Experimental Functional Analysis of Problem Behavior for Participants of a Social Skills Program for Children with Autism Spectrum Disorders

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Experimental Functional Analysis of Problem Behavior for Participants of a Social Skills Program

As a society, we have experienced a growing presence of disruptive and problematic behavior within our school systems (Lavigne et al., 1998). These behaviors have become increasingly evident in children with autism. Children with autism regularly exhibit social and communicative deficits, often displaying more problematic behavior than the typically developing child. A recent study by Blumberg et al. (2013), has identified a parent reported prevalence rate of autism in children to be 1 in 50. The Centers for Disease Control and Prevention (CDC) has estimated a slightly lower prevalence of 1 in every 68 children (Data & Statistics, 2016). As a result of this expanding prevalence rate, mental health professionals have strived to find evidence-based methods incorporating applied behavior analysis and intervention. One such method involves the varying methodologies of functional (experimental) analysis, most often based on the behavior assessment model developed by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994).

Applied behavior analysis states that behavior not only occurs for a reason (a function), but also within relation to environmental events (McComas & Mace, 2000). Functional assessment is an extensive process, whose objective involves the recognition of variables influencing problem behavior. This process uses varying levels of indirect, direct, and experimental assessments. Functional analysis is an experimental subcomponent of functional assessment, which aims to identify maintaining contingencies for target behavior(s) (McComas & Mace, 2000). These contingencies for problem behavior are believed to be learned through an individual's interaction with his

or her environment and the subsequent positive or negative reinforcement (Iwata & Worsdell, 2005). Unlike standard functional assessment, functional analysis uses experimental methods to manipulate conditions that are introduced and withdrawn in a systematic way. This experimental analysis utilizes both indirect and direct forms of assessment, with the overall goal of assisting in the development of effective interventions for problem behavior (McComas & Mace, 2000).

Over the last 30 years, functional analysis has become a huge topic of interest among researchers of behavior assessment. Since the first standardized model was introduced by Iwata et al. (1994), over 2,000 articles and authors discussed this systematic and analytical approach (Beavers, Iwata, & Lerman, 2013). According to Hanley, Jin, Vanselow, and Hanratty (2014), more than 435 studies (since 2012) in the literature of behavioral assessment, 117 of which involved individuals with autism, have employed functional analysis. Among these studies, there have been a wide variety of methods used in regards to setting, subject, session length, and types of manipulation (Hanley et al., 2014). To fully understand the true impact, versatility, applicability, and limitations of functional analysis, one can explore the vast plethora of studies incorporating this experimental method.

Emergence of Analog Functional Analysis

Descriptive analysis is a means of identifying antecedent and consequent events of directly observed behavior, in the natural setting. Often referred to as A-B-C recording, this form of assessment is frequently used in the school setting. It is considered a more reliable tool than indirect methods such as structured interviews (Iwata & Worsdell, 2005). Because of the inability to alter or manipulate environmental events,

descriptive analysis is limited in its ability to accurately predict functional relations. When inconclusive results are obtained from descriptive analysis, it can be advantageous to use experimental functional analysis to formulate a more definitive hypothesis (Iwata & Worsdell, 2005).

Iwata et al. (1982/1994) composed a general model, often referred to as analog functional analysis, which used the conditions of attention, demand, alone, and control to help identify a cause-effect function. These conditions made it possible to manipulate both antecedent and consequent variables in order to provide a more precise function of problem behavior. An example of this is observed during the attention condition, when the therapist only provides attention contingent on each occurrence of the problem behavior (Iwata & Worsdell, 2005). Standard (analog) functional analyses consist of alternating conditions that last 15-minutes each, delivered by a trained therapist, and are usually conducted in a laboratory setting (English & Anderson, 2006). Although this analysis provides a more definitive hypothesis than descriptive does for treatment, it is important to note several limitations.

There is an important concern involving the ethics of eliciting and reinforcing problem behavior. In an analysis of the methodology, Iwata & Worsdell (2005) do state that "it (functional analysis) may not be appropriate for the assessment of behavior that poses a high degree of risk or behavior that occurs at extremely low rates" (p. 28). Behavior that rarely occurs is often hard to observe during the short duration of a functional analysis. English & Anderson (2006) also argue that analog functional analyses are not often used in the school setting. This is due, in part, to the extensive training required for therapists to perform such a complex form of assessment. These

researchers also question the lack of external validity of analog analyses, as caregivers were not utilized and the setting was not in the natural environment (English & Anderson, 2006).

Brief Functional Analysis

A number of researchers have also questioned the efficacy of analog (standard) functional analysis in relation to the extensive amount of time required to complete one. Gardner, Spencer, Boelter, DuBard, and Jennett (2012) performed a systematic review of twelve articles that incorporated brief functional analysis (BFA). Gardner et al. (2012) focused on twelve studies that involved typically developing children. Similar to standard functional analysis, the BFAs within this review employed the manipulation of both antecedent and consequential environments. The crucial difference in both methodologies involves the time constraints of each functional analysis. BFA methodologies, often based on Northrup et al. (1991), have shortened the 15-minute conditions of standard functional analysis to 5-minute condition durations. A major advantage in doing so involved the feasibility of implementing such experimental methods (Gardner et al., 2012).

Gardner et al. (2012) argued that it is not practical, in regards to resources (time, personnel, expenses), to conduct standard functional analysis, especially in the general education classroom for typically developing children. The allocation of resources is ever more crucial with typically developing children, as special education funds are not available for such situations. Gardner et al. (2012) concluded that BFAs are valid measures in the assessment of problem behavior. The identification of functions behind typically developing children's behavior led to decisive and efficient interventions. Nine

of the twelve studies reviewed by Gardner et al. were determined to have sufficient quality in evidence-based determination of the function of problem behavior. The acceptable studies involved 41 participants, 9 groups of researchers, consisted of 4 different locations geographically, and represented a variety of disruptive behaviors. An overall consensus was made stating that BFAs are empirically supported methods. They are methods that may be a more practical means of assessment, specifically for typically developing children (Gardner et al., 2012).

