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Some Effects of Functional Analysis on Problem Behavior Outside of Session

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Some Effects of Functional Analysis on Problem Behavior Outside of Session

by

Karie S. John

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Applied Behavior Analysis Department of Child and Family Studies College of Behavioral and Community Sciences University of South Florida

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DEDICATION

This thesis is dedicated to my family. Michael, thank you for your unwavering support and patience. Ava and Max, I hope that you both follow your hearts and reach for the stars because you can both achieve anything you set your minds to. In the words of B. F. Skinner, “When you run into something interesting, drop everything and study it.”
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# TABLE OF CONTENTS

List of Tables ........................................................................................................................ ii

List of Figures .......................................................................................................................... iii

Abstract ...................................................................................................................................... iv

Chapter One: Introduction ........................................................................................................ 1
  Barriers to Functional Analysis ............................................................................................. 1
  Time Constraints ...................................................................................................................... 2
  Setting Limitations .................................................................................................................. 2
  Ethical Considerations ............................................................................................................. 3

Chapter Two: Method .................................................................................................................. 6
  Subjects and Setting ................................................................................................................ 6
  Response Measurement and Reliability .................................................................................. 7
  Treatment Integrity .................................................................................................................. 8
  Indirect Assessment ............................................................................................................... 9
  Descriptive Analysis .............................................................................................................. 9
  Functional Analysis .............................................................................................................. 11

Chapter Three: Results .............................................................................................................. 13

Chapter Four: Discussion .......................................................................................................... 29

References ............................................................................................................................... 32

Appendices .............................................................................................................................. 38
  Appendix A: Functional Analysis Fidelity Checklist .............................................................. 39
  Appendix B: Demographic Questionnaire .............................................................................. 41
  Appendix C: Multiple Stimulus Without Replacement Data Sheet ...................................... 42
  Appendix D: IRB Approval Letter .......................................................................................... 43
LIST OF TABLES

Table 1: Participant Information .................................................................6

Table 2: Interobserver agreement scores across potential establishing operations, putative reinforcers, ad target responses during descriptive analysis observations .................8

Table 3: Interobserver Agreement Scores Across Conditions During the Functional Analysis ..8
LIST OF FIGURES

Figure 1: MSWO preference assessment results for all three subjects .........................18
Figure 2: FAST results from interviews conducted with the subjects’ parent and BCBA.....19
Figure 3: Functional analysis results for all subjects...................................................20
Figure 4: Chart of descriptive analysis observations..................................................21
Figure 5: Overall rate of problem behavior on the left hand side of the figure, and rate of problem behavior on the right hand side of the figure for all three subjects ..........22
Figure 6: Percentage of observation spent within the relevant EO during descriptive analysis observations. ...............................................................23
Figure 7: Difference rate between preceding-FA, following-FA, pre-FA, and post-FA observations .................................................................................24
Figure 8: Problem behavior following an FA series and time spent within the relevant EO during an FA series ......................................................................25
Figure 9: Problem behavior following and FA series and problem behavior within an FA series .........................................................................................26
Figure 10: Problem behavior following an FA series and reinforcement per minute within an FA series .................................................................27
Figure 11: Unconditional probability of the occurrence of potential reinforcement and the conditional probability of potential reinforcement given problem behavior .......28
ABSTRACT

Conducting a functional analysis (FA) is the most empirically supported method of determining problem behavior, yet clinicians report various barriers to conducting FAs. A common concern associated with conducting FAs is that by reinforcing problem behavior during assessment, problem behavior may increase outside of the assessment context (Hanley, 2012). However, little research has validated this concern. In fact, behavioral contrast research suggests the opposite may be more likely. Behavioral contrast can best be described as a change in behavior in one context as a result of the rate of reinforcement of the behavior in another context (Reynolds, 1961). The purpose of the current study was to evaluate problem behavior outside of the FA context. Response-stimulus sequences were observed through descriptive analysis across days as well as immediately preceding and following-FA sessions to examine temporal relations and the extent to which caregivers may influence behavior prior-to and post-FA. Our results suggest that problem behavior rate during an FA, reinforcement schedule, and time spent in the relevant establishing operation do not lead to increases in problem behavior outside of session. However, a change in caregiver behavior was observed for two of the three subjects between pre-FA and post-FA observations.
CHAPTER ONE:
INTRODUCTION

Individuals diagnosed with autism spectrum disorder (ASD) may engage in greater levels of problem behavior, such as aggression, self-injury, and property destruction than individuals diagnosed with another intellectual or developmental disability (McClintock et al., 2003). In order to provide the most effective treatment to such individuals problem behavior should be properly assessed through functional analysis (FA). Functional analyses identify maintaining contingencies of problem behavior by manipulating establishing operations (EOs) and consequences (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). Identifying the function maintaining problem behavior allows clinicians to design and implement function-based interventions, leading to better treatment outcomes (Iwata & Dozier, 2008). The traditional FA, as described by Iwata et al., (1982/1994) is considered the gold standard, yet clinicians report being hesitant to conduct it in a clinical setting (Oliver, Pratt, & Normand, 2015).

