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FUNCTIONAL ANALYSES: A COMPARISON OF ISOLATED AND SYNTHESIZED CONTINGENCIES

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FUNCTIONAL ANALYSES: A COMPARISON OF ISOLATED AND SYNTHESIZED CONTINGENCIES

THESIS

A thesis submitted in partial fulfillment
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By

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ABSTRACT OF THESIS

FUNCTIONAL ANALYSES: A COMPARISON OF ISOLATED AND SYNTHESIZED CONTINGENCIES

The purpose of the study was to compare traditional functional analysis procedures (isolated contingencies) to functional analysis procedures which are modified to include nuanced environmental variables (synthesized contingencies) for children in an outpatient setting in order to determine sensitivity to the isolated or synthesized contingencies. A multi-element design embedded into a multi-treatment design was used to evaluate differentiated rates of challenging behavior across the two analyses for three children exhibiting challenging behaviors. The results supported the utility of the traditional functional analysis (FA) procedures when compared to that of the interview informed synthesized contingency analysis (IISCA) for one of three participants.

KEYWORDS: Functional analysis, functional assessment, challenging behavior, interview informed synthesized contingency analysis, modified functional analysis

Devin N Graley
April 12, 2019

FUNCTIONAL ANALYSES: A COMPARISON OF ISOLATED AND SYNTHESIZED CONTINGENCIES

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Section 1: Introduction

Psychology from a behavioral lens attempts to explain human behavior in terms of its relationship to the environment in which a behavior occurs. In 1913, Watson described the stimulus-response (S-R) paradigm in which behavior could be explained by the environmental arrangements that immediately preceded it (Cooper, Heron, & Heward, 2007). This S-R paradigm would later be referred to as respondent behavior and was thought to be an involuntary response due to its proximity to the events that immediately preceded it (antecedent events). However, the S-R model proved inadequate for explaining the entirety of human behavior, particularly behaviors in which there was no clear antecedent. From this shortcoming, B.F. Skinner began to look more closely at not only the environmental arrangements that precede a behavior, but also environmental arrangements that followed a behavior. This second paradigm was referred to as operant behavior and attempted to explain human behavior by looking at the consequent events that followed a behavior of interest (Cooper et al., 2007).

In a dynamic environment, it can be challenging to discern immediate antecedent and consequent events as they relate to a behavior of interest. These environmental circumstances, which occur in close temporal relation to a behavior of concern, provide insight into the function a behavior serves under particular environmental conditions. However, to understand function, or *why* a behavior is occurring, it is imperative to recognize an elicited behavior as it relates to its environment in this way. This becomes particularly crucial when considering behavior modification. In order to change behavior, antecedent and/or consequent events must also change.

When attempting to understand why a challenging behavior occurs (e.g., self-injury, aggression, property disruption) the same principles apply as these behaviors are immediately related to the environment in which they occur. Thus, it is critical to understand the immediate environment to effectively alter it in a way that no longer evokes the aberrant response. There are a variety of techniques used to identify events that may be responsible for explaining the function a behavior serves. Each of these techniques fall under the umbrella of functional assessment.

Functional assessment includes three major components*:* (1) indirect assessment, (2) descriptive assessment, and (3) direct assessment via functional analyses (Hanley, 2012). Each assessment or analysis yields varying types of data. Results from an indirect assessment are typically obtained via questionnaires and behavioral interviews. While the indirect assessment process is time-efficient, and provides useful information pertaining to relevant environmental idiosyncrasies, information obtained via these assessments yield results that may be unreliable in determining functions of behaviors (Roscoe, Phillips, Kelly, Farber, & Dube, 2015). The second component, descriptive assessment, involves directly observing and collecting data on the behavior of concern. Oftentimes this is done through antecedent, behavior, consequence (ABC) data collection which describes events that both immediately precede and follow a behavior of concern. This information is helpful in determining hypotheses about why the behavior is occurring. However, one shortcoming of the descriptive assessment process is that it does not include the systematic manipulation of environmental variables surrounding the observed behavior to reliably test hypotheses that experimentally determine function.

Descriptive assessments provide practical information about behaviors as they occur in the natural environment, but may require extensive training in order to accurately conclude function (Tarbox et al., 2009). While useful in determining events immediately surrounding behavior of concern, descriptive assessments typically yield a count of observed events but have shown mixed results in the literature in determining the same function as a functional analysis (FA; Tarbox et al., 2009).

The FA is oftentimes considered the final component of the functional assessment process. While this component is the most intrusive, as it involves the direct and systematic manipulation of environmental variables which provide cause and effect information about a behavior of concern, it is also the most accurate component of the process (Hanley, 2012; Roscoe et al., 2015). This analysis is the prescribed process of identifying variables that are functionally related to a behavior of interest (e.g., environmental variants that produce predictable changes in a behavior; Skinner, 1953, as cited in Fisher, Piazza, & Roane, 2011).

FAs begin the systematic investigation into environmental variables directly influencing a behavior of concern. This manipulation has the capability to inform professionals as to why a behavior is occurring (Hanley, 2012). FAs have the capability to more accurately identify antecedent conditions that evoke behavior and consequent events that maintain behavior, therefore the results yielded from a FA better inform effective interventions and yield positive results for the treatment of maladaptive behaviors (Campbell, 2003). The identification of isolated or idiosyncratic contingencies that evoke and maintain behavior puts professionals in a strong position to fashion antecedent strategies (e.g., noncontingent reinforcement) that prevent a behavior from

occurring and consequent strategies (e.g., differential reinforcement of alternative behaviors) that extinguish a behavior of concern without relying as heavily on punitive consequences (Kahng, Iwata, & Lewin, 2002). Despite the utility, precision, and reliability of results obtained by FAs (Roane, Fisher, Kelley, Mevers, & Bouxsein, 2013), previous literature supports that this method is not the most widely used by practitioners when compared to indirect and direct assessments (Ellingson, Miltenberger, & Long, 1999; Desrochers, Hile, & Williams-Moseley, 1997; Roscoe et al., 2015).

The traditional methodology for conducting a FA was originally described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) when treating self-injury for nine participants. In their seminal work on FAs, Iwata and colleagues conducted analyses in which environmental variables commonly suspect in maintaining behavior (e.g., automatic positive or negative reinforcement, positive reinforcement via access to attention, and negative reinforcement via escape from demands) were manipulated individually and compared to a control condition (e.g., a condition in which all potential reinforcers are controlled for) to determine functions of problem behaviors over the course of several 15 min sessions. Results indicated differentiated patterns of responding for 6 out of 9 participants, in that the rates of self-injurious behaviors were higher in one condition when compared to other test and control conditions. This study supports that self-injury may be functionally related to various environmental conditions and provide a rationale into the investigation of functions of other topographies of aberrant behavior.