Another variant of BFA methodology focuses on the environmental manipulation of antecedents and/or consequences. BFA models formulated from Northrup et al. (1991) have traditionally used the A-B-C model. In contrast, some researchers have explored the utility of manipulating only antecedent variables, known as brief A-B models. Reinforcement is withheld after the occurrence of problematic behavior (Call, Zangrillo, Delfs, & Findley, 2013). Studies by Badgett & Falcomata (2015) and Call et al. (2013), examine the effects of BFA models that include and exclude consequences. In the first study by Badgett and Falcomata (2015), four participants, three boys and one girl, ages 8-11 were introduced to three different BFA models. All four participants were individuals with autism, who were referred to the study due to their past histories of exhibiting aberrant behavior. All BFA models included 5-minute conditions of escape, attention, tangible, and free play. Conditions took place in empty classrooms within the participants' current schools.

The BFA models of A-B, A-B-C, and latency-based were counterbalanced across all four participants. Researchers' results showed that all three models had an overall high correspondence within conditions. An increased level of differentiation between the test

conditions (play) and control conditions was seen in the A-B model when compared to the A-B-C model. That is, more aberrant behaviors were observed during A-B only conditions. Regardless of these results, the researchers in this study concluded that the A-B model may be more agreeable to educators and clinicians due to ethical opposition to reinforcing problematic (aberrant behavior in this study) behavior (Badgett & Falcomata, 2015). This ethical concern and increased differentiation amongst control and test conditions is further analyzed and interpreted in the study by Call et al. (2013).

In the study conducted by Call et al. (2013), the comparison of BFA models of A-B and A-B-C were further explored in an experiment that involved five participants. Participants ranged in age from three to five-years old, were boys, and all were children with autism. A multi-element design was used, consisting of brief 5-minute conditions (Call et al., 2013). Conditions included attention, demand (escape), tangible, and play control. Each model was completed in full, and assessments for participants were also counterbalanced in distribution. Researchers used a board of experts that included masters and doctoral level clinicians. These experts were used in order to review and inspect each graph to determine if function was identified. They were not told which type of model they were assessing. Results concluded that 14 out of 15 possible comparisons were determined to have high correspondence between both the A-B and A-B-C models. Similar to findings in Badgett and Falcomata (2015), there was a higher discrepancy between test conditions and the experimental control condition of play during the A-B model. In other words, higher rates of problematic behavior were observed comparative to the control condition during the A-B model BFA. These results do suggest that

antecedent only BFAs could be useful alternatives depending on the situation (Call et al., 2013).

One must be careful in interpreting the results of the previous two studies. Call et al. (2013) mentioned that extinction burst could explain the higher rate of problem behavior during the BFA (A-B) due to the behaviors being placed on extinction. During BFAs (A-B-C) there was also substantial time consumption due to contingent reinforcement (consequences) after the presence of problem behavior. This reality results in a reduction of overall occurrences of problem behavior. For example, during the attention condition time consumption from reinforcement lasts twenty seconds. When choosing a BFA, one must consider the individuals and behaviors in question. If the target behavior is aggression, a clinician may be hesitant to choose a BFA (A-B) method because of the likelihood of having a higher incidence rate of aggressive behavior (compared to A-B-C). In contrast, parents, educators, or clinicians may be hesitant in using a BFA (A-B-C) model due to the ethical dilemma of providing reinforcement for problem behavior (Call et al., 2013). In order to further explore alternate possibilities and directions in BFAs, many researchers have explored the value of employing trial-based BFAs.

Trial-Based (Brief) Functional Analysis

A possible alternative to address the above limitations of BFA (A-B-C & A-B) in regards to exposure frequency and reinforcement of problem behavior, involves using trial-based BFAs. Trial-based approaches influence the latency or exposure time to functional analysis conditions. In general, they involve an A-B-C methodology that differs in regards to reinforcement frequency. For example, in the attention condition,

after the target behavior is expressed, attention is given (consequential and contingent reinforcement) for a specified time period and then the session is immediately terminated (Falcomata, Muething, Roberts, Hamrick, & Shpall, 2016). This differs greatly from BFA (A-B-C) models similar to Northrup et al. (1991), as these conditions continue to reinforce the target behavior until the 5-minute session has elapsed. In summary, trial-based BFA can be exceptionally useful when constraints such as limited time in the classroom, a need to restrict episodes of problem behavior frequency is present, or the restriction of reinforcement of problem behavior is pertinent (Falcomata et al., 2016).

Falcomata et al. (2016) conducted a recent study that involved three participants with ASD, ranging in age from 4 to 5-years old (all boys). Participants' disruptive behaviors varied, and the settings included contrived therapy rooms as well as at the homes of two participants. Aberrant behaviors were operationalized for each participant, and trained observers were used for data collection. Falcomata et al. (2016) used a brief multielement design with an additional ABAB reversal design for treatment evaluation. Similar to previous BFA studies, conditions included 5-minute sessions that tested escape, attention, tangible, alone, and free play. The major difference in this study (and other trial-based studies) was the prompt termination of each condition session, following the first contingent reinforcement of aberrant behavior. Researchers concluded that treatment utility was accomplished in assisting interventions targeting the operationalized target behaviors. Falcomata et al. (2016) emphasized that this form of BFA should not become a substitute to other methodologies, but instead should become one of many tools in the assessment and treatment of problem behavior. It is their belief that specific

situations with case significant constraints should be considered when choosing the appropriate form of functional analysis (Falcomata et al., 2016).