Barriers to Functional Analysis

Oliver, Pratt, and Normand (2015) surveyed BCaBAs, BCBAs, and BCBA-Ds on their opinions and use of functional behavior assessment methodology. Over half of respondents reported FAs to be the most valid method for determining functions of behavior. However, 63% of respondents reported conducting FAs “never or almost never.” Commonly reported barriers for conducting FAs include time constraints, setting limitations (Oliver et al., 2015), and ethical considerations (Hanley, 2012).
**Time Constraints**

Although the traditional FA is considered the “gold standard,” it may be a time-consuming assessment. Sessions described by Iwata and colleagues in 1982 were 15 min, and the average FA consisted of 30 sessions, resulting in approximately 8-hour assessments. However, Wallace and Iwata (1999) assessed both 5- and 10-min session lengths and reported adequate results at those durations. Moreover, literature reviews of FA methodology report the traditional (ABC model) FA comprised of 10-min sessions to be most commonly conducted (Beavers, Iwata, & Lerman, 2013; Hanley, Iwata, & McCord, 2003).

Additionally, Thomason-Sassi, Iwata, Neirdert and Roscoe (2011) addressed time-related concerns by demonstrating latency to problem behavior is effective at determining maintaining variables. As sessions are terminated immediately contingent on problem behavior, the latency-based FA is considered a less time-consuming option (Thomason-Sassi et al., 2011). Given the aforementioned, although time-constraints are reported to be a limitation of FAs, there are viable options for combating this limitation.

**Setting Limitations**

Clinicians report setting limitations, such as not having adequate space or materials as a barrier to conducting FAs (Oliver et al., 2015). Although the most FAs reported in the literature are conducted within a hospital or clinic setting (Beavers et al., 2013) research suggests that FAs conducted in the natural environment have similar outcomes (Thomason-Sassi, Iwata, & Fritz, 2013). Sigafoos and Saggers (1995) addressed concerns surrounding setting limitations by developing the discrete trial FA. The discrete trial FA involves implementing contingencies in a trial-based format within the subjects’ natural learning environment. Both LaRue et al. (2010) and Bloom, Iwata, Fritz, Roscoe, and Carreau (2011) extended Sigafoos and Saggers’ trial-based methodology and compared the trial-based FA to the standard FA. LaRue et al. (2010) reported
correspondence in four of five cases. Bloom et al. (2010) reported correspondence in six to eight of the 10 cases, making the trial-based FA an appropriate approach for conducting FAs within the natural learning environment.

**Ethical Considerations**

**Reinforcing problem behavior.** Some individuals have expressed ethical concerns in reference to reinforcing problem behavior within the FA context, suggesting that reinforcing such behavior may strengthen contingencies and increase rate of problem behavior outside of the FA context (Call et al., 2017:). Additionally, the traditional FA allows for problem behavior to occur repeatedly, which may be dangerous when problem behavior is severe. One way researchers have addressed this concern is by demonstrating the assessment of precursors of problem behavior is effective at determining maintaining functions of problem behavior (Carr, 1977; Herscovitch, Roscoe, Libby, Bourret, & Ahearn 2009; Najdowski, Wallace, Ellsworth, MacAlesse, & Cleveland, 2008; Smith & Churchill, 2002).

**Behavioral contrast.** Although some have expressed concerns related to reinforcing problem behavior within the FA context for fear that this could lead to increases in problem behavior outside of the FA context (Call et al., 2017). Little research has indicated this is a valid concern (Call, Delfs, & Findley, 2013; Shabani et al., 2013). Moreover, behavioral contrast research suggests that the exact opposite may occur (Reynolds, 1961). More specifically, Reynolds (1961) defines behavioral contrast as a change in behavior in one context as a result of the rate of reinforcement of the same behavior in another context. For example, when problem behavior is densely reinforced within the FA context, rate of problem behavior should decrease outside of that context if the schedule of reinforcement is thinner in that outside context. Although well researched within basic behavioral literature, minimal behavioral contrast research has been conducted with human subjects. However, Boyle, Samaha, Slocum,
Hoffmann, and Bloom (2016) investigated the differential influence of preceding and following schedules of reinforcement on positive and negative behavioral contrast, as well as within-session contrast with adults diagnosed with an intellectual or developmental disability in a 3-component human-operant arrangement. Positive contrast occurs when the rate of reinforcement in the varied component decreases and behavior in the target component increases (Rachlin, 1973). Results indicated positive contrast was found in five of six cases, and the magnitude of contrast was dependent on whether change in reinforcement occurred preceding versus in the following component.

