AN EVALUATION OF TRIAL-BASED FUNCTIONAL ANALYSES

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by

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AN EVALUATION OF TRIAL-BASED FUNCTIONAL ANALYSES

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Department of Psychology
Abstract

of

AN EVALUATION OF TRIAL-BASED FUNCTIONAL ANALYSES

by

Sarah A. Kohlman

In this study, the effectiveness of two different trial-based functional analysis methodologies were compared in a center-based setting. Three participants referred for problem behavior were exposed to both a Natural Trial-Based Functional Analysis and a Contrived Trial-Based Functional Analysis throughout their day. Results of these analyses were compared to each other and then to a Standard Functional Analysis. Correspondence was observed for all three participants. Further, an analysis of the duration of time it took to complete the Natural Analysis versus the Contrived Analysis indicated that the Contrived Trial-Based Functional Analysis might be both a more efficient and acceptable method to determine the function of problem behavior in natural settings.

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Date
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Chapter 1

INTRODUCTION

In the field of behavior analysis there are three main types of functional behavioral assessments that are used to determine the function of problem behaviors displayed by individuals. These include indirect assessments which involve the use of surveys or questionnaires (Durand & Crimmins, 1992), direct assessments, which consists of direct observation of problem behavior (Miltenberger, 2004) and finally, functional or experimental analyses in which environmental events are systematically manipulated under controlled conditions (Iwata et al., 1982/1994). All three methods have strengths and limitations which should be considered when choosing which type of assessment to use, however functional analysis methodology developed by Iwata et al. (1982/1994) has been found to be the most reliable and valid way to determine functions of problem behavior (e.g., Arndorfer & Miltenberger, 1993).

This method for evaluating problem behavior consists of a control condition and three test conditions. The test conditions check for social positive reinforcement (e.g., attention), social negative reinforcement (e.g., escape) and automatic positive reinforcement (e.g., self-stimulatory behavior) functions. The control condition is also known as the play condition, and consists of an environment that is rich in both preferred items and attention, and no demands are placed in an attempt to safeguard that no extraneous variables are evoking the problem behavior. If the function of the problem
behavior is not multiply controlled or maintained by automatic positive reinforcement, one would expect to see an absence of problem behavior in this condition since the condition is designed to ensure that the participant has access to reinforcement (e.g., attention, preferred items and no demands).

**Alternative Methods**

The original Functional Analysis design consisted of 10 to 15 min conditions that were rotated and repeated in a multielement design (Iwata et al., 1982/1994). These procedures can be time consuming, which has been noted as a criticism in the literature (e.g., Alexrod, 1987) and may partially account for why Functional Analyses are not used frequently in applied settings. As a solution to this constraint, a Brief Functional Analysis (Northup et al., 1991) was developed which involves fewer sessions of a shorter duration (5 min as opposed to 10 or 15 min). This assessment can be completed in much less time than a Standard Functional Analysis, and has been reported to identify empirical functional relations in 50% of cases (Derby et al., 1992). Further, this method allows for Functional Analyses to be conducted in cases such as consultation services or outpatient treatment programs.

Another method used to address how time consuming Functional Analyses can be is single-function testing (Iwata & Doizer, 2008). This type of analysis is conducted when anecdotal reports or informal observations suggest that the problem behavior is maintained by one function; the condition that tests for the suspected function is evaluated against a control condition, in a multielement design in which test and control
sessions are rapidly alternated. If the suggested function is verified, a treatment plan is then developed and implemented; however if results do not corroborate anecdotal reports or informal observations, then further testing would need to be conducted.

**Additional Modifications**

Since the development of Functional Analysis methodology by Iwata et al. (1982/1994), modifications to the procedures have been made in order to identify specific or idiosyncratic environmental variables of various problem behaviors observed in clinical settings. Such modifications include structuring the test conditions to specifically target environmental situations that have been observed to evoke the behavior, such as baiting the environment to evoke pica (Piazza et al., 1998) or testing environment-behavior relations after identifying specific stimuli that evoke problem behavior (Van Camp et al., 2000). Modifications have also been made to address the risk of an individual being harmed during the analysis; if an individual engages in severe self-injurious behavior, a Standard Functional Analysis may be difficult to implement due to the harm that may be imposed by the individual.

