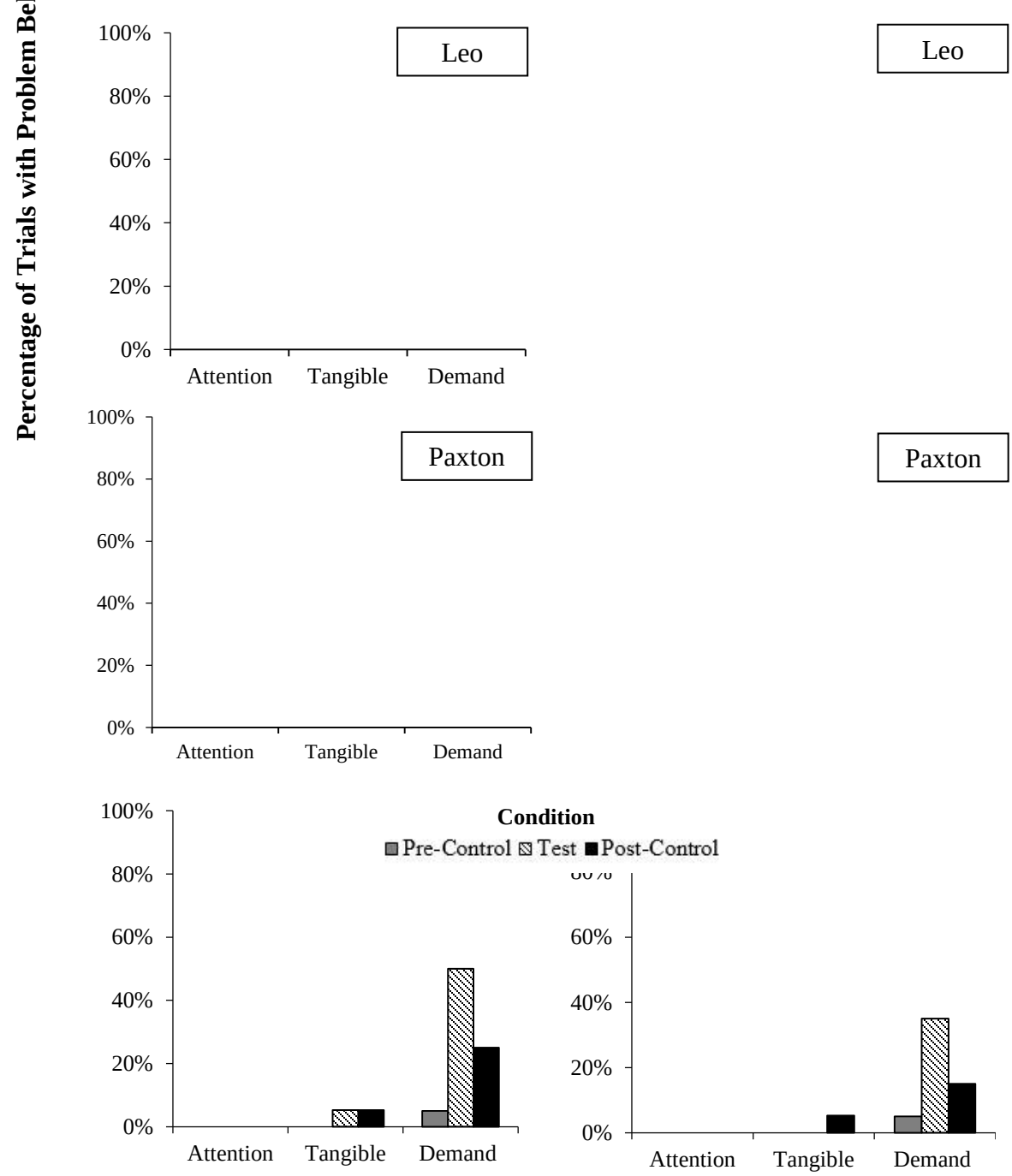


Figure 2. Proportion of trial segments in which problem behavior occurred within the allotted 120 s and first 60 s.