In addition to reporting that FAs are not routinely conducted clinically (Oliver et al., 2015), research suggests that clinicians are most commonly relying on indirect and direct assessments, which may not reliably indicate maintaining functions of behavior (Roscoe, Phillips, Kelly, Farber, & Dube, 2015; St. Peter et al., 2005; Thompson & Iwata, 2007). This is problematic for several reasons. One such reason, is that according to the Professional and Ethical Compliance Code for Behavior Analysts (Board Analyst Certification Board, 2014) analysts have an obligation to conduct appropriate assessments prior to making recommendations or developing behavior-change programs (3.01). Therefore, if problem behavior is of concern clinicians have an ethical responsibility to conduct an FA.

Given the aforementioned studies, many of the reported concerns associated with conducting FAs have been addressed in the literature. However, one gap within the literature is whether problem behavior increases outside of the FA context, and if it does to what extent. Shabani et al. (2013) examined this concern by observing subjects for 10-min preceding and following an FA session. They reported little variance in problem behavior when the subject was returned to their typical setting. However, it’s possible changes in behavior, such as negative behavioral contrast may occur over time. Negative contrast is when behavior decreases as a
result of reinforcement contrast occurs when the rate of reinforcement in the varied component increases and behavior in the target component decreases (Boyle et al., 2013). Therefore, the purpose of this study was to replicate and extend the findings of Shabani et al. (2013) by not only examining problem behavior immediately before and after an FA session, but the also the days leading up to the start of and days after the completion of the FA. Additionally, this study evaluated the relations between problem behavior and caregiver responses to such behavior through descriptive analysis.
CHAPTER 2:
METHOD

Subjects and Setting

Three children who engaged in problem behavior participated in this study. Data were deidentified and subjects were assigned a pseudonym. Elijah was a 11-year old male diagnosed with ASD and Downs Syndrome. Elijah was non-vocal and used a picture cards to communicate. Jacob was a non-verbal 5-year old male diagnosed with ASD and Mason was a 7-year old male who was also diagnosed with ASD. Mason had a limited vocal repertoire, and also used a picture cards communicate. Sessions for Elijah and Mason were conducted at a local ABA day program and sessions for Jacob were conducted in home during regularly scheduled ABA therapy sessions. See Table 1 for a summary of subject information.

Table 1. Participant Information

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age</th>
<th>Sex</th>
<th>Ethnicity/Race</th>
<th>Diagnosis</th>
<th>Problem Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elijah</td>
<td>10</td>
<td>Male</td>
<td>Caucasian</td>
<td>ASD &amp; Down syndrome</td>
<td>Aggression</td>
</tr>
<tr>
<td>Jacob</td>
<td>5</td>
<td>Male</td>
<td>Hispanic</td>
<td>ASD</td>
<td>SIB</td>
</tr>
<tr>
<td>Mason</td>
<td>7</td>
<td>Male</td>
<td>Black</td>
<td>ASD</td>
<td>Property destruction +</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>aggression</td>
</tr>
</tbody>
</table>

Data were collected electronically using a data collection application (Countee©). Researchers wore different colored shirts during all conditions of the traditional FA to enhance discriminated responding across conditions (Conners et al., 2000). An array of tangible items were assessed through a multiple stimulus without replacement (MSWO) preference assessment.
(DeLeon & Iwata, 1996). Items selected as highly preferred through this preference assessment were used during the tangible and play conditions, items identified as moderately preferred were used in the attention condition of the FA.

**Response Measurement and Reliability**

The target behavior for each subject was operationally defined prior to the study. For Elijah aggression was targeted and defined as hitting, kicking, headbutting, or biting another individual. For Jacob self-injurious behavior in the form of hand-mouthing was targeted and defined as any instance in which the subject put any part of his hand in his mouth. Finally, for Mason property destruction and aggression were targeted and defined as any instance in which Mason hit, kicked, or knocked a tangible item off of a surface. Additionally, if another individual was near Mason when he engaged in property destruction he would often hit, kick, or throw an item at them. Because property destruction and aggression often occurred together, data were collected on both were during the descriptive analysis observations and the FA.

Researchers collected data on the rate or duration (for Jacob’s FA only) of problem behavior during each 10-min FA session. Data were also collected on the delivery of attention during the play and attention condition, prompt and compliance during the escape condition, and toy engagement during the tangible condition. Additionally, during descriptive observations, data were collected on the frequency of putative reinforcers and duration of the onset and offset of potential EOs.