Smith and Churchill (2002) developed a Functional Analysis method in which behaviors that reliably occurred prior to self-injurious behavior and were determined to be within the same response class were identified. These are termed precursor behaviors. The authors conducted a Functional Analysis on these precursor behaviors instead of the target self-injurious behavior as to reduce any risk of harm to the individual. Results suggest that this method may be helpful in reducing the number of self-injurious
behaviors individuals engage in while still identifying the function maintaining the problem behavior, as was demonstrated for the four participants in the study, in which the problem behavior occurred at a greatly reduced rate during the precursor analysis. Najdowski et al., (2008) extended this line of research to determine if treatment based on results of precursor functional analyses would effectively reduce severe problem behavior. The treatments implemented based on functions identified by this kind of functional analysis eliminated precursor behaviors while possibly preventing the occurrences of the severe target problem behaviors.

Another variation of the original Functional Analysis methodology is what is known as a Latency Functional Analysis, developed by Thomason, Iwata, Neidert, and Roscoe (2008). The procedures employed in this study consisted of measuring the response rates of the target behavior within sessions. Conditions were arranged, as they would be for a Standard Functional Analysis; however, upon the first demonstration of the target behavior the condition was terminated. This methodology is also used for individuals with severe self-injurious behaviors, and when compared to results of a Standard Functional Analysis, results corresponded in nine out of 10 cases. An advantage of a Latency Functional Analysis is that fewer occurrences of the target behavior occur, in addition to requiring less time to complete.

A final limitation of functional analyses that is often discussed pertains to the environmental control required. Traditionally, Functional Analyses are conducted in a highly controlled environment that lacks typical environmental distracters that are found
in a home or school setting (referred to as an analogue functional analysis). The purpose of this is to eliminate confounding variables, such that the influence of specific antecedent and consequent events can be isolated. However, by conducting a Functional Analysis in this manner, other factors that may evoke the problem behavior may not be present. Steps have been taken to extend the generality of Functional Analyses to natural environments (e.g., Mace & Lalli, 1991). These steps have lead to parents being trained to implement a Functional Analysis in the home environment (e.g., Najdowski, 2008), as well as the examination of Trial-Based Functional Analyses in school and vocational environments (e.g., Bloom et al., 2011; Wallace & Knights, 2003; Sigafoos & Saggers, 1995).

**Trial-Based Functional Analysis**

Trial-based Functional Analyses were evaluated in a classroom setting, in an early study conducted by Sigafoos and Saggers (1995). The procedures they outlined consisted of a number of probes that were included in ongoing classroom activities spread throughout a week. These probes, or trials, consisted of a 1 min test trial in which an establishing operation (EO) and contingency for a problem behavior were in place. This test condition was followed by a 1 min control trial, which included continuously available reinforcement. In this study, trials were terminated if and when the problem behavior occurred. Results indicated that for two participants, their behavior was maintained by social-positive reinforcement. Although these results were encouraging, several limitations warranted further investigation, including the limited number of
participants and the fact that results were not compared to a Standard Functional Analysis.

In a study conducted by Bloom, Iwata, Fritz, Roscoe and Carreau (2011), the application of a Trial-Based Functional Analysis was further examined by evaluating a variation of the procedures described by Sigafoos and Saggers (1995), by comparing results obtained from a Trial-Based Functional Analysis with those obtained from a Standard Functional Analysis and increasing the number of participants to ten. In the Trial-Based condition, opportunities to conduct trials presented themselves naturally across the day. All participants were exposed to attention and demand trials, and only those for whom a tangible function was suspected, were exposed to this condition. Participants who demonstrated aggression were not exposed to ignore trials, with the exception of one participant. Trials included three, 2-min trials, an initial control, followed by the test trial, and a final control trial. During the first control trial the reinforcer was freely available and problem behavior produced no consequences. In the second trial, or the test condition, the EO was present, and problem behavior produced a specified consequence. The third trial was identical to the first trial. All test conditions were conducted similar to procedures described by Iwata et al. (1982/1994); however they were presented in the natural environment. Across all test conditions, participants were allowed to move freely in their environment. If the participant interacted with a peer or classroom staff during the test trial, the trial was considered failed and had to be conducted again. After the Trial-Based portion of the study was completed a Standard
Functional Analysis was conducted for each participant based on procedures described by Iwata et al. (1982/1994).

Results from the comparison of these two methods demonstrated a match in functions for six of ten participants, with one additional partial match. This suggests that Trial-Based Functional Analyses may be an alternative method for identifying the function of problem behaviors when traditional Functional Analyses cannot be conducted. Additional strengths found in this study are the efforts that were taken to analyze data in an objective manner by having blind doctoral level students analyze data to determine the function. Also, by conducting the trial-based assessment in the environment where the problem behavior occurred allowed for nuances in the classroom to be present that may have also controlled the problem behavior, which would be absent in a more contrived setting.