Following Iwata and colleagues (1982/1994) publication, variations of FAs have occurred and yielded positive results for determining the function of various challenging behaviors (e.g., self-injury, aggression, property disruption, elopement). In a literature

review of these variations, Hagopian, Rooker, Jessel, and DeLeon (2013) reported the outcomes of 176 FAs. Of the analyses described, 161 utilized one or more modification to the traditional procedures described by Iwata and colleagues (1982/1994) in order to obtain differentiation (e.g., changing design, altering antecedent or consequent events, extending conditions). While data were not reported relating to at which the modifications were implemented or what specific alterations were made when antecedent and consequent events were modified, this review provided practical implications for considering modifications of the traditional FA in order to determine functions of challenging behaviors.

One such modification to the FA process has been the consideration and integration of idiosyncrasies within participants' unique reinforcement histories. Schlichenmeyer, Roscoe, Rooker, Wheeler, and Dube (2013) identified 42 articles in which researchers manipulated antecedent (e.g., presentation of a *specific* task demand) and consequent events (e.g., providing access to a preferred conversation) within the context of a FA. Practical implications suggested utilizing the indirect and descriptive methods of assessment to inform more precise and ecologically valid conditions in an FA that may lead to more efficient determination of function and reduce the time between assessment and the introduction of an effective treatment protocol (Campbell, 2003; Hagopian et al., 2016). Another variation of the traditional FA is the trial-based FA. This analysis is commonly conducted in school environments where test and control conditions are naturally embedded into a student's daily routine (Lambert, Bloom, & Irvin, 2012). Implications of this variation support the utility of these analyses in different

environments and suggest that individuals other than a researcher can utilize these procedures in order to better inform treatment and student outcomes.

Another more recent modification and major shift from the traditional FA is the synthesis of relevant test conditions within the FA, determined through the use of the functional assessment process (i.e., a behavioral interview and direct observation). These conditions are then synthesized into a dichotomous test-control analysis (Hanley, Jin, Vanselow, & Hanratty, 2014). The interview-informed synthesized contingency analysis (IISCA), as employed under the test-control format, is driven by an open-ended interview with individuals' significant others in order to better determine distinct contingencies (e.g., escaping task demands to access preferred items) that are pertinent to evoking a behavior of interest. In an IISCA, test conditions are synthesized (e.g., attention, tangible, and escape are tested together if they are all hypothesized maintaining functions) to better mirror a dynamic environment. Hanley and colleagues (2014) employed this method for three participants with severe problem behavior (i.e., screaming, aggression, and crying). Results from the IISCA demonstrated abrupt changes in level of the target behaviors when contingencies were synthesized when compared to the control condition. The results also led to a determination of function within approximately 25 min, leading to an effective and efficient determination of function of the observed problem behaviors (Jessel, Hanley, & Ghaemmaghami, 2016).

Aberrant behaviors that do not respond to typical behavior management strategies employed by caregivers, teachers, and significant others require immediate attention in order to develop effective behavior modification protocols. For this reason, the effective and efficient treatment of these behaviors needs to be addressed. In order to better

provide comprehensive and effective treatment, it is vital that function be determined in a time-effective manner. To date, only two comparisons of the traditional FA and the IISCA have been conducted to determine differentiated outcomes that lead to an effective and efficient determination of treatment (Fisher, Greer, Romani, Zangrillo, & Owen, 2016; Slaton, Hanley, & Raftery, 2017).

Fisher et al. (2016) conducted a study in which the researchers evaluated the differentiated effects of a FA and an IISCA. Their rationale for this study was to determine if the implementation of an IISCA could facilitate an interactive effect between two or more independent variables simultaneously that might produce a more robust reinforcement contingency. Findings consistent with the assumptions of the IISCA would impact the responding of participants in way that would produce a more robust reinforcement contingency when compared to the implementation of a single independent variable (the assumption of a traditional FA) that could more precisely capture participant's responding during an isolated test condition. Results illustrated differentiated patterns (i.e., higher rates of responding in the test conditions when compared control conditions) of responding for four of five participants when testing the assumptions of the traditional FA. Findings from these four FAs suggested that, overall, there was little evidence to suggest that establishing operations EOs act in combination to produce a more robust reinforcement contingency. While there were differentiated levels of responding in the IISCA for the four participants, this differentiation produced false positives when compared to outcomes of the traditional FA. For all participants, with the exception of one non-responder, a traditional FA produced a more concise conclusion

related to function of the target behaviors. Based on results from this study, the authors suggest that a traditional style of FA produced more reliable outcomes than an IISCA.

Similarly, Slaton et al. (2017) were looking to determine relative probability of differentiated outcomes of the traditional FA and the IISCA. In order to do this they recruited participants who had previously been exposed to the FA process, but whose analyses yielded inconclusive results. In addition to determining outcomes through the use of traditional and modified FAs, researchers proceeded to implement function-based treatments to evaluate outcomes. Results from this study described analyses which produced differentiated outcomes in a synthesized analysis for 100% of participants where a traditional FA produced differentiated effects for only 44% of participants. This study illustrated the utility of an IISCA when determining function of maladaptive behavior for nine participants, suggesting that a traditional FA, while still effective, may inadvertently omit relevant contingencies when evaluating maintaining functions of problem behavior. Implications of this study suggest that a dynamic environment may have various influences on a behavior of interest and that a behavior may be multiply maintained by one or more environmental factors (e.g., an individual escapes to something else). For this reason, it may be wise to consider the idiosyncrasies of an individual's environment when designing an analysis in order to produce meaningful treatment outcomes for clients.

Given the discrepancy in findings of the aforementioned comparison studies and the scarcity of literature related to the comparison of differentiated effects between IISCAs and traditional FAs, the purpose of this study is to expand upon previous literature that compares the aforementioned analyses. Outcomes from a comparison of

these two analyses will ideally provide practitioners with information regarding effective and efficient analysis that could potentially lead to reduction in time between assessment and treatment for individuals exhibiting problem behaviors.

Section 2: Research Question

The research questions were as follows: (a) When using an IISCA and FA to determine function of problem behavior, are there differential patterns of responding (e.g., rate of problem behavior) across the two analyses for participants who exhibit problem behaviors at an outpatient clinic? (b) Will participants demonstrate sensitivity to both isolated contingencies (FA) and synthesized contingencies (IISCA) in a way that yields similar conclusions regarding function(s) of behavior?

Section 3: Method

Participants

Three participants who were between 7 and 10 years of age were recruited for this study. Inclusion criteria were as follows: (a) outside agency referral for severe problem behavior, (b) target behavior which could be addressed within the parameters of the setting (e.g., aggression, property disruption, screaming), (c) qualification for special education services or a diagnosis of a developmental disorder, and (d) a hypothesis of a socially mediated function. Participants were excluded from participation in this study if they (a) were referred to the clinic seeking assistance with behaviors related to skill acquisition (e.g., toileting, academics, life skills, and/or vocational skills); (b) exhibited behaviors that could not be safely assessed within the parameters of the clinic (e.g., elopement); and (c) exhibited behaviors that were likely automatically maintained (e.g., hand flapping, pacing, and/or stereotypic vocalizations) (based on parent report via an intake packet or during the semi-structured interview). Participants attended the clinic with caregivers during a series of five appointments geared towards caregiver training in the implementation of treatment procedures. During their time in this study, an additional three visits were required in order to conduct further analyses.