A second observer collected data for 34% of FA sessions for each subject, 34% of descriptive observations for Elijah and 33% descriptive observations for Jacob and Mason to assess reliability of the data collection system. Functional analysis sessions and descriptive observations were divided into 10-s bins, the smaller number of events recorded by one data collector was divided by the larger number of events recorded by the other data collector (Iwata,
Pace, Cowdery, & Miltenberger, 1994). For events scored using duration, the smaller number of seconds was divided by the larger number of seconds within each 10-s bin, the values were then averaged for each session or observation. If both observers agreed that no responses occurred, the bin was scored as 100%. See Tables 2 and 3 for a summary of descriptive observation and FA interobserver agreement results.

**Table 2.** Interobserver Agreement Scores Across Potential Establishing Operations, Putative Reinforcers, and Target Responses During Descriptive Analysis Observations

<table>
<thead>
<tr>
<th>Subject</th>
<th>Potential EO</th>
<th>Putative Reinforcer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Attention</td>
<td>Demand Attention</td>
</tr>
<tr>
<td>Elijah</td>
<td>85</td>
<td>87.27</td>
</tr>
<tr>
<td>Jacob</td>
<td>83.87</td>
<td>85.37</td>
</tr>
<tr>
<td>Mason</td>
<td>86.87</td>
<td>88.12</td>
</tr>
</tbody>
</table>

**Table 3.** Interobserver Agreement Scores Across Conditions During the Functional Analysis

<table>
<thead>
<tr>
<th>Condition</th>
<th>Subject</th>
<th>Ignore</th>
<th>Attention</th>
<th>Play</th>
<th>Tangible</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elijah</td>
<td>100</td>
<td>99.5</td>
<td>100</td>
<td>99.6</td>
<td>98.1</td>
<td></td>
</tr>
<tr>
<td>Jacob</td>
<td>100</td>
<td>97.2</td>
<td>100</td>
<td>100</td>
<td>98.6</td>
<td></td>
</tr>
<tr>
<td>Mason</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>96.7</td>
<td>97.5</td>
<td></td>
</tr>
</tbody>
</table>

**Treatment Integrity**

Graduate students trained on the procedures of the session-based FA assessed the implementer’s treatment integrity across 34% of sessions per subject. A fidelity checklist (see
Appendix A) was used to assess treatment integrity. Researchers implemented the FA procedures with 100% treatment fidelity across all subjects.

**Indirect Assessment**

A parent of each subject was asked to fill out a demographic questionnaire (see Appendix B) to identify the age, ethnicity, and primary language of each child. The Functional Analysis Screening Tool (FAST; Iwata, DeLeon, & Roscoe, 2013) was completed with each subjects’ caregiver and BCBA. Data collected from the FAST were used to identify topographies of problem behavior, as well as potential contingencies maintaining problem behavior. Information collected from the FAST was intended to better inform descriptive observations and FA procedures. See Figure 2 for summary of the FAST results.

**Descriptive Analysis Observations**

Direct observations were conducted within the subjects’ typical learning environment during a time in which the subjects’ BCBA suggested problem behavior regularly occurred. Elijah and Mason were both assigned a one-on-one therapist within the clinic setting but several adults interacted with them during observations. Jacob’s sessions were conducted at home during regularly scheduled therapy sessions and he only interacted with his therapist during observations. Thirty-minute observations were conducted on separate days until a minimum of 30-min of each EO was captured prior to the start of the FA and after the completion of the FA. Additionally, daily 15-min direct observations were conducted immediately preceding and following-FA sessions. Data were collected in a descriptive analysis format using procedures described by Vollmer, Borrero, Wright, Van Camp and Lalli (2001). The researcher simultaneously collected data using a data collection application (Countee©) on frequency of problem behavior and the duration of environmental events. Environmental events were divided into two classes: establishing operations (EOs; low attention, restricted access to tangibles, and
demand presentation) and putative reinforcers (attention, access to tangibles, and escape from demands). Potential EOs and putative reinforcers were scored as duration measures and operationally defined in a mutually exclusive and exhaustive manner such that if a putative reinforcer key was “on”, its corresponding EO key was “off”. It was however possible for an EO to overlap with another EO. For example, “attention on” would always overlap with “demand on” because demands involved attention delivery. EOs and putative reinforcers were defined in the same manner as Samaha et al. (2009):

“Attention on” was scored when any occurrence of physical contact or spoken statement between the therapist and the subject was observed. “Attention on” was scored until 3 s elapsed without a spoken statement or physical contact directed toward the subject, and then “attention off” would be scored. “Demand on” was defined as an occurrence a spoken command to initiate, continue, or complete any task. “Demand on” was continued to be scored materials were removed, therapist turned away from the subject, or 10s had elapsed without a demand presentation. At this point “demand off” would be scored. “Access on” was scored when tangible items were engaged with, within reach of the subject when seated, or when the subject was no longer engaging with an item, but it wasn’t restricted by the therapist. “Restricted access” was scored any time “access on” was off. Having observers record both the occurrence and nonoccurrence of environmental events allowed for us to correct for errors prior to data analysis. For example, there were occasions in which an EO and its corresponding reinforcer were both scored as “on”. According to our mutually exclusive and exhaustive definitions it was impossible for an EO and its corresponding reinforcer to be scored as “on” at the same time. Therefore, to correct for this error we set the offset key to the onset time of the latter.