Studies by Bloom, Iwata, Fritz, Roscoe, & Carreau (2011) and Rispoli, David, Goodwyn, & Camargo (2013) further explored trial-based FBAs in the natural classroom setting. Furthermore, these studies examine the plausibility of trial-based measures compared to standard (analog) functional analysis. Both studies examine the challenges that arise from conducting standard functional analysis in the classroom setting. They also address the concerns that standard functional analysis give extended amount of time to potential exposure and learning effects of problem behavior, which is consequentially and continually reinforced. In the first study by Bloom et al. (2011), ten participants ranging in age from 6 to 18 years were chosen based on referral for various problematic behaviors. Participants represented several diagnoses and trial-based functional analysis were done within each participant's regular classroom. The trial-based functional analyses were then followed by standard functional analysis, within session rooms. Graduate students acted as therapist in the childrens' natural classroom during the trial-based sessions. Conditions included attention and demand, but only tangible for participants suspected of having this function. Bloom et al. (2011) followed the model first introduced by Sigafoos and Saggers (1995). This model incorporated 1-minute sessions based one single occurrence of target behavior. Control sessions also lasted 1-minute in duration. Each trial was then extended to 2-minute sessions with the same termination factor for subsequent target behavior occurrence. Ignore trials were finally used to test for problem behavior thought to have a function of automatic reinforcement (Bloom et al., 2011).

During the standard functional analysis, a method was used that incorporated conditions based on a multielement design originating from Iwata et al. (1982/1994). Results from the study showed a correspondence in approximately 60% of the single-participant cases (a 7th case had a partial correspondence). Within the classroom, the trial-based BFA was dependent on the availability of natural opportunities to conduct the conditions, henceforth resulting in a longer assessment than the standard functional analysis. Another limitation that researchers addressed was the interruptions of staff and other students during conditions, in which the conditions had to be stopped or repeated. Although there were a number of limitations, there is hope for future refinements of trial-based BFA. Specifically, researchers suggested that increasing the test condition length may have helped in identifying the function of behavior. Overall, trial-based BFA may be a viable option when more standard assessment procedures are not feasible in regards to time and resources (Bloom et al., 2011).

Rispoli et al. (2013) further investigated behavioral function in their comparison and analysis of both analogue functional analysis and trial-based BFA. Both analyses took place in the two participants' public schools; however, the analog phase was conducted in a conference room and in a segregated section of one of the participant's classrooms. One participant was a 5-year old girl with autism, and the other was a 15-year old male diagnosed with Down's syndrome and an Intellectual Disability. The analogue functional analysis differed from more standard measures in regards to its 5-minute conditions instead of 10 or 15-minute conditions. Conditions included attention, tangible, escape, and play. During the trial-based BFA, which followed the analogue, 20 discrete trials were used to test the conditions of attention, tangible, and escape. Rispoli et

al. (2013) also followed methods from Sigafoos and Saggers (1995), where trials consisted of 2 min sessions that were embedded into the child's natural activities. For example, the escape condition was done during direct instruction of some sort of academic task demand. Results from the analogue functional analysis were determined to be inconclusive in nature, while the trial-based BFA was determined to have effectively identified functions of problem behavior for both participants (Rispoli et al., 2013). It should be noted that the analogue conditions were purposefully done in contrived settings, which could have resulted in absence of relevant establishing operations. It would be pertinent for further research to include analog FA in the natural setting in order to appropriately and fairly compare these two separate methods. Rispoli et al. also differ in their definition of analogue FA compared to the vast majority of other researchers. This is in regards to the time period of the introduced conditions. Their analogue conditions could better be described as a brief functional analysis and it could have been implemented in the natural setting as well. The comparison of studies among natural and contrived settings has been a highly debated aspect of functional analysis that may play a key role in future development of the methodologies of this practice. In the past, research has focused on the contrived setting, and a need for a more extensive research base is evident for treatment utility within the school setting (Payne, Scott, & Conroy, 2007).

Contrived Versus Natural Settings

A major concern with functional analysis involves the external validity of certain measures. For example, standard functional analyses are traditionally conducted in contrived settings such as research centers or unused classrooms created for the conduction of research. Contrived settings may also not be a viable option for many

school systems due to costs or availability (Bloom et al., 2011). Functional analysis also involves a high degree of discriminative variables in the manipulation of antecedents and consequences. Some argue that natural settings (e.g. classroom) may lack internal validity, as these procedures may be compromised (Lang et al., 2008). For example, a peer may unintentionally reinforce the participant during the attention condition. Lang et al. (2008) conducted a study that compared the use of functional analysis results across settings. The study consisted of an ABAB reversal design, involving two children with autism. The two settings consisted of an empty classroom (therapy room with observation window) and the children's natural classroom. Functional analyses consisting of 5-minute conditions were conducted for conditions of attention, escape, and play (control). Using a multielement design, conditions systematically transitioned between settings. Positive results for one participant suggested that elevated behavior in both settings confirmed the function of both attention and escape. For the second participant, different outcomes occurred for the functional analyses across settings. Lang et al. (2008) suggest that there may be challenges to the classroom environment, as it is not highly controlled and outside variables may affect results. For example, outside reinforcement for attention can be present during natural classroom settings from peers or other adults unaware of the procedure in progress (Lang et al., 2008). This limitation of natural settings has been seen throughout previous research studies. It is also a potential threat to the validity of my thesis study, as it will be conducted in a natural setting in the context of a social skills program.

Umbreit and Ferro (2011) further explore the issues related to natural settings in regards to functional support, specifically in the resulting treatments based on functional

analysis. One such issue involves the concept of treatment integrity. Conducting functional analysis within the classroom setting means that the appropriate caregivers must be effectively trained in the process, unless of course, a trained clinician is available for the assessment (which is not always practical). There is also the issue of fidelity. Sometimes in order for extinction to be implemented, a behavior must be ignored (attention based), which can be difficult in the natural setting if the behavior is disruptive in nature. When a function is determined and a treatment for extinction is developed, obstacles such as intermittent reinforcement may be damaging in the acquisition of alternative functional behaviors. Umbreit and Ferro (2011) also caution conductors of FA to consider the concept of carryover effects. This occurs when the student does not initially recognize a specific condition change. This may be seen in a treatment design such as ABAB (Umbreit & Ferro, 2011).