Margot, a 7-year-old, Caucasian female diagnosed with autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD) was referred to the clinic to assess and treat aggressive (hitting, kicking, spitting, and biting) and disruptive behaviors (breaking, tearing, hitting, throwing items). Based on information from Margot's Individual Education Program (IEP), she spent less than half the day in a general education setting. She communicated in full and complex sentences and performed at an

academic level commensurate with her same-age peers. Goals written in her IEP were related to behavior management practices (i.e., decreasing defiance and aggression while increasing use of self-regulation strategies). She received occupational therapy (OT) two times per month for 30 min and counselling services once per week for 30 min in her resource room. She also received OT outside of the school setting once per week. Richie, a 10-year-old, African American male diagnosed with ASD, engaged in dropping. He communicated with one to two-word utterances and gestures. Information from Richie's IEP was unable to be obtained. Anecdotally, Richie had limited expressive communication abilities. Although his expressive language was not at the level of typically developing peers, his receptive language skills were significantly more developed. Chas, a 10-year-old, Caucasian male diagnosed with ASD, engaged in aggressive (hitting, pushing), disruptive (throwing, breaking, tearing), and arguing behaviors. He communicated using full and complex sentences. Based on information from Chas's IEP, he spent one hour a day in the resource special education classroom and the rest of his school day in a general education setting. Goals listed on his IEP were related to transitioning between activities and managing feelings. There were no academic goals. He received OT on a consultative basis.

Interventionist and Data Collectors

The primary data collectors and implementors for this study were graduate students in Applied Behavior Analysis. Each data collector and implementer had at least one semester of experience in implementing and collecting data during FAs. Prior to data collection, collectors were trained by the researcher on usage of the data collection system and procedural fidelity (PF) measures. Training was conducted by coding a video

of a FA conducted in the same setting as the study. Data collectors reached 80% interobserver agreement (IOA), prior to collecting data during FAs in this study in order to ensure fluency with the data collection materials.

The researcher and another graduate student with similar experience as the primary researcher served as the implementor for all analyses. Implementors were second-year graduate students working towards their master's degree in Applied Behavior Analysis and both held a bachelor's degree in Psychology.

Settings and Materials

Both the indirect assessments and FAs occurred at a University-based clinic specializing in the assessment and treatment of severe behavior. All portions of the FA process were conducted in the clinic's therapy room (approximately 3.5 m by 3.5 m). The researcher conducted each 5 min session in a one-on-one arrangement with the participant in the therapy room. The room was equipped with a one-way observation window and a video camera for direct observation by data collectors, supervisors, and caregivers. The therapy room included a table and chairs as well as preferred items unique to each participant, as indicated by the unstructured interview described by Hanley (2012). Participant-specific demand items (e.g., toys to clean up, pencils and paper for academic tasks) were included in the room as needed when testing for escape. These items were identified by caregivers during the unstructured interview. Table 1 provides a comprehensive list of materials used during escape, tangible, and synthesized escape to tangible conditions for each participant. For all analyses, the room was equipped with protective equipment (i.e., pads and arm guards) to ensure the safety of both participants and the experimenter. A video of each analysis was recorded. These

video recordings were common practice at the facility and were used for additional post hoc data collection and safety measures. In order to protect the confidentiality of participants, recordings were stored on an external hard drive that were locked in a filing cabinet and stored in a locked file room within the clinic.

Table 1

Materials Used in the FA and IISCA Conditions

	Escape Condition	Tangible Condition
Margot	Addition and subtraction worksheet, handwriting (tracing) worksheet	Doll house, dolls, squish ball
Richie	Backpack, school items (e.g., pencils, paper, notebooks; for tidying), clothing (for dressing), handwriting worksheets	iPad
Chas	Addition and multiplication worksheets, loose leaf paper for essays, receptive identification, tooth brush and paste	Nintendo Switch, Legos

Dependent Variable

The dependent variable of this study was the rate of the target behavior(s) as they occurred in each condition of both assessments. Target behaviors were determined via parent-report during the semi-structured interview based on the work by Hanley (2012), prior to the first assessment. Target behaviors were unique to each participant, but

remained the same throughout each participant's assessments in order to accurately capture the conditions under which the behavior(s) occurred.

Target Behaviors and Measurement System. Trained observers collected data on the frequency of the target behaviors in vivo or via video recordings using of the mobile application, *Countee* (Peic & Hernandez, 2015). This application allowed data collectors to record frequency and duration with time stamps. For this reason, event-recording with time stamps was used for obtaining a frequency count for the identified target behavior(s).

A count of the target behaviors within each session was scored for each participant. Following the semi-structured interview in which the target behaviors were identified (i.e., the goal the parent or caregiver chose to focus on for the purpose of treatment), the researcher operationally defined (see Table 2) the behavior(s) to precisely capture and measure during the course of the assessments. While some of these behaviors were similar in topography, each behavior was uniquely defined based on caregiver's responses from the semi-structured interview. From the information obtained during this interview, the researcher also determined the dimension of behavior to be measured (i.e., frequency or duration). Data for each analysis were scored in vivo using the aforementioned mobile application to code the frequency of the target behaviors. Live data collection allowed the researcher to run another series (a collection of the relevant test conditions and control condition) if there was no differentiation in the data between conditions and if time allowed. After each 5 min session, data collected on the app were transcribed to a tangible data sheet (see Appendix C) in order to make within-assessment decisions.

Table 2

Participant	Target Behavior(s)	Operational Definitions
Margot	Aggression, Property Disruption	Aggression: Any instance in which the participant hit from a distance of 6 in (open hand or closed fist), swiped, threw (out of the context of appropriate play; e.g., throwing a ball into a hoop), kicked, tore, or broke an item. A new instance was counted following 3 s of the absence of property disruption. Property Disruption: Any instance in which the participant hit (open hand or closed fist) or kicked another person from a distance of 6 in away; any instance in which the participant bit or used finger nails to press into implementor's skin with enough force to leave an imprint.
Richie	Dropping	Any instance in which the participant moved from a standing or seated position to a lying or sitting position that was not within the context of an ongoing and/or contextually appropriate activity A new instance was counted for each of the following body transitions: standing to seated, standing to lying on back or stomach, or seated to lying on back or stomach. (e.g., holding the iPad in hand, prior to a restriction [first time saying " I need the iPad"] and moving to a

		sitting/lying position while operating the device or moving from a standing position to a seated position to do work).
Chas	Aggression, Property Disruption	Aggression: Any instance in which the participant's hand (open or closed fist) made contact with another person from a distance of 6 in or more; any instance in which the participant used an item to make contact with another person from a distance of 6 in or more; e.g., using a Lego to hit another person); any instance in which the participant's hands made contact with another person in an attempt to alter the position of their body (e.g., using one or both hands to push the therapist's arm away from task materials) Property Disruption: Any instance in which the participant hit (open or closed fist), threw an item a minimum of 3 ft away from body, or altered the appearance of an item (e.g., rips, tears, crumbles, smashes, or breaks). A new instance was counted following 3 s without the occurrence of property disruption.