Appendix A

From: Dr. Lisa Curtin, Institutional Review Board Chairperson

RE: Notice of IRB Approval by Expedited Review (under 45 CFR 46.110)

Date: 12/10/2014

Study #: 14-0117

Study Title: Contributions of Functional Behavior Assessment to Intervention Development

Submission Type: Renewal

Expedited Category: (6) Collection of Data from Recordings made for Research Purposes,(7) Research on

Group Characteristics or Behavior, or Surveys, Interviews, etc.

Renewal Date: 12/10/2014

Expiration Date of Approval: 12/09/2015

The Institutional Review Board (IRB) renewed approval for this study for the period indicated above. The IRB found that the research procedures meet the expedited category cited above. IRB approval is limited to the activities described in the IRB approved materials, and extends to the performance of the described activities in the sites identified in the IRB application. In accordance with this approval, IRB findings and approval conditions for the conduct of this research are listed below.

Regulatory and other findings:

The IRB has determined that the research presents minimal risks to participants, adequate provisions are made for soliciting assent of minors, and obtaining the consent of one parent or guardian (45 CFR 46.408).

Approval Conditions:

Appalachian State University Policies: All individuals engaged in research with human participants are responsible for compliance with the University policies and procedures, and IRB determinations.

Principal Investigator Responsibilities: The PI should review the IRB's list of PI responsibilities. The Principal Investigator (PI), or Faculty Advisor if the PI is a student, is ultimately responsible for ensuring the protection of research participants; conducting sound ethical research that complies with federal regulations, University policy and procedures; and maintaining study records.

Modifications and Addendums: IRB approval must be sought and obtained for any proposed modification or addendum (e.g., a change in procedure, personnel, study location, study instruments) to the IRB approved protocol, and informed consent form before changes may

be implemented, unless changes are necessary to eliminate apparent immediate hazards to participants. Changes to eliminate apparent immediate hazards must be reported promptly to the IRB.

Approval Expiration and Continuing Review: The PI is responsible for requesting continuing review in a timely manner and receiving continuing approval for the duration of the research with human participants. Lapses in approval should be avoided to protect the welfare of enrolled participants. If approval expires, all research activities with human participants must cease.

Prompt Reporting of Events: Unanticipated Problems involving risks to participants or others; serious or continuing noncompliance with IRB requirements and determinations; and suspension or termination of IRB approval by external entity, must be promptly reported to the IRB.

Closing a study: When research procedures with human subjects are completed, please complete the Request for Closure of IRB review form and send it to irb@appstate.edu.

Websites:

1. PI responsibilities: http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/PI%20Responsibilities.pdf

2. IRB forms: http://researchprotections.appstate.edu/human-subjects/irb-forms

Appendix B

TBFA Quiz

Circle true or false for questions 1-10

1. The caregiver should provide the child a lot of attention in part 1 of the demand condition.
   True False
2. The child is not allowed to play with preferred toys in the ignore condition.
   True False
3. Eye contact is considered interacting with the child.
   True False
4. The caregiver should interact with the child in part 2 of attention.
   True False
5. If the child does not complete a task the first time the caregiver asks, the caregiver should show him/her how to complete the task.
   True False
6. The child is allowed to play with his/her favorite toy in part 2 of tangible.
   True False
7. The caregiver should respond to his/her child if he/she engages in problem behavior in the ignore condition.
   True False
8. The child is allowed to play with his/her favorite toys in the attention condition.
   True False
9. The child is allowed to play with his/her favorite toy in part 3 of tangible.
   True False
10. The caregiver should only ask the child to complete demands that he/she would normally complete.
    True False