All direct observation data were evaluated to determine the likelihood of problem behavior increasing outside of the FA context. Additionally, data were analyzed to determine the
unconditional probability of potentially reinforcing events occurring and the conditional probability of the delivery of a potentially reinforcing event given problem behavior.

**Functional Analysis**

The traditional FA procedures were based upon those described by Iwata et al. (1982/1994). Sessions were 10 min and arranged using a multielement design and included the ignore, attention, play, tangible, and escape conditions. Condition order was fixed to maximize the influence of establishing operations (Hammond, Iwata, Rooker, Fritz, & Bloom, 2013). Researchers who served as therapists during the FA wore different colored shirts to enhance discriminated responding across conditions (Conners et al., 2000). One series of conditions were conducted per day, so that temporal relations across days could be evaluated. Data were collected until a clear function was determined through visual analysis.

**Ignore.** During the ignore condition the therapist sat in the room with the subject but ignored all appropriate and inappropriate responses. No programmed consequences were delivered contingent on problem behavior.

**Attention.** The subject had access to moderately preferred items during the attention condition. The session began with the therapist saying, “I have some work to do,” and turning away from the subject. Attention was delivered, in the form of a mild reprimand or statement of concern, contingent on the subject engaging in the target behavior.

**Play.** The subject was given free access to highly preferred tangible items throughout the play session. Attention was provided non-contingently every 30 s, and no consequences were provided for problem behavior.

**Tangible.** The tangible condition was included when FAST results indicated that problem behavior may be sensitive to restricted access to tangibles. The subject had access to highly preferred items for 2 min prior to the tangible session. The session began with the therapist
removing the highly preferred items and turning away from the subject. Access to the highly preferred tangible items was provided for 30 s, contingent on the subject engaging in the target behavior. If results from the FA indicated a tangible function, data from descriptive analysis observations were analyzed to ensure problem behavior occurred within the relevant EO to rule out a false-positive tangible function (Rooker, Iwata, Harper, Fahmie, & Camp, 2011).

**Escape.** The therapist repeatedly presented developmentally appropriate demands to the subject (e.g., “clap your hands”) using the three-step prompting sequence. One-step directions were considered developmentally appropriate because the researcher observed each subject engage in one-step during descriptive analysis observations. Each trial began with an instruction, followed by, as needed, a model, and then physical assistance. If the subject engaged in the target behavior, the researcher said “okay, you don’t have to” and demands were terminated for 30 s.
CHAPTER THREE:
RESULTS

Figure 1 shows data collected from the MSWO preference assessment for each subject. The top two items were considered highly preferred and used in the play and tangible conditions of the FA and the middle two items were considered moderately preferred and used in the attention condition of the FA. Elijah’s data are on the top panel and indicated the toy snake and the music toy to be highly preferred. Legos and a squeeze toy were considered moderately preferred. Jacob’s data are on the middle panel and suggested the giraffe and car were highly preferred. The Rubik’s cube and an action figure were considered moderately preferred. Mason’s data are on the bottom panel and suggested the blocks and drumsticks to be highly preferred, and a ball and bendy toy to be moderately preferred.

Figure 2 shows data collected after conducting the FAST with each subject’s parent and BCBA. Data collected from parents are on the left and data collected from BCBA are on the right. Potential functions of behavior are plotted along the x-axis and number of “yes” responses are plotted on the y-axis. Refer to Figure 2 for a summary of the FAST results.

Figure 3 shows data collected during the FA for each subject. Elijah’s data are on the top panel. Responding is elevated in the escape condition in comparison to the play condition, suggesting that aggression was maintained by escape from demands for this subject. Jacob’s data are on the middle panel, responding is elevated in both the attention and escape conditions in comparison to the play condition. These data suggest that SIB was multiply maintained by attention and escape for this subject. Mason’s data are on the bottom panel. Responding is
elevated in the tangible condition in comparison to the play condition, suggesting that property destruction plus aggression was maintained by access to tangibles for this subject. To ensure a false-positive tangible function was not observed, data from Mason’s descriptive analysis observations were analyzed to ensure problem behavior occurred within the restricted access EO.

Figure 4 shows a chart of descriptive analysis observations and when these observations occurred in relation to when the functional analysis was conducted.

Figure 5 shows data collected during descriptive analysis observations to examine some effects of FA on problem behavior outside of the FA context. Data collected on the overall rate of problem behavior indicate that all subjects typically engaged in less problem behavior during following-FA observations than during preceding-FA observations. A behavioral contrast effect is more clearly depicted in the graphs on the right hand side of the figure, which only show behavior recorded within the relevant potential EO for each subject.