As mentioned before, the goal of functional analysis is to ultimately develop a hypothesis of the function of behavior, in order to construct the most appropriate and effective intervention. Payne et al. (2007) examined the effectiveness of function-based interventions within the school setting. The researchers selected two boys and two girls, who were selected based on high levels of exhibiting inappropriate behaviors. First, FBAs were conducted to inform researchers of viable hypotheses for the participants' functions of behavior. This included direct measures such as observations of students, as well as indirect measures including structured interviews. Based on hypotheses, specific conditions including attention, escape, and control were introduced using a BFA consisting of 10-minute intervals. Based on results, individualized interventions were devised and implemented based on the function of each child's disruptive behavior.

These function-based treatments were counterbalanced by contra-indicated interventions using a multitreatment single-participant design. Results indicated that participants reacted more positively to the interventions that were based on each BFA. The interventions not based on functional data did not exhibit a significant decrease in problem behavior. This study gives evidence and utility to the use of interventions based on functional assessments in the form of brief functional analysis (Payne et al., 2007). It is important to note a specific limitation involving interventions that focused on decreasing undesirable behaviors, rather than increasing functionally equivalent positive behaviors. This could result in extinction burst or lack of developing appropriate behaviors in general.

The purpose of this current study is to further explore the usefulness in implementing a brief functional analysis in the natural setting. The study will focus on two children with Autism Spectrum Disorders, both of whom exhibit varying levels of disruptive behavior. The goal is to validly and reliably determine the function(s) of these behaviors in order to provide information for future interventions. This study hopes to further explore past limitations and implications of previous research within the extensive data base field of functional analysis. Members of the SUNY Plattsburgh Committee on the Protection of Human Subjects (COPHS) have approved the study proposal as well as associated appendices.

Method

Participants

The study included two participants, one boy and one girl. Alaina was a 14-year-old girl, who was previously diagnosed and classified with Autism. She attended a school

in a self-contained special education program that provided career preparation, special education services, and instructional services. Prior to treatment, Alaina had recently transitioned from a 6:1:1 classroom for students with autism to a 6:1:1 life skills program. Adam was a 9-year old boy, who was diagnosed with moderate to severe Autism at the age of three. When he was five, Adam was placed in a public school, within a 6:1:1 classroom. Adam continued in this educational setting, until his parents pulled him from the school in December of first grade. This was due to an extensive struggle within this setting for Alex that included: behavioral and academic regression, and communication issues between teacher and parents. Adam became home-schooled and remained home-schooled throughout the research period.

Setting

The research was conducted at a Saturday program for 30 children with ASD, at a university campus in Northern New York. The weekly social skills program is run and supervised by two clinicians that are Board Certified Behavior Analysts, as well as experienced practitioners in the field of autism. Eight graduate students in the field of school psychology as well as 15 undergraduate fieldwork students staff the program. Staff encourages students to improve targeted and individualized social skills, which include behaviors such as appropriate conversation, play, self-monitoring, and offering help. Social skills are developed in the context of various activities that include sport related activities, crafts and board games, and small-group activities and games.

Observer and Aide Training

Six undergraduate fieldwork students, that were part of the research team, collected data. The lead researcher trained fieldwork students in 10-second partial

interval recording, for 5-minute session periods. Training sessions took place during research meetings for two consecutive weeks. Additionally, fieldwork students practiced data collection for six weeks, on site, with both participants. Practice took place prior to condition culmination. Observer practice also aided in the operationalization of target behaviors, for each participant. Cell-phone interval time apps were incorporated, in order to ensure reliability for time measurement. Data were recorded on designated data sheets (See Appendix B and C) that were tailored to each specific participant. Data sheets contained participant pseudonyms to ensure confidentiality, and were placed in secure files daily. Each data sheet defined specific target behaviors that were operationalized by the lead researcher during research meetings. Conditions were also described in detail on the back of each data sheet.

Prior to condition implementation, participant's one-to-one aides were trained, for approximately 45 minutes, on appropriate delivery of each condition. Training took place with the lead researcher, at the program. One-to-one aides had time to master conditions during the practice phase, alongside the observers.

Interobserver Agreement

In order to ensure reliability of observer recording, interobserver agreement were assessed during the practice and actual condition implementation sessions. The process involved the lead researcher randomly picking two observers, in the same age group, for specific conditions each session. Observers were instructed to inform the one-to-one aide, of the target participant, one minute prior to condition start. One observer was the designated primary observer, of which, her data were used for official results. The secondary observer's data were compared to the primary's, to calculate the percentage of

agreement. Each condition consisted of 30 partial intervals, with durations of 10-seconds each. The total number of agreed upon intervals, amongst both observers, were then divided by the total number of intervals (30). This resulted in a percentage of interobserver agreement. Across the 27 sessions, interoberver agreement was incorporated 7 times (26% of conditions). The final agreement was determined to result in an average of 90%.

Experimental Design and Procedures

Hypotheses for the functions of problematic behaviors were developed with the use of informal interviews, direct observation, and psychoeducational reports. Preferred activities and tangible items were also determined through parent interviews, aide interviews, and direct observation.

Using an alternating treatments design; a brief functional analysis (BFA) was conducted. The BFA consisted of four uniquely manipulated environments (conditions), lasting 5-minutes in duration. The conditions for Adam were completely counter-balanced. Due to the number of conditions for Alaina, a Latin-Square was developed to increase internal validity for condition implementation. The conditions for Alaina were play (control), attention, escape/avoidance, and tangible. The conditions for Adam included play, attention, and escape/avoidance (See Appendix D). During initial evaluation, it was determined that it was unlikely that Adam's problematic behavior was a determinant of the function of attention. Therefore, the attention condition was not incorporated in Adam's BFA. All condition procedures are described below:

- *Play Condition (Control):* During the play condition, baseline data were obtained on the frequency of target behaviors. Access to preferred tangibles, activities, and

attention were freely available throughout the condition. No demands were placed on the child. The aide ignored all occurrences of target behaviors.