Circle the correct answer for questions 11-20

11. In this condition(s), the child is allowed to play with his/her favorite toys in part 1, 2, and 3
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. All of the above
    f. None of the above
12. In this condition(s), the caregiver should not interact with the child only in part 2
    a. Attention

b. Demand
c. Tangible
d. Ignore
e. A and C
f. A and D

13. In this condition(s), the caregiver should ask the child to complete tasks in part 2
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. All of the above
    f. None of the above
14. In this condition(s), the child is only allowed to play with his/her favorite toys in parts 1 and 3
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. All of the above
    f. None of the above
15. In this condition(s), the caregiver should ignore problem behaviors in part 1, 2 and 3
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. All of the above
    f. None of the above
16. In this condition(s), the caregiver should respond to problem behavior how he/she normally would in part 1 and 3.
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. All of the above
    f. None of the above
17. In this condition(s), the caregiver should not interact with the child in part 1, 2, and 3
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore

e. All of the above
f. None of the above

18. In this condition(s), the caregiver should not interact with the child only in parts 1 and 3
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. All of the above
    f. None of the above
19. In this condition(s), part 2 will end if the child engages in problem behavior
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. All of the above
    f. None of the above
20. In this condition(s), parts 1 and 3 will end if the child engages in problem behavior
    a. Attention
    b. Demand
    c. Tangible
    d. Ignore
    e. A, B, and C
    f. All of the above

Fill in the blank for questions

21. In part 2 of the Demand condition, the caregiver should ask the child to complete a task every _____.
22. Talking, smiling and making eye contact are all considered _____ with the child.
23. At the beginning of part 2 in the attention condition, the caregiver should tell the child _____.
24. If the child engages in problem behavior in part 2 of the Demand condition, the caregiver should tell the child _____.

Please write a short answer for the following question

25. Please list the steps that the caregiver will take when the caregiver asks the child to complete a task.

Appendix C

Trial-Based Functional Analysis

The purpose of the trial-based functional analyses (TBFA) is to learn more about why your child might engage in problem behavior. The TBFA consists of role-plays designed to mimic how you typically interact with *your child*[1]. There are four role-plays: attention, demand, tangible, and ignore. In the attention condition we will be trying to learn whether your child engages in problem behavior to obtain attention from you. The demand condition tests whether problem behavior might be occurring to avoid engaging in less preferred activities, such as cleanup time. The tangible condition tests whether *your child* might engage in problem behavior when *he/she* loses access to preferred toys or activities. Finally, the ignore condition assesses what happens when your child does not have anything particularly fun to do and your attention is not available, such as when you are on the phone or trying to cook a meal.

Procedures for TBFA

Attention Condition. This condition will include three parts. In the first part, your child will be allowed to play with *a moderately preferred item*. You should remain close to *your child* (2-4 feet) and try to interact with *him/her* as much as you can. For example, you can talk to *him/her*, play with *him/her*, or make eye contact and smile. Try not to allow more than 5 seconds to pass without interacting with *your child*. If your child engages in *problem behavior*, respond as you normally would. When 2 minutes have passed we will ask you to tell *your child* that you have some work to do. This will mark the beginning of the second

[1] All information in italics will be modified for a given participants. For example, *your child* will be replaced with the child's name.

part of this condition. At this point we'd like you to remain near your child, but not interact with *him/her*. This will continue for 2 minutes unless your child engages in *problem behavior*. If *your child* engages in *problem behavior*, immediately interact with your child as you would if the behavior concerned you. For example, you might say, *"don't do that," or "stop, that hurts me."* From that point on we would like you to return to interacting with your child in a positive way for another 2 minutes. This will be the final part of this condition.

Demand Condition. This condition will consist of three parts. In the first part, *your child* will not be allowed to play with *moderately or highly preferred items*. You should remain close to your child (2- 4 feet), but you should not interact with *him/her*, including making eye contact. After 2 minutes, we will ask you to begin the second part of this condition. In this part, you should ask *your child* to complete tasks that you normally would ask *him/her* to complete. If *your child* does not complete the task within 5 seconds of the first time you ask, you should show *him/her* how to complete the task and ask your child once more to complete the task. If *your child* still does not complete the task within 5 seconds of your request to do so, you should help *him/her* complete the task by physically guiding *him/her* through the motions of completing the task. Once your child completes the task, you should praise *him/her* for doing what you asked of *him/her* and give *your child* a 5 second break before asking *him/her* to complete a different task. You will continue asking *your child* to complete tasks for 2 minutes or unless *he/she* engages in *problem behavior*. If *your child* engages in *problem behavior*, then you should tell *him/her* that *he/she* does not have to complete the task and the final part of this condition will begin. In the final part of this condition, you should remain close to your child, but do not interact with *him/her*.