Experimental Design

In order to evaluate differentiated patterns of responding for each participant during both analyses and to compare rates of problem behavior during test and control conditions, two single-case research designs were used in combination for this study.

Specifically, two multi-element designs, a FA and an IISCA, within the context of a multi-treatment design were used to evaluate outcomes of the two analyses.

In order to compare differentiated outcomes between the two analyses, each analysis was alternated within the context of a multi-treatment design. In describing a multi-treatment design, Ledford and Gast (2018) explain that the "sequential introduction and withdrawal designs allow for the comparison between two treatments" (p. 292). This design was implemented to answer the primary research question related to each analyses' ability to evoke the target behavior(s). In this study each analysis served as the "treatment" that was sequentially alternated and withdrawn in order to draw conclusions about the effects each had on evoking challenging behavior. To control for sequencing effects, assessments were counterbalanced across participants. These analyses were alternated in a BCBC or CBCB fashion, where B was the FA, and C was the IISCA. Experimental control was established through comparison of adjacent analyses via differentiation in rates of the identified target behavior(s). Since the amount of time participants spent in each analysis differed based on the number of conditions conducted, data pertaining to occurrences of the target behavior(s) were extrapolated from each and used to evaluate outcomes related to rates of problem behavior for each analysis.

The multi-element design was used to identify maintaining environmental factors or motivating operations (MOs) for challenging behavior (Ledford & Gast, 2018). The multi-element design included up to three test conditions (e.g., attention, tangible, and escape or a synthesized combination of these conditions) and a control condition that were randomly alternated a priori via an online list randomizer. This was done in order to identify the maintaining MOs for the identified target behavior(s). Because data from the

multi-element designs cannot be evaluated in a way that would demonstrate experimental control of the overall comparison of analyses, information obtained from this design occurred during a post hoc analysis to inform a treatment plan with the goal of decreasing challenging behavior. This information was used to address the secondary research question pertaining to whether each analysis allows the researcher to draw similar conclusions about function for the target behavior(s).

General Procedures

Each participant partook in four assessments, two FAs and two IISCAs in order to determine the function of the identified challenging behavior and to analyze and compare rates of the target behaviors across each assessment. The independent variables of the proposed study were the different assessment techniques (isolated and synthesized contingencies) and the varying conditions within each (i.e., attention, escape, tangible, and control). These assessments were used to evaluate the dependent variable, which was measured as the rate of occurrence of the target behavior during test and control conditions. During each participant's initial appointment, a review of an intake packet and semi-structured interview (See Appendix A) were conducted in order to obtain information on the target behavior(s) to be assessed and targeted for treatment. Following the unstructured interview, the researcher used the information provided by participant's caregivers to hypothesize function of the target behavior(s). These hypotheses were then formally assessed as conditions within the analyses (i.e., using relevant stimuli to evoke and abate challenging behavior). Participants attended a total of four assessments in order to ensure that each analysis could be implemented twice. After the unstructured interview, the researcher conducted one of the two analyses (counterbalanced across

participants to control for sequencing effects) in order to determine a function of the target behavior(s) through differentiated patterns of responding across control and test conditions. This also allowed the researcher to examine the effects each assessment had on evoking the target behaviors. Each FA took approximately an hour and a half to conduct (range 60 to 107 min) and each IISCA took approximately 45 min to conduct (range 34 to 57 minutes). Following each assessment, the researcher had a short debriefing with caregivers to address any questions or concerns. The total range and average of assessments includes the acclimation time between conditions in which researchers were waiting for a consecutive 30 s of calm (an absence of the target behaviors) from the participants .

Semi-structured interview. Prior to each participant's initial appointment, caregivers filled out an intake packet that provided therapists with information about the participant, the behaviors of concern (target behaviors), and antecedent and consequent events. Typically, caregivers complete these intake packets approximately 1 to 6 mos before the initial appointment. Because of the delay from completion of the intake packet to the family's first appointment, a semi-structured interview (which is common practice at this facility) was used as a secondary screening measure to ensure participants did not meet any of the exclusion criteria. If information pertaining to exclusion criteria mentioned above had been identified as the target for the admission during the interview, clients would have been excluded for participation in this study; however, exclusion from this study did not preclude participant's from receiving effective treatment and behavior management strategies for the target their behavior. The semi-structured interview used during this study followed the procedures described by Hanley (2012; see Appendix A).

During the interview process caregivers were asked questions related to pertinent challenging behaviors (i.e., events that commonly preceded and followed the target behavior). Answers from these questions were used to inform hypotheses about maintaining motivating operations and to act as a guide in determining the synthesis of various test conditions. Additional information regarding the topography of each target behavior was used to inform operational definitions used for measurement purposes during the assessments. While the interview process was streamlined using the semi-structured interview described by Hanley (2012), additional clarifying questions were asked if caregivers provided an answer that was unclear or did not yield enough detailed information. Following the semi-structured interview, therapists reviewed all information from the intake packet and interview to develop definitions and test conditions. Assessments began at the participant's next appointment at the facility and continued for approximately 2 weeks (i.e., 2 assessments per week). Table 3 provides a summary of the hypothesized function and nuanced variables for test conditions obtained from the semi-structured interview for each participant.

Table 3

Hypothesized Function and Nuanced Variables from Semi-Structured Interview

Participant	Function	Attention	Tangible	Escape

Margot	Escape, attention, tangible	Told not to engage in the target behaviors and given brief lecture on correct way to behave	Novel toys	Academic tasks related to writing, nagging to complete task
Richie	Escape, tangible	NA	iPad or tablet	Chore-like demands (i.e., cleaning up, packing backpack, dressing)
Chas	Escape, Tangible	NA	Video game consoles	Menial and/or simple tasks (i.e., simple math), brushing teeth

Traditional FA. Information obtained from the semi-structured interview guided each 5 min condition during the FA. Conditions conducted during the traditional FAs were as follows: toy play (control), attention, tangible, and escape. In order to limit carryover effects during the traditional FA, the order of each 5 min condition was randomized by inserting the various test conditions for each participant into an online list randomizer following the semi-structured interview and prior to the assessments. This information was then inserted into a tangible data sheet for data collection and within assessment decision making purposes. A calm criteria was used between each condition which consisted of the absence of the target behavior(s) for a consecutive 30 seconds. If

behaviors occurred during the 30 s window, the timer was restarted once the behavior(s) subsided.