- *Attention Condition:* During the attention condition, access to preferred activities or tangibles were given. No demands were placed on the child. At the start of the session, the aide stated that she had work to do. Attention was then diverted, as the aide pretended to write (some form of paper work), read something, or talk to another staff member. Contingent on target behavior occurrence, brief attention was given (>10 seconds) in the form of a verbal reprimand (i.e. "Don't tease other students") or prompt (i.e. modeling personal space). Attention was once again withdrawn, until target behavior was exhibited, in which the process repeated.
- *Escape/Avoidance:* During the escape/avoidance condition, access to preferred activities were restricted. While seated, the participant was asked to participate (demand) in the relevant activity (schedule review, craft project, point sheet review, etc...). First, the participant was verbally prompted, if no response within 5-seconds, a gestural prompt was given. Contingent on target behavior occurrence, brief escape from demand was given ("Ok, you don't have to do it"), and the aide turned away from student for 30-seconds. After 30-seconds had elapsed, prompts for task engagement were once again given. Whenever target behavior was exhibited, the process repeated.
- *Tangible:* Prior to the tangible condition, one-minute of access to highly-preferred tangibles were granted. The participant had access to attention and no demands were present. Once the condition started, the highly preferred tangible(s) was removed and replaced with a low preference tangible. Contingent on target

behavior occurrence, the highly preferred tangible was reintroduced for 30-seconds, then once again removed.

Conditions were conducted throughout the social skills program during the following activities: Games/Crafts, Schedule Review, Large Group Activity, Snack, Afternoon Games/Crafts, and 'Let's Get Moving'. Prior to the implementation of conditions, informed consent was acquired from parents (See Appendix A). Parents were informed of the purpose of the study, the procedures that were used, what will be gained from the study, and the risks associated with the functional analysis conditions.

Results

After condition sessions concluded, data were analyzed, to delineate trends and significance in function of behavior. The play condition served as a baseline rate for percentage of target behavior occurrence during 5-minute intervals. Adam exhibited a baseline rate of behavior of 18%, averaged across three separate days. Alaina displayed a lower baseline rate of 1%, averaged across three days as well. Interobserver reliability was assessed during seven sessions (26% of total sessions). It incorporated all four conditions, and both participants. Reliability scores ranged from 63% to 100%, with a combined average of 90% agreement. Table 1 and Table 2 further depict percentages of Target Behavior Occurrences (TBO) during each condition, for each participant.

Table 1.

Participant Data

Adam	**Condition: Percentage of TBO**		
Day	Escape	Tangible	Play
1	3	73	3
2	60	73	30
3	97	33	40
4	93	63	0
Average	**63**	**60**	**18**

Table 2.

Alaina	**Condition: Percentage of TBO**			
Day	Escape	Tangible	Attention	Play
1	37	73	--	3
2	--	--	0 / 0	0
3	90	30	0	--
4	50	43	--	0
5	100	23	0	--
Average	**69**	**42**	**0**	**1**

As depicted in Table 1, Adam showed a substantial increase in target behavior during both the escape and tangible conditions. Data suggest that both conditions were strong determinants of Adam's problematic behaviors. Researchers observed that during the escape condition on Day 1, Adam appeared to be indifferent to the demand placed on him. Additionally, researchers also observed an unforeseen change in tangible preference during the Day 3 tangible condition. Specifically, mid-session Adam decided to play with a set of cupcakes that he had previously and adamantly denied in prior sessions. These two variables are believed to have decreased the overall percentage of TBO, subsequently decreasing the power of results.

Prior to research implementation, it was hypothesized that Alaina's problematic behavior may be reinforced by attention. Data shown in Table 2 debunked this hypothesis, as results showed a zero percentage of TBO during attention conditions. Results suggested that Alaina's target behaviors are contingent on escape from undesired demands or activities (69%), as well as preference for desired tangible items (42%).

The data for Adam and Alaina are further illustrated in Figure 1 and Figure 2.