Tangible Condition. This condition will have three parts. In the first part, your child will be allowed to play with *a highly preferred item*. If *your child* tries to interact with you, you should respond to *him/her*. Otherwise, you should interact with your child every 30 seconds. When 2 minutes passes, we will inform you that you should take *the highly preferred item* away from *your child*. This will begin the second part of this condition. In this part you should not interact with your child, including making eye contact. This part of the condition will last for two minutes unless *your child* engages in *problem behavior*. If *he/she* engages in *problem behavior*, then you should return *the toy* to your child immediately. This will mark the beginning of the final part of this condition.

Ignore Condition. This condition will consist of three back-to-back parts that are exactly the same. In this condition, your child should not have access to *preferred items*. You should remain close to your child (2-4 feet), but do not interact with *him/her*, including making eye contact. This condition will end after 6 minutes.

<u>Attention</u>

Part 1:

- *Your child* is allowed to play with *toys*.
- Play with *your child* and provide a lot of positive attention.
- If *problem behavior occurs*, respond to the *behavior* as you typically would.

Part 2:

- Begin by telling *your child*, “I have work to do.”
- Do not interact with *your child* unless *problem behavior* occurs.
- If problem *behavior occurs*, respond with a statement of verbal concern and then begin part 3.

Part 3:

- Play with *your child* and provide a lot of positive attention.

- If *problem behavior* occurs, respond to the *behavior* as you typically would.

Demand

Part 1:

- *Your child* is not allowed to play with *toys*.
- You should remain close to *your child*, but do not interact with *him/her*.
- If *problem behavior* occurs, ignore the *behavior*.

Part 2:

- Start the session by telling *your child* it is time to do work.
- Ask *your child* to complete tasks every 5 seconds.
- If *your child* does not complete the task within 5 seconds, show *your child* how to complete the task and ask *him/her* to complete it again.
- If *your child* still does not complete the task within 5 seconds of the second time you asked, help *him/her* complete the task by physically guiding *your child* through the motions.
- Praise *your child* once the task is complete and give your child a 5 second break from completing tasks.
- If *problem behavior* occurs, tell *your child* "you don't have to do that" and begin part 3.

Part 3:

- Remain close to *your child*, but do not interact with *him/her*.
- If *problem behavior* occurs, ignore the *behavior*.

Tangible

Part 1:

- *Your child* is allowed to play with *his/her favorite toy*.
- Respond to *your child* if *he/she* tries to interact with you. Otherwise, interact with *your child* every 30 seconds.
- Do not ask *your child* to complete any tasks.
- If *problem behavior* occurs, ignore the *behavior*.

Part 2:

- Begin this part by taking away *the toy* from *your child*.

- Do not interact with *your child*.
- If problem behavior occurs, return *the toy* back to *your child* and begin part 3.

Part 3:

- *Your child* is allowed to play with *his/her favorite toy*.
- Respond to *your child* if *he/she* tries to interact with you. Otherwise, interact with *your child* every 30 seconds.
- Do not ask *your child* to complete any tasks.
- If *problem behavior* occurs, ignore the *behavior*.

  .

Ignore

Part 1, 2 & 3

- *Your child* is not allowed to *play with toys*.
- You should remain close to *your child*, but do not interact with *your child.*
- If *problem behavior* occurs, ignore the *behavior*.

Vita

Cassandra Marie Standish was born in Savannah, Georgia to Lisa and Peter Standish. In 2007, she obtained her GED from Catawba Valley Community College. In 2011, she acquired her Associates in Arts from Cape Fear Community College in Wilmington, North Carolina. She enrolled at Appalachian State University in Boone, North Carolina the following spring. She graduated with her Bachelors of Science in Psychology in December 2013. In August 2014, Cassandra began working towards her Masters of Art in Experimental Psychology. In April 2016, Cassandra began working at Kennedy Krieger Institute. In August 2016, Cassandra graduated with her Masters of Art in Experimental Psychology from Appalachian State University. Cassandra has presented her research at ten national and regional conferences.