Although one of the strengths of this study is that it was conducted in the natural environment, this also poses limitations. It should be noted that contingencies in the natural environment, such as teachers who have implemented previously developed behavior plans, could in fact suppress the target behavior that needs to be observed. This type of assessment may be most useful for participants who are new to a program and do not have a long history with any particular staff members in the environment. This is also important so that any ongoing interventions need not be suspended in order to observe the target behavior, as was suggested in the study. Also, while conceptually it would seem that the Trial-Based method could be completed in less cumulative amount of time than
the Standard Functional Analysis, it in fact required approximately 45 min longer to complete. A Trial-Based Functional Analysis could take up to 5 hours to complete if the behavior occurs at a low rate, and may not be the best method of analysis for those types of behaviors. Additionally, conditions lasted 2 min each, and were ordered control-test-control. Findings indicated that the second control condition was not necessary given the fact that a possible carryover effect may bias data.

In another study conducted by Wallace and Knights (2003), a brief Functional Analysis conducted in the natural vocational environment, consisting of 2-min sessions was compared to results of an extended Functional Analysis consisting of 10-min sessions in a different therapy room for three participants. Conditions for the brief Functional Analysis consisted of a 1-min test condition followed by a 1-min control condition, using a modified pairwise design and were compared to the extended Functional Analysis within a multielement design. Results indicated that brief Functional Analyses might be effective in identifying maintaining variables of problem behavior in a vocational setting. Further, this study reported the total duration it took to complete both analyses, an average of 37 min for the brief Functional Analysis, and 310 min for the extended analysis.

In a recent study conducted by Bloom et al. (2013), teachers were trained to conduct the Trial-Based Functional Analysis, and interventions were designed based on results obtained from the Trial-Based Functional Analysis for 3 participants utilizing the procedures described in Bloom’s (2011) study. All interventions developed from results
of the Trial-Based Functional Analyses resulted in a decrease in problem behavior and an increase in alternative behaviors for all 3 participants.

As modifications to not only Standard Functional Analysis, but Trial Based Functional Analysis continue to be examined through empirical methods, it is important to remember what the current practices have evolved from. Identifying multiple empirically proven methods for determining the function of behavior will aid the field of Behavior Analysis in creating positive change for a greater number of individuals. To date, no one has compared the effectiveness of Contrived and Natural Trial Based Functional Analysis in a Center Based environment with young children. Results from this study could potentially provide practitioners with a better method to address problem behavior and achieve a better quality of life at an earlier age.

**Purpose of the Study**

Given the number of modifications that have been studied regarding Functional Analysis methodology, the purpose of this study was to further investigate a more efficient way to conduct this type of analysis in a natural setting. By replicating, modifying and extending research conducted by Sigafoos and Sagger (1995), Wallace and Knights (2003) and Bloom et al., (2011), the effectiveness of a Trial-Based Functional Analysis was further evaluated in a Center-Based setting. A Natural Trial-Based Functional Analysis and Contrived Trial-Based Functional Analysis were conducted initially, followed by a Standard Functional Analysis in order to compare results obtained, as well as to eliminate exposure to session contingencies and avoid
biased results in favor of the Trial-Based analysis. Additionally, the total time it took to complete each analysis was compared.
Chapter 2

METHOD

Participants and Setting

Three boys (William, 4-years 2-months; George, 4-years 6-months; and Blaine, 2-years 8-months) who had been diagnosed with autism spectrum disorder and attended a Center-Based program participated. Both the Contrived and Natural Trial-Based Functional Analyses were conducted in the participants’ usual programming building which consisted of two separate large rooms set up similar to a classroom, a number of tables and chairs for other students and staff, as well as an area in the corner filled with toys and books. The Standard Functional Analyses were conducted in a different room in a separate building at the same location, equipped with a table, a large desk, chairs, lockers, and a variety of items required to conduct the necessary conditions.

Measurement of the Dependent Variable

The target behavior in this study was operationally defined for each participant and was identified as tantrum behavior. William’s (4-years 6-months) tantrum behavior included crying with or without tears, yelling “no” once or screaming, and any combination of two or more of the following: twisting away in a chair, sliding out of a chair, falling to the ground, repeatedly saying “no” three or more times, pushing items away and placing open palms on his face. George’s (4-years 2-months) tantrum behavior included crying with our without tears, vocalizations that were audible from the next
room (i.e., screaming), falling to the floor, hitting his face with an open hand(s), spitting, hitting others with open hands, kicking with one or both feet while crying, swinging his arms while crying, and/or hitting hard surfaces (e.g., table top) with an open hand while screaming. Blaine’s (2-years 8-months) tantrum behavior included crying with or without tears, two or more whiny coughs and light foot stomping or kicking with a furrowed brow, hitting his head or face with an open hand, hitting his head lightly onto the table with enough force to make a sound but not leave a mark, throwing an object at the therapist, hitting, kicking, or hitting his head against the therapist.