Toy play. This condition was used as a control condition in which all potential reinforcers were present (i.e., attention provided, neutral tangibles available, and no demands placed). This condition served as a standard of responding for participants with which to compare each test condition. During this condition the participant had access to noncontingent adult attention (e.g., narrating play, behavior specific praise for appropriate engagement) provided on a variable interval 30 s reinforcement schedule or as often as attention was requested from the participants, access to neutrally preferred items and activities as described during the semi-structured interview, and no demands were placed nor demand materials present during this time. Any instance of the target behavior(s) or other challenging behavior(s) that occurred during this time were blocked and redirected or otherwise ignored.

Attention. This condition tested the hypothesis that the participant engaged in the target behavior in order to gain access positive reinforcement in the form of access to attention (e.g., reprimands, consoling, lecturing). At the beginning of this condition the researcher informed the participant that she would engage with another activity (e.g., "I'm going to do some work") while still present in the room. Neutral or low-preferred items were available in the assessment room during each attention condition. During this condition, the researcher provided attention in the form of brief reprimands or short lectures (e.g., "I don't like when you hit me like that; it hurts.") contingent on the occurrence of the target behavior. The attention provided in this condition varied per participant and was based on caregiver report from the semi-structured interview. For

example, if participant's caregiver reported that they typically lectured their child on either the correct or incorrect way to behave in a situation then attention was provided in this way. The occurrence of the target behavior during this condition, resulted in nuanced and contingent attention described above in the form of a brief statement followed by a withdraw of attention in the form of an announcement about needing to go do more work. All other bids for attention by the participant, appropriate or otherwise, were ignored by the researcher.

Escape. During the escape condition, the researcher tested the hypothesis that the participant engaged in the target behavior to access negative reinforcement in the form of escape nonpreferred demands or activities. When testing for escape, the researcher began by placing demands that typically mirrored those that are placed in the participant's natural environment and those that are typically associated with the target behavior. During this condition relevant task materials (e.g., pencil, paper, worksheets) and neutral or low-preference items were also in the room during this condition. Appropriate bids to escape the task (e.g., "I don't want to [engage in the task]") were ignored by the researcher and the task remained present. The researcher used a three-step prompting procedure (i.e., verbal, model, physical prompt hierarchy) to prompt participants through the completion of a task demand. This procedure allowed the participant 5 s to initiate independently after the demand was first placed. If the participant did not initiate towards the demand after 5 s, the researcher provided a model prompt of the correct way to complete the demand while restating the task direction (e.g., "write the letter 'a' like me"). Following the model prompt, if the participant did not initiate within 5 s, the researcher provided hand-over-hand or physical assistance in order to complete the

demand. If the participant engaged in the target behavior, the task was removed (e.g., "You don't have to [engage in the task]") for 20 s before the researcher represented the demand.

Tangible. During the tangible condition the researcher tested the hypothesis that the participant engaged in the target behavior to access positive reinforcement in the form of access to preferred items or activities. Prior to the beginning of each tangible condition, a pre-exposure period was conducted. During this time participants were allowed to interact with their high preference item(s)/activity for approximately 30 s. The pre-exposure period was extended for one participant, Chas, because his preferred tangible item was a portable videogame console. The researcher allowed Chas 1 min to interact and begin video game play before the official start of the tangible condition. At the start of this condition, the researcher told the individual that their preferred item(s) were no longer available and removed them from the participant's reach. Following each restriction, the participant could redirect to a different item and was allowed 10 s to engage before another restriction. If the participant did not redirect, but also did not engage in the target behavior(s), the researcher would make brief statements about the items (e.g., "This is so cool. I love drawing.") Appropriate bids for the tangibles were ignored or denied (e.g., "No. You can't have it."). This response was based on parent report during the semi-structured interview so that it simulated the natural environment. If the participant engaged in the target behavior during this condition, they were given access to the tangible for 20 s before the researcher restricted access again.

IISCA. Information obtained from the semi-structured interview guided the synthesis of conditions during this analysis. For each participant, hypothesized functions

were combined into a single test condition with a matched control condition. Like the FA procedures, the sequence of the control and test conditions were randomized at the start of the study.

Control. This condition was used as a match control for which to compare each synthesized test condition. This condition served participant's baseline level of responding during the IISCA. In this condition all hypothesized reinforcers were present in order to abate the need for participants to engage in the target behavior(s). During the control condition for the IISCA, items relevant to task demands, neutral tangibles, and highly preferred tangibles were included in the room. The participant could interact with the highly preferred items. Although task materials were present in the room, no demands were placed during this time. In the control condition, the participant had noncontingent access to each possible reinforcer, including the researcher's attention. If attention was not a hypothesized reinforcer, moderate rates of the researcher's attention were provided (e.g., neutral comments about play, moderate praise for appropriate behavior) throughout the assessment with the exception of when the target behavior occurred. Any instance of the target behavior(s) or other challenging behavior(s) were blocked or otherwise ignored during this time.

Test. Consequences for each combination of test conditions (i.e., attention and tangible, escape to attention, escape to tangible, or escape to attention and tangible) looked similar to those described earlier. The only difference was that multiple consequences were provided (e.g., attention and escape from a demand) contingent on the occurrence of the target behavior. For example, if the researcher tested the synthesized escape to tangible condition, both the removal of the demand and access to preferred

tangibles followed the occurrence of the target behavior(s).

Reliability and Fidelity

IOA and PF data were collected via live observation by two independent observers for each assessment for each participant and a minimum of 20% of each condition within the assessments. Data collectors were graduate students working towards their master's degree in Applied Behavior Analysis and had familiarity with data collection procedures used during these assessments. Data collectors were trained on data collection procedures prior to observation of the assessments as mentioned in the measurement section above. Training consisted of the researcher reviewing the operational definition(s) for the target behavior(s), a review of examples and nonexamples, and a practice coding session on the mobile data collection application. If IOA fell below the standard acceptable level of 80% agreement, retraining occurred before the next assessment.

Prior to each assessment, the researcher and outside observers reviewed operational definitions of challenging behavior(s). IOA and PF data were totaled at the end of each assessment in order to keep rates at or above 80% and ensure that the researcher was implementing procedures as written. If IOA data fell below the acceptable 80% agreement rate, the researcher determined what errors occurred with the operational definition or measurement system, rewrote the definition, and/or coded behaviors with the independent observer via video following the assessment. The agreement obtained via recoding was not used as ultimate agreement for the assessment, but rather as a training mechanism.