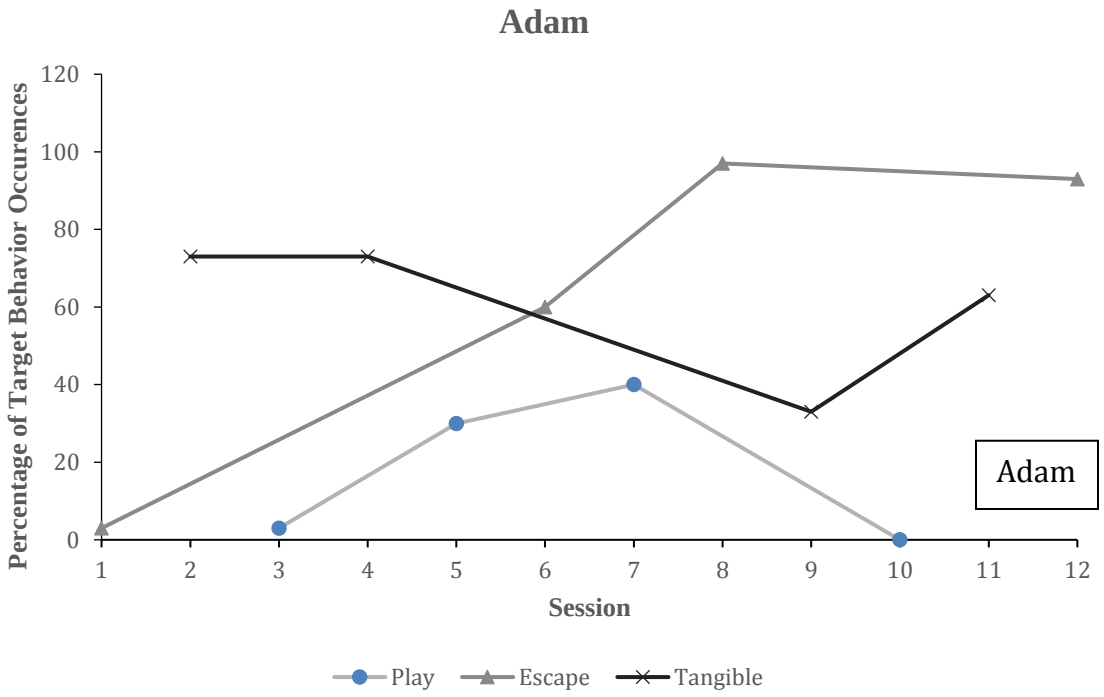

Figure 1. Percentage of Target Behavior Occurrences per Condition for Adam

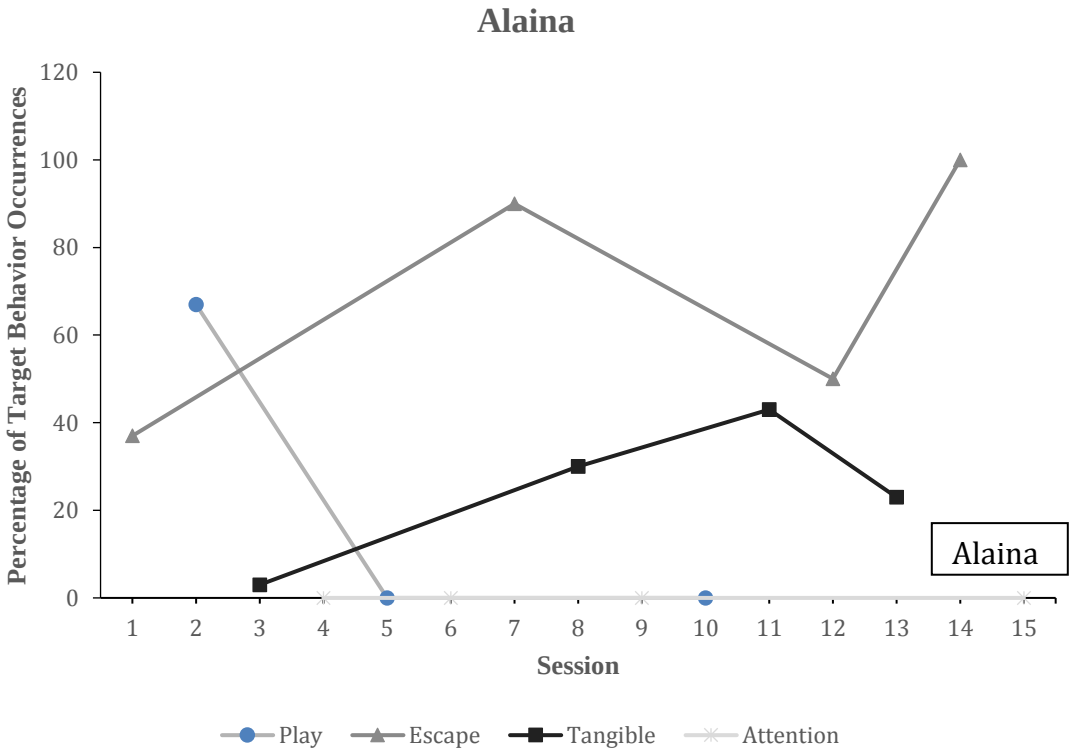

Figure 2. Percentage of Target Behavior Occurrences per Condition for Alaina

Discussion

Commensurate with previously discussed studies, the current experimental BFA proved to be an effective means of determining the function of behavior for two participants. The hypotheses of tangible and escape functions for Adam were strongly supported by results. In contrast, Alaina exhibited higher prevalence rates of disruptive behavior during the escape demand rather than during the attention condition, which prior to this analysis was thought to be the function. As is the goal with all forms of functional analysis, valid and reliable results from this study will provide meaningful insight into future treatment for both individuals. Furthermore, this study builds upon the emerging research of the efficacy and practicality of implementing BFAs within the natural setting. Although results are predominately encouraging for future intervention, it is also important to address limitations specific to this study.

It is essential to assess the external validity of any study. Whether or not results or interventions are likely to generalize to other settings is pivotal in the field of research, particularly that involving function of behavior. Fieldwork students and researchers conducted all conditions within natural settings, consisting of locations throughout a social skills program for children who are diagnosed with ASD. Following brief training sessions, participants' actual 1:1 aides were utilized in conducting each session. Researchers and fieldworkers solely played the role of data observers and experimental consultants. It is relevant to mention that research was conducted in the natural setting with peers that each participant interacts with in school; however, the setting did not fully constitute the general population or community. The program involved undergraduate and graduate students in the field of special education and psychology, as well as peers

with the same diagnostic backgrounds. It is possible that home, community, and future school placements may elicit different functions for disruptive behaviors.

The validity of the study was further enhanced by measures created to improve internal validity. Precisely, statistical measures were implemented, in order to ensure that conditions were alternated in an equitable and random way. For Adam, a complete counter-balance was able to be utilized, due to the number of conditions and sessions available. Alaina's situation was more difficult, as conditions also included the attention condition; however, the use of a Latin Square technique was able to ensure the maximum level of interval validity. Intentions and planning for alternating conditions were thoroughly explored. This being said, unforeseen and uncontrollable threats to internal validity appeared. The alternating treatments layout was not able to be fully accomplished due to her absence on the last day of research. Similarly, for Adam, the alternating conditions were not fully implemented, as only four out of six days resulted in attainable data collection.

In contrast to Alaina, this was due to a unique and further limitation to not only the study, but BFAs in general. Adam was highly sensitive to both the tangible and escape condition implementation. After extended sessions, his behavior starting to become progressively worse. This included extensive swearing, verbal threats of hurting staff, and even attempts (some successful) of kicking or punching his 1:1 aide. A downside to BFA involves the fact that participants have the potential to briefly increase disruptive behavior. During a research meeting, it was decided that Adam's behavior became too severe to continue conditions, for his safety and that of others. Subsequently, his involvement in the study was immediately terminated.