**Interobserver Agreement and Treatment Integrity**

An independent observer collected data during 100% of Williams’s Natural Trial-Based Functional Analysis, and 60% of his Contrived Trial-Based Functional Analysis. For George, an independent observer collected data during 50% of his Contrived Trial-Based Functional Analysis. For Blaine, an independent observer collected data during 40% of his Natural Trial-Based Functional Analysis, and 50% of his Contrived Trial-Based Functional Analysis. For the Standard Functional Analysis, an independent observer collected data for William, George and Blaine for 37%, 30% and 31% of sessions respectively. Reliability for the Trial-Based Functional Analysis sessions was determined by dividing the number of trials in which both observers recorded either the presence or absence of the target behavior in each trial by the total number of trials across sessions and then multiplying by 100 to obtain a percentage of agreement. For William, interobserver agreement (IOA) was 100% for both the Natural and Contrived Trial-Based
Functional Analysis. For George, average IOA was 99% for the Contrived Trial-Based Functional Analysis, ranging from 98% to 100%; he did not receive a Natural Trial-Based Functional Analysis for reasons discussed below. For Blaine, IOA was 100% for both the Contrived Trial-Based Functional Analysis and Natural Trial-Based Functional Analysis.

IOA data recorded during the standard analysis was calculated using the frequency within interval method (Miltenberger, 2008) by first partitioning the session into 10-s intervals; agreement for each 10-s interval was then calculated by dividing the smaller frequency by the larger frequency and multiplying by 100. The resulting quotients were then summed and divided by the total number of intervals. For William, George, and Blaine, average IOA was 99% (91% - 100%), 98% (90% - 100%), and 96% (81% - 100%), respectively.

The same observer was also present to collect data on treatment integrity measures (i.e., therapist implementation of consequences, or participants contact with tangibles or attention that was extraneous to the condition) for William, George and Blaine for 100%, 40% and 33% of all Trial-Based Trials, respectively. Integrity was calculated by dividing the total number of trials that the observer scored that treatment was implemented correctly divided by the total number of trials the observer scored that treatment was either implemented correctly or not implemented correctly. Since a third observer was not available to collect treatment integrity data, these numbers are based on
the observers data, and IOA for treatment integrity could not be calculated. The average treatment integrity across all participants was 99%, ranging from 94% to 100%.

**Experimental Design**

A mulitelement design was used to conduct both the Natural and Contrived Trial-Based Functional Analysis and the Standard Functional Analysis.

**Procedures**

**Trial-Based Functional Analysis**

In an effort to ensure procedural consistency, one trained graduate student in Applied Behavior Analysis conducted all sessions in a center-based program, located at Applied Behavior Consultants Inc. campus. This graduate student was different than the graduate student who conducted the Standard Functional Analysis in order to control for any bias that may occur from being involved in both analyses. Additionally, a third-party (blind BCBA) conducted on-going visual analysis of data for both trial-based functional analyses. Trials were presented throughout the day, 10 times per condition across 2-6 days. For the Natural Trial-Based Functional Analysis, conditions were conducted at naturally occurring times throughout the day. For example, the tangible condition was conducted during free play, and demand trials were presented during structured session time. Additionally, no more than two successful trials of the same condition were run consecutively, and the number of trials in one condition was never allowed to get more than three trials beyond the other conditions. All participants were exposed to demand, attention, and ignore conditions, and only those for whom a tangible function was
suspected were exposed to tangible trials. This means that participants were exposed to as few as 30 trials, and as many as 80 trials, depending on the hypothesized function of the target behavior and if the trial-based data was differentiated. If any variable interfered with a test condition the trial would be considered failed. This could include the participant receiving attention or an item during either the test or control segment of a trial. Criterion for failed trials is described in detail below. All failed trials were conducted again at a later time.