Figure 6 shows percentage of session spent within the relevant EO during 30-min descriptive analysis observations conducted prior to and after the completion of the FA and 15-min observations conducted immediately preceding and following a series of FA sessions for all subjects. The relevant EO for Elijah was demand presentation, for Jacob relevant EOs included demand presentation and low attention, and the relevant EO for Mason was restricted access to tangibles.

Figure 7 shows results for the difference in problem behavior observed during observations conducted immediately preceding and following a series of FA sessions on the left and the difference in problem behavior observed during observations conducted pre-FA and post-FA observations on the right. As a reminder, pre-FA and post-FA observations were conducted prior to the start of and after the completion of the FA. The difference score was determined by subtracting the following-FA rate by the preceding-FA rate. So for example, the
following rate of behavior observed after an FA series would be subtracted from the preceding-
FA rate of problem behavior observed on that same day. To determine the difference in problem
behavior across time we subtracted the post-FA rate from the corresponding pre-FA observation
rate. The only exception to this was for Elijah. Elijah had four pre-FA observations and only
three post-FA observations. This is because it took four pre-FA and only three post-FA
observations to capture 30 min within each EO. To determine the difference in problem
behavior across time for Elijah we averaged used the average rate of problem behavior observed
during the pre-FA observations and subtracted that from the rate of problem behavior observed
during the post-FA observations. Figures on the left represent the difference scores of
preceding and following-FA observations. With the exception of the first data point for Mason,
a behavioral contrast effect can be observed across these observations for all subjects. That is,
problem behavior was more likely to occur preceding the FA session rather than after. Figures
on the right represent the difference in problem behavior between pre-FA and post-FA
observations. Elijah’s data are on the top panel and suggest that for Elijah problem behavior
decreased post-FA. Jacob’s pre and post-FA data are plotted on the middle on the right side of
the figure. Jacob’s data suggest that problem behavior was less likely to occur after the
completion of the FA initially, but that problem behavior returned to baseline levels by the
second post-FA observation. Mason’s pre and post-FA data are on the bottom panel and on the
right side of the figure. Mason’s data suggest that his problem behavior returned and maintained
at baseline levels. These data suggest that problem behavior does not increase during the period
of time after an FA is conducted as a result of FA.

Figure 8 shows seconds spent in the EO during the FA and the overall rate problem
behavior observed during following-FA observations on the top panel. The bottom panel shows
seconds spent in the EO during the FA and rate of problem behavior observed within the relevant
potential EO during following-FA observations. These data suggest that time spent within the 
EO during the FA did not lead to increases in problem behavior outside of session on a daily 
basis.

Figure 9 shows rate of problem behavior within each FA series and rate of problem 
behavior immediately following an FA series for all three subjects. These data suggest that for 
all subjects’ rate of problem behavior decreased from following the FA series within the typical 
setting.

Figure 10 shows reinforcement per minute during each FA series and the rate of 
problem behavior observed in the natural environment during the following-FA observations for 
all subjects. The top panel depicts data on the overall rate of problem behavior and the bottom 
panel depicts rate of problem behavior within the EO during following-FA observations. These 
data suggest that the rate of reinforcement within the FA context did not predict increases in 
problem behavior outside of session.