Further problems arose, due to external variables that interfered with both condition implementation and fieldwork student observation. On several occasions, data sessions were disrupted by adults who were unaware that data were being collected at the time. Thankfully, this only occurred during sessions in which two observers were collecting data for the purpose of reliability. As a result, the lead researcher had to make a statement to staff and volunteers to be aware of live research and interference, prior to the next data collection day. Reflecting on this disturbance to data collection, it would have been beneficial to have made this statement before the study had started in the first place.

Comparable to adult interference, was the reality of child interference. This could not be controlled for, as the setting consisted of natural environments including peer interactions. Adjustments were made to minimize this reality. For example, during attention conditions, the setting was adjusted to have fewer students around (e.g. sitting at table in corner of room). The research team had to be inventive and flexible to counter such variables. This was further illustrated, as highly preferred tangible items (i.e. i-pad, or computer) sometimes changed, or the participant decided to play with an item (cupcakes) that had previously been a highly undesirable tangible item.

In regards to the accuracy of measurement, the reliability of observed results were determined to be nearly excellent, with an average interobserver agreement of 90%. Minimal training was required for fieldwork students to master partial interval recording. The use of consistent measurement devices, in the form of cell-phone apps, also provided a reliable means of recording behaviors within 10-second time intervals.

After personal reflection of the research process and results, I found this study to be highly educational and rewarding. More importantly, it was valuable to acquire results

that were adequately valid and reliable. These results have the potential to make great strides in the applied behavior analysis of each participant's behavior. There is an optimism that these results be utilized and incorporated into future treatment plans that are effective for both Adam and Alaina. Furthermore, the validity, reliability of measures, and results, from this study, suggested that this form of BFA could serve as a means for future use with students or individuals with ASD. The study structure was set up in a way that is easily adjustable to differing settings. Condition implementations were easily adaptable to individual needs, suggesting future versatility with other students in the determination of the function of behavior. Minimal training sessions are required for one-to-one aides and concise and easily altered data sheets provide additional versatility for further application. Although this form of BFA holds promise for future use with the above population; there are several limiting factors that should be considered. As seen in the results, this model of FBA had the potential to momentarily increase problematic behavior. It may not be appropriate to utilize this model for individuals who have behavior that is destructive in nature. Due to the short duration of conditions, it may also not be suitable for behaviors that do not occur frequently. This study is yet another example of the different forms of functional analysis that can be used to determine function of behavior. Research has made many strides towards successful implementations of functional analyses. It is my hope that continued exploration will provide further insight into optimal means of determining behavior function(s).

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Appendix A

INFORMED CONSENT
State University of New York at Plattsburgh

Experimental Functional Analysis of Problem Behavior for Participants of a Social Skills Program for Children with Autism Spectrum Disorder

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What is the purpose of this study?
The purpose of this study is to use evidence-based methods to develop a hypothesis of the functions or purposes of problem behavior for your child and other Nexus students who have histories of disruptive behavior. The information we obtain will allow us to develop the best behavioral intervention plan for your child.

What procedures will be used?
Most disruptive behaviors serve one of four functions or reasons for the child: to escape or avoid something, to obtain attention, to obtain a tangible item or activity that he/she cannot have, or to obtain automatic reinforcement (e.g., self-stimulatory behavior). We would like to test three of these conditions by providing associated "consequences" (attention, escape, & desired item) in 5-minute intervals approximately 3 times per Nexus session. Each time the behavior occurs during the 5-minute intervals, your child's regular one-to-one counselor will respond with one of the three consequences planned for that 5-minute interval. We will record occurrences of the behavior during the interval, and compare data across the three different conditions. A "control" condition will also be tested, whereby your child will simply have access to preferred activities and increased positive attention. At the end of the analysis (approximately 8 weeks), we will determine which condition resulted in the highest rate of disruptive behavior, and we will develop a positive behavior intervention plan with your input, based on those data.

In summary, if you give your consent, your child will be observed for 5-minute intervals during three separate activities each week (e.g., schedule review, large group activities, and board game time). During each of the intervals, a different consequence will be given for his/her disruptive behavior: attention, escape, or access to a desired item).

What will be gained from this?
Information that will allow us to work with you to develop the best behavioral intervention plan that will be implemented at Nexus, and can be implemented at home and in school settings, as well.

Are there any risks?
There is the risk of increasing the probability that your child will have disruptive behavior for 5-minute intervals when we test the specific condition that might be causing the problem behavior. For example, if your child's disruptive behavior is reinforced by attention, we would expect to see increases in disruptive behavior during the 5-minute intervals in which the attention condition is tested. We believe, however, that the benefits will outweigh the risks because an appropriate

behavior plan will be developed and put into place that is specific to your child's individual needs.

Another risk is that your child's behavior will not respond to any of the trial conditions, and we will have no further information about the functions of his or her behavior.

Will anyone know my child is in this study?
Your child's participation is completely confidential. Data will be safely stored and secured. Only Nexus workers will know that your child is a participant; and only Dr. Egan's 5 research team members, Dr. Egan, and Matthew Rothwell (school psychology graduate student & Nexus fieldworker) will see the data. At weekly meetigs, Dr. Egan will lead discussion of individual child data with research students and Matthew Rothwell.

Will I be paid for completing this study?
There will be no monetary compensation for this study.

Do I have to do this?
You can refuse your child's participation now or at any time. Refusal to participate will not involve a penalty or loss of benefits to which your child is otherwise entitled. Furthermore, you can withdraw consent for your child's participation at any point during the study.

What if I have questions?
If you have questions or concerns during the time of your child's participation in this study, or after its completion or you would like to receive a copy of the final aggregate results of this study, please contact:

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If you would like more information regarding your rights as a research participant, please feel free to contact the Committee on Protection of Human Subjects (COPHS) at (518) 564-2155.

If you give consent for your child to participate in the study, please sign and print your name on the lines below. Please write your child's name and birth date on the lines below.