The Contrived Trial-Based Functional Analysis was conducted under similar conditions with a few procedural modifications. This included running the trials in the same order as the conditions occurred in the Standard Functional Analysis, one after another until all necessary trials were completed for the session. During the analyses, participants received 30-s play breaks between conditions, and 2-min play breaks after every 4 trials so that participants were able to engage in their scheduled snack routines or toileting programs if necessary. Additionally, trials were conducted in the natural environment, however in an area separate from the main classroom. To control for any sequencing effect, conditions were counterbalanced, where one participant was exposed to the Natural Trial-Based Functional Analysis first, while the remaining two were exposed to the Contrived Trial-Based Functional Analysis first.

Several modifications to the procedures used by Bloom et al. (2011) were made based on their findings. A test condition lasting 3-min was followed by a control condition that lasted 1-min. The authors suggested that a lengthier test condition may
potentially improve accuracy in the analysis by exposing the participants to more time with potential EOs. If problem behavior occurred in the test trial, 15 s was allowed to elapse from the end of the test condition to the beginning of the control condition in order to control for any carry over effect. For the second and third participant, an additional procedural modification was made to account for any carry over effects, which consisted of a delay between the termination of the test condition and onset of the control condition. Specifically, if the problem behavior continued for longer than 15 s, the start of the control condition was delayed until the problem behavior was absent for 5 s. Additionally, participants received a Multiple Stimuli without Replacement (MSWO) preference assessment (DeLeon & Iwata, 1996) of items that were present in the environment. The MSWO preference assessment was conducted prior to the beginning of both trial-based and standard functional analyses in order to represent participants’ current tangible preferences.

**Ignore**

During the test trial the participant was left alone for 3 min, without access to any preferred or work materials. No eye contact or other form of attention was provided, however the therapist remained in close proximity to the participant. The problem behavior produced no consequences, and the trial continued for the entire 3-min. The test trial was considered failed if the participant contacted attention, preferred items, a demand was placed or close proximity was not maintained. Throughout the 1 min control trial that followed, continuous attention was provided, and the participant was given
access to one highly preferred item. The therapist maintained close proximity, no
demands were placed, and physical contact was delivered occasionally. The test trial was
considered failed if proximity was not maintained, a demand was placed, or attention and
a highly preferred item were not delivered.

Attention

During the test trial, the therapist was seated with the participant and a moderately
preferred item was available. The therapist then stated “I have some work to do” and
turned away for 3-min, or until the problem behavior occurred. If the participant left their
seat at any time the therapist maintained a close physical proximity; however no
interaction occurred. If the participant engaged in any activities after leaving their seat
that interfered with the 3-min trial (e.g., they interacted with a peer or other staff
member), the trial was considered failed and that was noted on the data sheet. Throughout
the 1-min control trial the therapist delivered attention and occasional physical contact. If
the participant moved away from the work area in the control trial, the therapist
maintained close proximity. Problem behavior during the control condition produced no
consequences, and the control condition was considered failed if the participant contacted
attention from anyone other than the assigned therapist, contacted another highly
preferred item, or if the therapist placed a demand.

Demand

During the test trial, the participant was seated with the therapist and only items
related to demand tasks were present. The therapist made a statement “It’s time to work”
or a related task instruction. Throughout the 3-min test trial continuous work demands were placed, using a 3-step prompt sequence if necessary (e.g., vocal, model, physical). Neutral praise was provided for correct task completion. If the problem behavior occurred in the test trial the demand was stopped and the therapist stated numerous times that the task was completed, such as “Okay, you don’t have to, we’re all done”, removed all materials, turned away, and the trial was terminated. If problem behaviors occurred that were not included in the operational definition (e.g., George threw toys), the behavior was ignored and demands continued to be placed. If the participant attempted to leave the work area their attempts were blocked by the therapist placing their body in the path the participant was attempting to take, maintaining close proximity, while continuing to place demands. The test trial was considered failed if the therapist continued to place the demand after the targeted problem behavior occurred or if proximity was not maintained. During the control trial no items were present and the therapist sat next to the participant, but turned away. If the participant attempted to leave the area the therapist maintained close proximity and problem behaviors produced no consequences. The control trial would be considered failed if proximity was not maintained, or the participant contacted attention or tangibles.