IOA data were coded using the *Countee* application (Peic & Hernandez, 2015). This application provided time stamps of each marked occurrence of the target behavior(s). The researcher calculated agreement using a point-by point agreement for free-operant behaviors measured with timed event recording (Ledford & Gast, 2018). Occurrences of the target behaviors were calculated as an agreement if they were coded within a 3 s window. A percentage for agreement was calculated at the end of each assessment by dividing the number of agreements by the number of total opportunities (agreements plus disagreements) and multiplying by 100. However, due to the limitations of capturing agreement for non-occurrences of the target behavior(s) agreement data were coded differently for participants who engaged in low-frequency behaviors or did not engage in the target behavior(s) at all. This method included dividing assessments into 10 s intervals and calculating non-occurrence reliability data. The number of agreements for non-occurrence intervals was divided by agreements and disagreements of non-occurrence intervals, and then multiplied by 100 (Ledford & Gast, 2018). This was done to calculate point-by-point agreement of non-occurrences.

If IOA data fell below the acceptable range of 80%, data coders reviewed a video recording of the assessment and recoded together in order to increase agreement. IOA data were collected for an average of 90% (range 81 to 100%) of conditions during each assessment. IOA levels ranged from 75 to 100% agreement. In the one instance in which IOA fell below 80%, recoding occurred post hoc and a total agreement of 81% was obtained during the retraining. Following that assessment, IOA levels were above 80% agreement. Thus, these behaviors were recorded by one coder and not the other.

PF data were collected during each assessment. See Appendix B for an example data sheet. In order to calculate PF data, the researcher calculated the number of correct implementor behaviors and divided that number by number of anticipated behaviors within a condition. Test conditions within each assessment in which PF data were collected were scored independently then summed together and divided by the number of conditions in which PF data were collected for a total percentage of correct implementor behaviors. In order to get a total percentage for correct implementor behaviors over the duration of an assessment the following formula was used: condition a + condition b + condition c/total number of conditions by 100.

PF data were collected for every assessment and 46.8% of sessions within each assessment (31% to 88%). If PF data fell below the acceptable rate of 80%, more conditions would be coded and the implementor would be coached via walkie-talkie during the assessment. PF levels were at or above the acceptable rate for all assessments and conditions (range 86 to 100%). The most commonly missed correct implementor step occurred during the toy play condition in which the implementor was meant to refrain from presenting task demands. This occurred, because the implementor asked questions related to the participant's play with neutral or high preference tangibles present in the room(e.g., "do you want to play with the ball," "what is happening on the video," "catch the ball"). Table 4 provides a list of correct implementor behaviors for each condition and each assessment.

Table 4

Correct Implementor Behaviors

Analysis	Condition	Implementor Behaviors

FA	Toy Play	Provided attention at least once every 20 s, neutral items available to child, refrained from task demands, ignored nontarget behaviors
	Attention	Restricted attention, neutral items available to child, attention provided if child engaged in the target behavior, ignored nontarget behavior, refrained from task demands
	Tangible	Restricted high preference and neutral tangible(s), access to tangibles provided for 20 s contingent on the occurrence of the target behaviors, ignored nontarget behavior(s), refrained from task demands
	Escape	Demand materials present, task demands placed, prompting hierarchy used, demand removed within 3 s of the occurrence of the target behavior, demand removed for 20 s then represented, ignored nontarget behaviors
IISCA	Control	Provided attention at least once every 20 s, neutral items available to child, refrained from task demands, ignored nontarget behaviors
	Test: Escape to Tangible	Demand materials present, high preference and neutral tangibles restricted, demands placed, demand removed, and tangibles provided within 3 s of the target behavior, demands removed and tangibles provided for 20 s then restricted again, ignored nontarget behaviors

	Test: Escape to Attention and Tangible	Demand materials and high preference and neutral tangibles present, attention present, all reinforcers restricted and demands placed, demands removed and reinforcers provided within 3 s of the target behavior, reinforcers present for 20 s then restricted again, ignored nontarget behaviors

Section 4: Results

Results from the traditional FAs and IISCAs were visually analyzed to detect differentiation between the various test and control conditions. To determine differentiation, the researcher first used traditional methods of visual analysis. This was done by considering within-assessment themes by looking at trend, level, stability, variability, and overlap. Following visual analysis within-assessment, a between-assessment analysis was conducted by looking at trend, level, stability, overlap and consistency of effect for each data series within each assessment (Barton, Lloyd, Spriggs, & Gast, 2018). Between-assessment visual analysis would provide information regarding the rates of the target behaviors in order to answer the primary research question. Following, the within and between-assessment analysis a summative analysis was made as it pertained to the secondary research question and agreement of assessments with regard to function of the target behavior(s).

As a supplemental determination of differentiation and way to make summative statements about the data, modified visual inspection calculations as described by Roane et. al (2013) were used. Using this method, differentiation was said to have occurred if at least 50% of data points in various test conditions were elevated above the criterion line (CL). The CL varied per participant and was based on their responding or rate of behavior(s) during the toy play or matched control conditions. This was calculated by finding the mean and standard deviation of occurrences of the target behavior(s) during the toy play condition in each assessment. Criterion lines were set at one standard deviation above and below the mean of the target behavior during the toy play condition of each assessment. If differentiation occurred, a determination of function (e.g., social-

positive reinforcement, social-negative reinforcement, automatic reinforcement) was made and then compared across each participant's assessments.

Table 5 illustrates the hypothesized functions based on information obtained during the semi-structured interview and the results regarding function from both analyses. For Margot, information obtained during the semi-structured interview reliably predicted EOs that evoked challenging behaviors (i.e., social-positive reinforcement in the form of access to attention and tangibles and social-negative reinforcement in the form of escape from task demands) in both the IISCA and FA. For Margot, all three of these components yielded similar conclusions about the function of her challenging behavior. For both Richie and Chas, information obtained during the semi-structured interview reliably predicted one EO for target behavior (escape and tangible, respectively). For Richie and Chas, results from the semi-structured interview and both analyses were not in agreement as they related to conclusions regarding the function of challenging behavior.