Figure 11 shows data on the unconditional probability, UP(Sr) of potential reinforcement 
and the conditional probability, P(Sr/B) of potential reinforcement given problem behavior. To 
determine the unconditional probability the number of seconds within the relevant EO that had 
reinforcement was divided by the number of seconds the EO was “on.” To determine the 
conditional probabilities the number of times problem behavior was followed by reinforcement 
(within 10s) within the EO was divided by the number of times problem behavior occurred 
within the EO. When an unconditional probability is higher than a conditional probability bar a 
negative contingency is observed. A negative contingency means that the individual was less 
likely to be provided with potential reinforcement after engaging in problem behavior. A 
positive contingency is when the conditional probability is higher than the unconditional 
probability. When a positive contingency is observed it means that the individual was more
likely to be provided with potential reinforcement after engaging in problem behavior. A neutral contingency is when the probabilities are equal. Jacob’s data are on the middle panel and suggest that he was more likely to be provided attention or escape after engaging in problem behavior during pre-FA, preceding-FA, and post-FA observations. Data from Jacob’s following series indicate a neutral contingency. Data for both Elijah and Mason indicate a negative contingency during the pre-FA observations, but then a positive contingency is observed for both subjects during the post-FA observations. The change from a negative to a positive contingency post-FA indicate a change in therapist behavior.
Figure 1. MSWO preference assessment results for all three subjects.
Figure 2. FAST results from interviews conducted with the subjects’ parent and BCBA.
Figure 3. Functional analysis results for all subjects.
Figure 4. Chart of descriptive analysis observations.
Figure 5. Overall rate of problem behavior on the left hand side of the figure, and rate of problem behavior on the right hand side of the figure for all three subjects.
Figure 6. Percentage of observation spent within the relevant EO during descriptive analysis observations.
Figure 7. Graphs on the left depict data on the difference in rate of problem behavior preceding and following-FA observations. Graphs on the right depict data on the difference in the rate of problem behavior during pre and post-FA observations.
Figure 8. Data on the top panel depict the overall rate of problem behavior following an FA series on the y-axis and seconds spent in the relevant potential EO on the x-axis. Data on the bottom panel depict rate of problem behavior following an FA series within the relevant EO on the y-axis and seconds spent in the EO within the FA on the x-axis.
**Figure 9.** This figure depicts data collected on the rate of problem behavior within an FA series and immediately following the series for all three subjects. Overall rate is on the top panel and rate within the relevant potential EO is on the bottom panel.
Figure 10. Overall rate of problem behavior observed during following-FA observations is plotted on the y-axis on the top panel. Rate of problem behavior within the relevant potential EO is on the y-axis on the bottom panel. Reinforcement per minute is plotted along the x-axis of both panels.
Figure 11. Descriptive analysis observations are plotted on the x-axis and probability is plotted along the y-axis. Grey bars represent the average unconditional probability of the occurrence of potential reinforcement and black bars represent the conditional probability of potential reinforcement given problem behavior.
CHAPTER 4
DISCUSSION

This study replicated and extended Shabani et al., (2013). Similar to Shabani et al., (2013) one purpose of the current study was to examine some effects of FA on problem behavior outside of the FA context. We extended the findings of Shabani et al., (2013) by examining how and to what extent the rate of problem behavior, rate of reinforcement, and time spent in the relevant potential EO within the FA context predicts problem behavior outside of session. Data were collected on the overall rate of problem behavior, problem behavior within the relevant potential EO, time spent within the relevant potential EO and the delivery of putative reinforcers during descriptive analysis observations.

Our results suggest that these variables were not predictive of increases in problem behavior outside of the FA context. Additionally although some have expressed concerns in relation to reinforcing behavior within the FA context such as it may lead to an increase in problem behavior outside of session (Call et al., 2017), our results suggest that the dense schedule of reinforcement within the FA context did not negatively impact problem behavior outside of the context. In fact, a negative behavioral contrast effect was observed for all subjects during following-FA observations. Problem behavior decreased during all of these observations with the exception of observation four for Mason. Mason did not engage in problem behavior during the fourth preceding observation but engaged in a very low rate of problem behavior during the fourth following-FA observation. Therefore the small amount of behavior that was
observed in the following-FA observation was emphasized by the disparity with the absence of problem behavior observed in the preceding-FA observation.

We also examined how time spent within the relevant EO during the FA may have impacted problem behavior outside of session. Results from all three subjects suggest that time spent within the EO during the FA did not positively correlate with problem behavior following the FA. For example, Jacob spent 999 s within the EO of an FA series and did not engage in any problem behavior during the following-FA observation.

A secondary purpose of this study was to evaluate some effects of FA on caregiver behavior. In order to do this we compared the unconditional probability UP(Sr) of putative reinforcement to the conditional probability, UP(Sr/B) of putative reinforcement given problem behavior. We found that for Elijah a negative contingency was observed during pre-FA observations, that is escape was less to be provided when he engaged in aggression. However, we observed a change during the post-FA observations. A positive contingency was observed, meaning that Elijah was more likely to escape from demands given aggression. Probability data for Jacob indicated a positive contingency across time, that is Jacob was more likely to be provided with attention or escape given problem behavior across pre and post-FA observations. Jacob’s data suggest that his therapist’s behavior was not influenced by the FA. Results for Mason were similar to Elijah’s as a negative contingency was observed during pre-FA observations and a positive contingency was observed during post-FA observations. Elijah and Mason’s data suggest that therapist behavior was influenced by the FA. For the purposes of this study, data were collected on whether the subject was exposed to a potential EO or if a punitive reinforcer was delivered. Therefore, our data on therapist behavior was correlational. However, future research should more closely examine the variables relating to therapist behavior following an FA.
A limitation of the current study is that we did not collect data for a specified amount of time within each EO during preceding-FA and following-FA observations. We did not make suggestions to care providers because we were interested in what they would do without our influence. One way that future research could address this challenge would be to conduct preceding-FA and following-FA observations until a certain amount of time within each EO is captured. Another option would be to consider contriving situations during these observations so that ample time within each EOs may be observed. However, the purpose of the current study was to evaluate problem behavior within the natural context and to observe caregivers’ responses to such behavior. Results from this study suggest that FAs have little impact on behavior within the natural context across time. The generality of our findings is unknown, but all three of our subjects engaged in similar rates of problem behavior during pre-FA and post-FA observations. Findings from this study add to the functional analysis literature and hopefully alleviate some clinicians’ concerns relating to conducting FAs.
REFERENCES