**Tangible**

Prior to the test trial, the participant had access to a highly preferred item for 1-min. After 1-min had elapsed, the test trial began with the therapist removing the toy from the participant with a statement such as “my turn,” or “we’re all done with that
now.” Throughout the 3-min condition the therapist commented on the toy or environment every 30 s, and responded to any statements made by the participant. No questions were asked to the participant, and no demands were placed. The purpose of commenting during this trial was to eliminate (or reduce) any motivating operations for attention as a reinforcer (S.E. Bloom, personal communication, November 27, 2012). If the problem behavior occurred in the test trial, the toy was immediately returned to the participant, and the trial was terminated. A test trial was considered failed if proximity was not maintained, if the therapist asked a question or placed a demand, if attention was not given throughout the trial, or the toy was not delivered contingent upon the problem behavior. During the 1-min control trial the participant was given access to the highly preferred toy, and the therapist commented on the toy or environment at least once every 30 s. No questions were asked and no demands were placed on the participant, and the therapist responded if the participant spoke with them. No consequences were delivered for problem behavior. The control trial was failed if a demand was placed, attention or preferred items were not given, or proximity was not maintained.

**Standard Functional Analyses**

Participants were exposed to a series of conditions based on those described by Iwata et al. (1982/1994), which were arranged in a multielement design. The Standard Functional Analysis was conducted on the same campus but in a different location that was appropriate for this type of analysis. The Standard Functional Analysis was conducted after the trial-based functional analyses over the course of 3-4 days. The
Standard Functional Analysis consisted of at least 4 sessions per condition, run in the order of ignore, attention, play, demand, and then tangible if necessary.

**Ignore**

The participant was seated alone without any materials present in the environment, other than that which could not be removed for 10 min. No consequences were delivered if the participant engaged in the target behavior.

**Attention**

The therapist was seated with the participant, who had access to a moderately preferred item. The therapist stated that she “had work to do” and turned away from the participant. If the participant engaged in the target behavior, the therapist delivered a brief statement of concern and light physical contact for 15 s.

**Play (Control)**

The participant had continuous access to at least one preferred item and the therapist delivered attention and gentle physical contact at least once every 30 s. If the participant spoke to the therapist the therapist would respond and interact. No consequences were delivered for problem behavior.

**Demand**

The therapist was seated with the participant and delivered instructions based on current lessons. Prompts were delivered using a three step prompting hierarchy (e.g., verbal, model and physical), allowing for 5 s between prompts. If the participant complied with the instruction, brief neutral praise was delivered. If the participant
engaged in the target behavior, the therapist removed any work materials and stated, “You don’t have to work” and turned away from the participant for 30 s.

**Tangible**

Prior to the start of the condition, the participant had access to a highly preferred item for 2 min. After 2 min had elapsed, the condition began with the therapist removing the toy from the participant with a statement such as “my turn.” Attention, in the form of a brief verbal comment about the toy or environment, was delivered at least once every 30 s. If the participant engaged in the target behavior, the therapist delivered access to the preferred item for 30 s.

**Data Analysis and Outcome Comparisons**

Differentiation for the natural and contrived trial-based functional analyses was determined by a 30% difference between test and control conditions. The percentage of responding was calculated by dividing the number of trials that problem behavior occurred in divided by the total number of trials completed. Results of these analyses were then compared to results of the Standard Functional Analysis in order to determine which trial-based functional analysis produced the most similar results to the Standard Functional Analysis.
Chapter 3

RESULTS

Figure 1 displays data for the first participant, William. During the Natural Trial-Based Functional Analysis, tantrum behavior occurred most often during the demand-test trials. Although some tantrum behavior occurred during the demand-control trial, this was possibly due to a carry-over effect from the test condition, which prompted later changes in the procedure. Anecdotally, responding that occurred in the attention-test trial was due to William reacting to the loud crying of another child in the environment. During William’s Contrived Trial-Based Functional Analysis, tantrum behavior occurred most often during the demand-test trial again, and minimal responding occurred in the ignore-control trial. During the Standard Functional Analysis, tantrum behavior occurred only during the demand condition. Data from all three analyses indicated that William’s tantrum behavior was maintained by social-negative reinforcement (escape).

Figure 2 displays data for the second participant, George. George started with the Contrived Trial-Based Functional Analysis. Differentiation was observed in the demand-test and tangible-test trial, however responding was not clear in the ignore-test trial. Contrived trials began at George’s desk; however four out of the first five trials were failed due to an inability to maintain proximity with the participant, and the participant gaining access to tangible items outside of the therapist’s control. This was a substantial number of failed trials in comparison to the first participant (William). Therapists then
moved George to a more confined space for the remainder of the trials. The analysis was successfully completed with this modification, although there were an additional three trials failed. It was then decided George would move immediately to the Standard Functional Analysis in order to avoid the likelihood of a large number of failed trials in the Natural Trial-Based Functional Analysis. Anecdotally, the intensity of George’s problem behavior was increasing outside of the Contrived Trial-Based Functional Analysis. This also supported the decision to move to the Standard Functional Analysis instead of moving forward with the Natural Trial-Based Functional Analysis. During George’s Standard Functional Analysis, responding was observed in all conditions, providing evidence that his tantrum behavior was multiply-controlled. An increasing trend was observed in the attention condition of the Standard Functional Analysis, a function that was not clearly identified in the Contrived Trial-Based Functional Analysis.