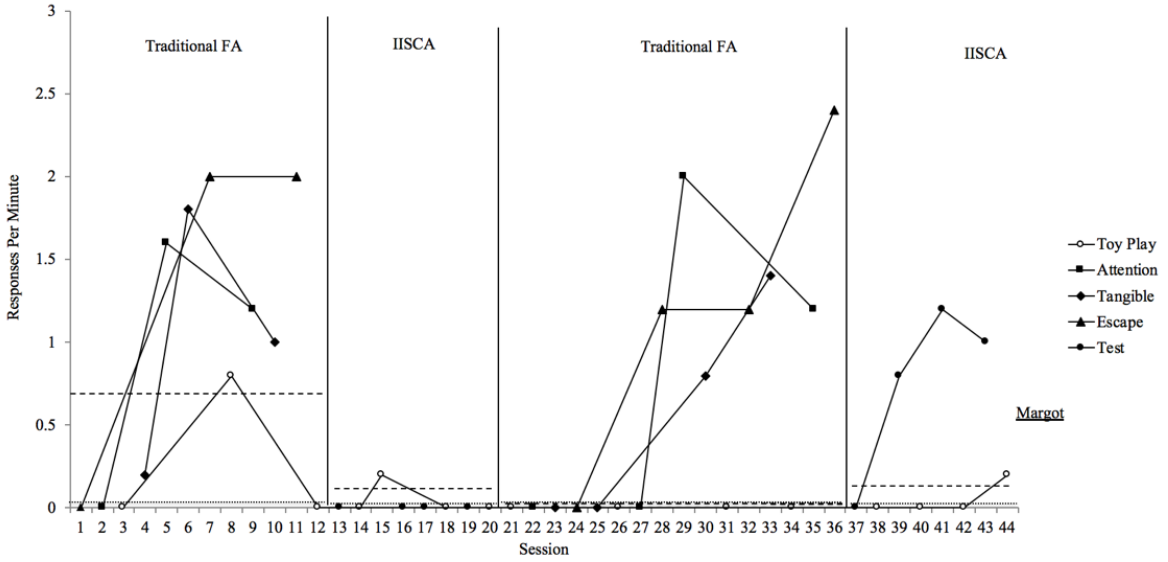

Figure 1. *Results from the traditional FAs and IISCAs conducted for Margot with embedded criterion lines.*

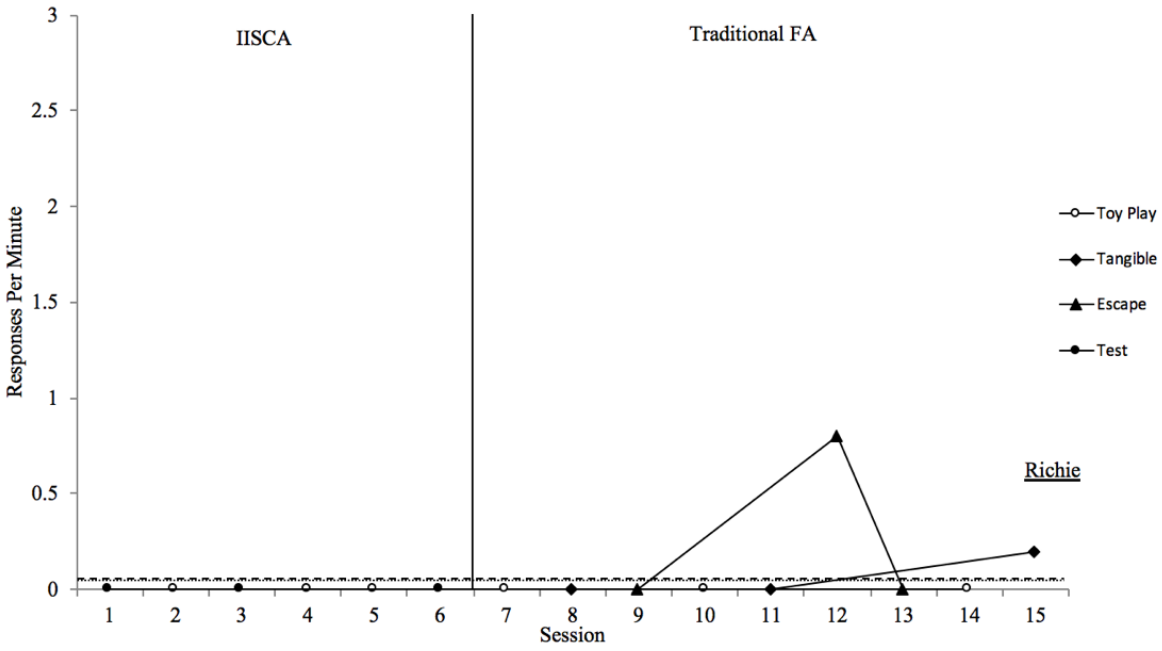

Figure 2. *Results from the traditional FAs and IISCAs conducted for Chas with embedded criterion lines.*

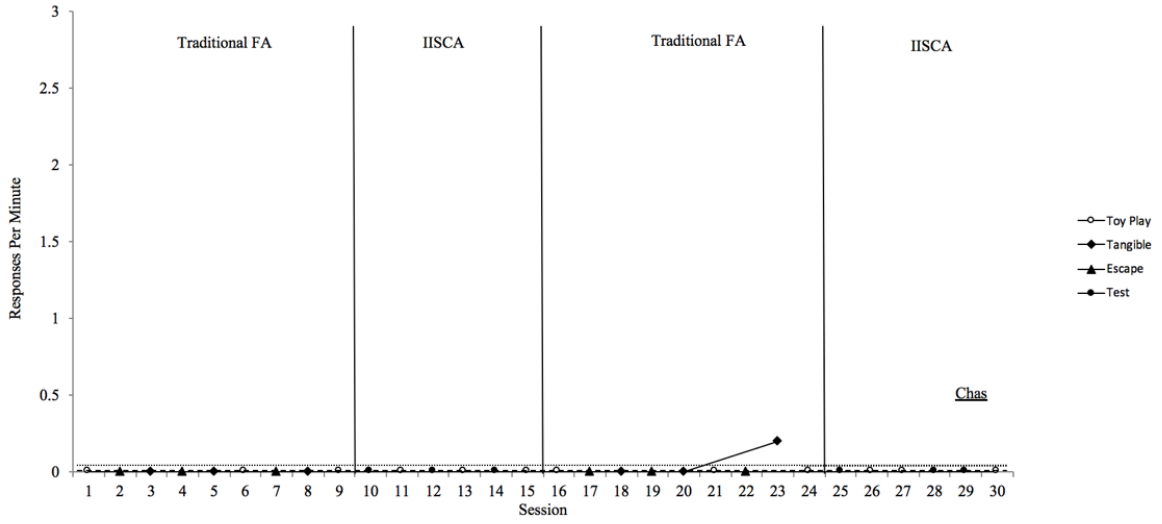

Figure 3. *Results from the traditional FAs and IISCAs conducted for Richie with embedded criterion lines.*

Figure 1 shows the results of the FAs and IISCAs conducted for Margot. Results from both FAs and the final IISCA demonstrated that Margot's target behaviors (aggression and property disruption) were likely reinforced by negative reinforcement via escape from nonpreferred task demands and positive reinforcement via access to both

attention and tangibles. These results matched the hypothesized function obtained via indirect assessment with Margot's caregiver. Given that there was relatively little overlap during her assessments between test and control data paths, results were not visually analyzed using the traditional point-by-point comparison as is typically done when visually analyzing MEDs, but rather visually analyzed to account for overall themes. When using within-condition or assessment visual analysis similar themes were observed across her assessments. During each assessment (with the exception of the 1st IISCA) a zero-celerating trend in the occurrence of the target behaviors was observed for the first few sessions followed by a steep and accelerating trend in a contratherepeutic direction. While there was some variability in the occurrences of her target behaviors across each session, this variability would be expected given one of the comparisons being made was between test and the control condition in which consistently lower rates of the target behaviors were observed.