Appendix A: Functional Analysis Fidelity Checklist

**Functional Analysis Fidelity Checklist**

Subject:  
Data Collector:  
Session Number:  
Target Behavior:  

<table>
<thead>
<tr>
<th><strong>Alone/Ignore Condition</strong></th>
<th>Implemented correctly?</th>
<th>Steps Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The child was seated in a room alone without access to any items OR the subject was seated in the room with a researcher, but still did not have access to any items.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>2) All appropriate or inappropriate responses were ignored.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>3) No consequences were delivered contingent on the target behavior.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>4) The session was terminated after 10 min elapsed.</td>
<td>Y N N/A</td>
<td>/4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Attention Condition</strong></th>
<th>Implemented Correctly?</th>
<th>Steps Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The subject was given access to a moderately preferred item and told they could play with it.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>2) The researcher told the subject they “had work to do” and turned away from the subject.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>3) The researcher did NOT place demands on the subject.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>4) Contingent on problem behavior, attention was delivered.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>5) After attention was delivered the researcher resumed being busy.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>6) No consequences were delivered for behavior other than the target behavior.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>7) Session was terminated after 10 min elapsed.</td>
<td>Y N N/A</td>
<td>/7</td>
</tr>
<tr>
<td><strong>Play Condition</strong></td>
<td>Implemented Correctly?</td>
<td>Steps Correct</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>1) Subject was given access to a variety of preferred items.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>2) Non-contingent attention was delivered at least every 30 s.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>3) The researcher did not place any demands on the subject.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>4) No consequences were delivered contingent on the target behavior.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>5) Session was terminated after 10 min elapsed.</td>
<td>Y N N/A</td>
<td>/5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tangible Condition</strong></th>
<th>Implemented Correctly?</th>
<th>Steps Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The researcher took the preferred items from the subject.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>2) The subject received access to preferred item for 30 s, contingent on engaging in the target behavior.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>3) Preferred item was removed after 30 s.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>4) Session was terminated after 10 min elapsed.</td>
<td>Y N N/A</td>
<td>/4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Escape Condition</strong></th>
<th>Implemented Correctly?</th>
<th>Steps Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) The researcher presented demands.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>2) The researcher used 3-step prompting.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>3) The researcher said “okay, you don’t have to” and provided a 30 s break contingent on problem behavior.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>4) The researcher waited 30 s after compliance before presenting a new demand.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>5) Praise was NOT provided for compliance.</td>
<td>Y N N/A</td>
<td></td>
</tr>
<tr>
<td>6) Session was terminated after 10 min elapsed.</td>
<td>Y N N/A</td>
<td>/6</td>
</tr>
</tbody>
</table>
Appendix B: Demographic Questionnaire

Demographic Questionnaire

How old is your child? ______

What gender is your child? ______

What language does your family speak at home? ______

Does your child speak a different language at school? ______

What is your child’s ethnicity? ______

How many people live in the household? ______

What is your marital status? ______

What is the highest level of education you completed? ____________
Appendix C: Multiple Stimulus Without Replacement Data Sheet

MSWO Data Sheet

<table>
<thead>
<tr>
<th>Item A: ______________</th>
<th>Item B: ______________</th>
<th>Item C: ______________</th>
<th>Item D: ______________</th>
<th>Item E: ______________</th>
<th>Item F: ______________</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Subject:</th>
<th>Date:</th>
<th>Data Collector:</th>
<th>Circle: Primary/ Reliability</th>
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</table>

<table>
<thead>
<tr>
<th>Trial #</th>
<th>Item Selected</th>
<th>Placement of Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x x x x x x</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>x x x x x</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>x x x x</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>x x</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
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Results

<table>
<thead>
<tr>
<th>Item</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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Appendix D: IRB Approval Letter

10/26/2018

Karie John,
ABA-Applied Behavior Analysis

St Petersburg, FL 33703

RE: Expedited Approval for Initial Review
IRB#: Pro00037071
Title: Behavioral Contrast and Functional Analysis: Problem Behavior Outside of Session

Study Approval Period: 10/25/2018 to 10/25/2019

Dear Dr. John:

On 10/25/2018, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Protocol Version 1

Consent/Assent Document(s)*:
Consent form version 1.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.
It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

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

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

**Research Involving Children as Subjects: 45 CFR 46.404**

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

**Requirements for Assent and/or Permission by Parents or Guardians: 45 CFR 46.408**

Permission of one parent is sufficient.

Assent is waived because it is not appropriate due to the age, maturity, and/or psychological state of the child.

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

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

Sincerely,

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