Figure 3 displays data for the third participant, Blaine. Blaine started with the Contrived Trial-Based Functional Analysis. Differentiation was observed, in both the demand-test and ignore-test trials. In the attention condition, responding was observed more in the control trials than the test trials. In the first 30 trials of the Natural Trial-Based Functional Analysis, differentiation was not observed in any condition. This was likely due to Blaine being ill during testing. As reported by Center Based staff, there was one day during the first set of trials when Blaine was inconsolable both prior to and after testing was complete, meaning he was demonstrating behavior that met the operational definition, regardless of attempts to get him back to baseline levels. His physiological
Figure 1. Results of William’s natural trial-based functional analysis, contrived trial-based functional analysis, and standard functional analysis.
Figure 2. Results of George’s contrived trial-based functional analysis and standard functional analysis.
state could have affected his responding during testing. His scores were as follows: attention, 20% in test and 20% in control; demand, 30% in test and 20% in control; and ignore, 30% in test and 10% in control. A second Contrived Trial-Based Analysis was conducted once the participant was well, consisting of 10 trials for each condition. Differentiation was observed in the demand condition, while responding was equal in both the test and control for attention, and ten percent higher in the ignore-test trial than the ignore-control trial. Both Trial-Based Analyses indicated that Blaine’s problem behavior was maintained by social negative reinforcement, however with responding occurring in all conditions his behavior appeared to be multiply controlled. This may have been attributed to his operational definition. Anecdotally, staff reported that Blaine engaged in whining throughout most of his day, even when he was physically well. Although we attempted to set a criterion in which we would consider his whining problem behavior, (i.e., including a furrowed brow and kicking), excluding this response topography may have produced more clear results. Alternatively, responding in the attention and ignore conditions was likely due to the environmental influences, and may be functions that should be addressed in that environment. In the Standard Functional Analysis, Blaine’s responding occurred consistently in the demand condition, also suggesting that his problem behavior was maintained by social negative reinforcement (escape). There was limited responding in the attention and ignore conditions.

Figure 4 displays the time in minutes it took to complete the following for each participant: total duration of each analysis, time spent preparing for Trial-Based
Functional Analyses (e.g., preference assessment, preparing materials, and environment, etc.) and total duration for the Standard Functional Analysis. For William, it took a total of 115 min to complete the Natural Trial-Based Functional Analysis, compared to a total of 113 min to complete the Contrived Trial-Based Functional Analysis. However, a total of 303 min was spent conducting and preparing the Natural Trial-Based Functional Analysis, compared to 201 min to conduct and prepare for the Contrived Trial-Based Functional Analysis. A total of 255 min was spent preparing and conducting the Standard Functional Analysis. For George, it took a total of 139 min to complete the Contrived Trial-Based Functional Analysis, and a total of 340 min conducting and preparing the Contrived Trial-Based Functional Analysis. A total of 329 min was spent preparing and conducting the standard functional analysis. For Blaine, it took a total of 111 min to complete the Contrived Trial-Based Functional Analysis, and 107 min to complete the Natural Trial-Based Functional Analysis. A total of 320 min and 309 min were spent conducting and preparing the Contrived Trial-Based Analysis and Natural Trial-Based Functional Analysis, respectively. A total of 222 min was spent preparing and conducting the Standard Functional Analysis.
Figure 3. Results of Blaine’s contrived trial-based functional analysis, natural trial-based functional analysis, and standard functional analysis.
Figure 4. The graphs depict the total duration to run the trials, total time spent at the center-based location, and the total time to complete the standard functional analysis for William, George and Blaine.
Chapter 4

DISCUSSION

Over the course of more than three decades, the analogue Functional Analysis as described by Iwata et al. (1982/1994) has been studied and modified in order to find the most efficient way to empirically determine the function of behavior (Beavers et al., 2012). Numerous methodologies have been examined to provide practitioners with more practical procedures to analyze the function of problem behaviors in applied settings. A Trial-Based Functional Analysis extends this line of research, while at the same time combining effective, empirically proven methods that have been studied over the years. This includes components of the Latency Functional Analysis (Thomaso, Iwata, Neidert, & Roscoe, 2008), as in both methods the conditions are terminated when the problem behavior occurs, allowing for less time to complete the procedure and less client exposure to the experimental conditions. Additionally, Trial-Based Functional Analyses are conducted in the natural environment (Mace & Lalli, 1991) and could be further modified to incorporate single-function testing (Iwata & Doizer, 2008) if determined to be appropriate.