Parent/Guardian Signature	Name of Child
Printed Name	Child's Date of Birth

Appendix B

Data: Partial interval recording, 10-sec. intervals for 5 minutes

Participant (Pseudonym) ____Alaina_______________________________________
Conditions: Attention, Escape/Avoidance, Tangible, Play
Activities: Games/Crafts, Schedule review, Large Group Activity, Games/Crafts

Begin the condition 2-3 minutes after the activity begins. Mark a + if the behavior occurs AT ALL during the 10-sec. interval. If the behavior does not occur at all during the interval, mark a --.

Date _______Activity ________________Condition____________________ Time ______

:10	:20	:30	:40	:50	:60

Date _______Activity ________________Condition____________________ Time ______

:10	:20	:30	:40	:50	:60

Date _______Activity ________________Condition____________________ Time ______

:10	:20	:30	:40	:50	:60

Target Behavior(s): Screeching, yelling, hiding face, cursing, rocking, hitting own teeth with objects, hitting surface with hand, kicking objects, stomping feet, crying, rolling eyes, or hiding face with clothing or other object(s)

Conditions

1.) Play (Control):

Access to preferred tangibles, activities, and attention is freely available throughout condition.
No demands are placed on child.
All occurrences of target behaviors are ignored.

2.) Attention:

Therapist is sitting next to or standing within close proximity (within 5 feet) to child
Access to preferred activities or tangibles is given, and no demands are placed on child.
At the start of the session, one-to-one states that she has work to do. Attention is diverted, as the one-on-one pretends to write (some form of paper work), or read something.

Contingent on target behavior occurrence, brief attention is given (>10 seconds) in the form of a verbal reprimand (i.e. “Don’t tease other students”), soothing (it’s ok) or prompt (i.e. modeling personal space).

Attention is once again withdrawn, until target behavior is exhibited, in which the process repeats.

3.) Escape/Avoidance:

Access to preferred activities is restricted.
While seated, student is asked to participate (demand) in the relevant activity (schedule review, craft project, point sheet review). First the student is verbally prompted, if no response within 5-seconds, a gestural prompt is given.

Contingent on target behavior occurrence, brief escape from demand is given (“Ok, you don’t have to) and one-to-one turns away from student (30 seconds).

Prompts for task engagement are once again given. Whenever target behavior is exhibited, the process repeats.

4.) Tangible:

Prior to condition, one-minute of access to highly preferred tangible is granted. Child has access to attention and no demands are present

Start: highly preferred tangible is removed and replaced with a low preference tangible
Contingent on target behavior(s), the highly preferred tangible is reintroduced for 30 seconds then removed

Appendix C

Data: Partial interval recording, 10-sec. intervals for 5 minutes

Participant (Pseudonym) ____Adam_____
Conditions: Escape/Avoidance, Tangible, Play
Activities: Games/Crafts, Schedule review, Large Group Activity, Games/Crafts

Begin the condition 2-3 minutes after the activity begins. Mark a + if the behavior occurs AT ALL during the 10-sec. interval. If the behavior does not occur at all during the interval, mark a --.

Date _____Activity _____Condition_____ Time _____

:10	:20	:30	:40	:50	:60

Date _____Activity _____Condition_____ Time _____

:10	:20	:30	:40	:50	:60

Date _____Activity _____Condition_____ Time _____

:10	:20	:30	:40	:50	:60

Target Behavior(s): Screaming, hitting a person or a surface, swiping materials, verbal or non-verbal threats, non-compliance to adult directions, or throwing objects

Conditions

Target Behavior(s): Screaming, hitting a person or a surface, swiping materials,

1.) Play (Control):

Access to preferred tangibles, activities, and attention is freely available throughout condition.
No demands are placed on child.
All occurrences of target behaviors are ignored.

2.) Attention:

Access to preferred activities or tangibles is given, and no demands are placed on child.
At the start of the session, one-to-one states that she has work to do. Attention is diverted, as the one-on-one pretends to write (some form of paper work), or read something.

Contingent on target behavior occurrence, brief attention is given (>10 seconds) in the form of a verbal reprimand (i.e. “Don’t tease other students”) or prompt (i.e. modeling personal space).

Attention is once again withdrawn, until target behavior is exhibited, in which the process repeats.

3.) Escape/Avoidance:

Access to preferred activities is restricted.
While seated, student is asked to participate (demand) in the relevant activity (schedule review, craft project, point sheet review). First the student is verbally prompted, if no response within 5-seconds, a gestural prompt is given.

Contingent on target behavior occurrence, brief escape from demand is given (“Ok, you don’t have to) and one-to-one turns away from student (30 seconds).

Prompts for task engagement are once again given. Whenever target behavior is exhibited, the process repeats.

Appendix D

Conditions Layout: Complete Counter-Balance & Latin Square:

I.) **Adam- 3 Condition Counter-Balance:**

Day	**Condition Counter-Balance**	**Condition Sequence**
10/22	A-B-C	Escape-Tangible-Play
10/29	B-C-A	Tangible-Play-Escape
11/05	C-A-B	Play-Escape-Tangible
11/12	C-B-A	Play-Tangible-Escape
11/19	B-A-C	Tangible-Escape-Play
12/03	A-C-B	Escape-Play-Tangible

Shaded area indicates session(s) that were abandoned and not implemented

A= Escape B= Tangible C= Play

II.) **Alaina- 4 Condition Partial-Latin Square:**

Day	**Condition Counter-Balance**	**Condition Sequence**
10/22	A-B-D	Escape-Play-Tangible
10/29	C-B-C	Attention-Play-Attention
11/05	A-D-C	Escape-Tangible-Attention
11/12	D-B-A	Tangible-Play-Escape
11/19	D-A-C	Tangible-Escape-Attention
12/03	B-A-B	Play-Escape-Play

Shaded area indicates session(s) that were abandoned and not implemented

A= Escape B= Play C= Attention D= Tangible