We compared results obtained from two types of Trial-Based Functional Analyses conducted in participants’ natural environments to results obtained from a Standard Functional Analysis conducted in the traditional controlled setting. Results across these analyses generally correspond for all three participants. These findings further support
Trial-Based Functional Analysis as an effective methodology in determining the function of problem behavior if conducting a Standard Functional Analysis is not practical or feasible. Additionally, by comparing the duration of time and results of a Contrived Trial-Based Analysis to a Natural Trial-Based Analysis, results suggest that the Contrived Trial-Based Analysis can be completed in less time, approximately 80 min on average, while still accurately identifying the function of problem behavior. Additionally, the fact that the conditions were arranged in the Contrived Trial-Based Analysis in the same order as Iwata’s Standard Functional Analysis may aid in the necessary EO’s being present during the analysis, however additional research is required. Further, the Natural Trial-Based Functional Analysis may not be appropriate for children whose behavior is multiply controlled and have a high activity level, as was the case with George. Many failed trials and extensive modification to the environment may in fact make this method more cumbersome, lacking the characteristics that define a Natural Trial-Based Functional Analysis. These modifications were required because George was constantly contacting materials in his environment that were interfering with the analysis. For example, he attempted to remove a fire extinguisher from its case, turned the light switches on and off repeatedly, and was constantly trying to remove his shoes. Although responding according to his operational definition was not observed in the attention condition of the Trial-Based Functional Analysis, these constantly changing behaviors appeared to be serving the function of social positive reinforcement. During the Standard Functional Analysis, an increasing trend of responding was observed in the attention...
condition. Although George continued to engage in alternative behaviors that were not included in his operational definition during this analysis, once he contacted reinforcement in the attention condition of the Standard Functional Analysis his responding increased and became more efficient. This may have not been observed during the Trial-Based analysis due to difference in duration of the conditions.

Limitations of the current research include that operational definitions should be checked in both environments in order to include all necessary components. For example, with George, since he was first exposed to the Contrived Trial-Based Functional Analysis, the area he was tested in was a smaller, more confined area than where the Standard Functional Analysis was conducted. For this reason, running away when an instruction was given was not included in the original operational definition, however if this had been tested in the environment where the Standard Functional Analysis was conducted it would have been included in the definition and may have produced clearer results.

Additionally, a carry-over effect which was more pronounced for George and Blaine, required modifications to be made to the procedures to ensure the participants’ responding had returned to baseline levels before moving on; however, some problem behaviors were still observed in the control, particularly for Blaine. This observed carry-over effect is believed to be due to health reasons. Modifications included allowing 15 s to elapse before beginning the control segment. If the behavior lasted longer than the allotted 15 s, the therapist waited until the problem behavior was absent for 5 s before
beginning the control segment. In Bloom (2011), it was suggested that the control trial be conducted first, followed by the test trial. In practice this appears to be a more appropriate order for the trials to be conducted. The purpose for having the control follow the test trial in this study was to leave the participants at baseline levels after conducting the test. Although during implementation of the trials, it was necessary for the therapist to facilitate the participants’ return to baseline before administering the next test condition.

A previous limitation that was noted by Bloom (2011) was the number of failed trials due to staff and peer interference. This was not observed in either the Natural or Contrived Trial-Based Analyses in this study. This was likely due to the fact that the staff in the Center-Based environment was behaviorally trained and acclimated to ongoing testing in this environment. They were also made aware that this research was being conducted.

Bloom et al., (2013) extended this line of research further, by training teachers to implement Trial-Based Functional Analyses and develop interventions based on results. Each of the three participants in this study demonstrated a reduction in problem behaviors and an increase in alternative behaviors. These results are promising in that this methodology has been demonstrated to be effective in the classroom when conducted by teachers. Future research could examine if these procedures may also be able to be utilized at remote locations using remote technologies, such as web conferencing, to instruct parents or paraprofessionals. Future research that incorporates the empirically
founded modifications in Standard Functional Analyses, such as latency to problem behavior and precursor behaviors, to Trial-Based Functional Analyses may be fruitful.
REFERENCES