Due to the systematic introduction and alternation of test conditions as described by the MTD design, visual analysis between conditions or assessments was done in order to address the primary research question. Between-condition analysis demonstrated a consistency of effect between the two traditional FAs when analyzing the accelerating and contratherapeutic trend in rates of challenging behavior following the first series of test and control conditions. This consistency of effect was also observed when comparing the adjacent and final traditional FA and IISCA as well. However, this did not apply during the initial alternation of the FA and IISCA as the target behaviors were not reliably evoked during the 1st IISCA.

A summative analysis of Margot's results yield similar conclusions regarding function and each assessment's abilities to evoke the target behaviors. Unfortunately, the assessments were not in complete agreement since results from the first IISCA were inconclusive as there was a near-zero trend in the rate target behaviors. While overall rates of the target behaviors were elevated above control for all test conditions, suggesting sensitivity to both isolated and synthesized contingencies, during the synthesized test conditions rates or levels of rates of these behaviors were lower during the second and fourth assessments (both IISCAs).

To further visually analyze results from Margot's analysis, the researcher utilized the modified visual inspection criteria as described by Roane et. al (2013). This method was originally used to determine differentiation in FAs with 10 or more conditions. However, it has recently been applied to FAs with more variability in length. For Margot, the level of her target behaviors in test conditions were elevated above the criterion line (based on mean and standard deviation of the toy play condition). Using this method of visual inspection, two of Margot's FAs were determined to be differentiated (her second FA and second IISCA). Because the calculation for modified visual inspection when detecting differentiation requires that at least 50 percent of data points be above the criterion line, results from the first two of Margot's assessments were not determined to be differentiated.

Richie (Figure 2) displayed challenging behavior reinforced by isolated contingencies during the traditional FA, with no evidence to support that the synthesized contingencies produced a more robust reinforcement contingency. During the IISCA, the rate of Richie's target behaviors remained zero-celerating with no observed occurrence of

the target behavior. After introduction of the FA, rates of challenging behavior accelerated from a zero-celerating trend after the first series to a somewhat differentiated and accelerating pattern of responding during one escape condition. Results from the modified visual inspection method were not useful in detecting differentiation between the assessments. Results from Richie's assessments suggest that his target behavior may be maintained via access to negative reinforcement in the form of escaping nonpreferred task demands. Results from the IISCA provided inconclusive results in determination of function. While, the traditional FA did not conclusively lead to an accurate determination of function, rates of the target behavior were higher and led to more information regarding why dropping occurred. However, more replications are necessary in order to make conclusive statements regarding function.

For Chas (Figure 3), challenging behavior was not reliably evoked in any of the test or control conditions across both assessments. For both within and between-condition analysis, rates of his target behaviors (aggression and property disruption) across all assessments remained at zero-celerating or near-zero levels. During the second FA, there was one instance of property disruption which occurred towards the end of the final tangible condition. However, that was not able to be replicated due to time constraints, thus no differentiation could be obtained during that assessment. Between-condition visual analysis yielded similar results pertaining to each assessment as the target behaviors were never reliably evoked. Results using modified visual inspection confirmed that there was no differentiation between the two analyses.

Table 5

Comparative Results of the Semi-Structured Interview, FA, and IISCA

Participant	Semi-Structured interview	FA	IISCA

Margot	Tangible, escape, attention	Tangible, escape, attention	Tangible, escape, attention (interactive effect)
Richie	Tangible, escape	Escape	Inconclusive
Chas	Tangible, escape	Tangible	Inconclusive

Section 6: Discussion

This study compared the results of traditional FAs with results of the IISCA for three participants referred to an outpatient clinic for the assessment and treatment of severe problem behaviors. One of the three participants demonstrated a response pattern that was consistent with the assumptions of the traditional FA (i.e., consequences or EOs operate independently of one another to reinforce behavior). For the second participant, Richie, each assessment demonstrated limited utility in reliably evoking target behaviors. For this reason, results from this assessment should be addressed with caution and more replications would be necessary in order to make any conclusions regarding adherence to the assumptions of each assessment. One of the three participants did not adhere to the assumptions of either the traditional FA or the IISCA as none of the target behaviors were able to be evoked with the exception of one instance during the tangible condition. Only one participant (Margot's second IISCA), demonstrated a response pattern consistent with the assumptions of the IISCA (i.e., consequences or EOs operate in combination to produce a more robust reinforcement contingency) on one occasion. Even though responding in this instance was consistent with the assumptions of the IISCA, rates of the target behaviors during this assessment were lower overall than rates during the traditional FA.

Several themes emerged across implementation of both assessments. During each assessment, implementors differentiated their attention across each condition (i.e., higher rates of interaction and voice inflection during control [when there was a suspected attention function] and lower rates of interaction and voice inflection during all test conditions [unless there was a suspected attention function]). However, due to the nature

of synthesized escape to tangible and attention conditions, the implementor's attention remained present in order to place task demands. For Margot, this could indicate that attention (while possibly a maintaining consequence) may compete with more robust forms of reinforcement (e.g., escape and tangible), lowering overall rates of challenging behavior in a synthesized condition. However, implications for treatment were the same across both assessments.

Results from the IISCAs and FAs were in overall agreement for two of the three participants during one comparison of adjacent conditions. Unfortunately, this was not replicated during assessments with additional participants. It is possible that the synthesized contingencies interacted in such a way that suppressed the EO or competed with the EO to engage in the target behaviors and thus suppressed overall responding during these assessments.

When considering calculation of agreement data and the instance in which IOA fell below the acceptable level, it may be worth noting this could have been a potential error in the operational definition. When graphing the rate of observed behaviors, each behavior (if there were more than one) was combined to get a total rate of overall occurrences. However, during data collection, each was scored independently with a different criteria of when there was an occurrence. In the future it may be worth collapsing behaviors into a single definition that captures each topography with a clear onset and offset criterion in order to streamline data collection procedures.

Limitations, Implications, and Future Research

One major limitation of this study was the constraint of time due to the setting in which the assessments were conducted. Participants attended an outpatient clinic for the

assessment and treatment of the target behaviors. With this model, student therapists provide indirect services over the course of five appointments (an intake, assessment, treatment recommendation, and two follow-up appointments) that take place over several weeks. Each appointment lasts approximately an hour and a half. The primary goal at this facility is to assess the child and provide recommendations and training to caregivers to implement individualized function-based treatment plans. While this model is set up in a way to help ensure successful implementation of procedure, the time student therapists spend interacting with the child is limited. Following the typical flow of the functional assessment process, a direct observation would be conducted after indirect assessments occurred. This component allows therapists to gain a better understanding of the target behaviors under typical circumstances. Procedures described by Slaton et. al (2017) described the utility of a structured observation in which they were able to test hypotheses from the semi-structured interview prior to their participant's formal assessments. However, due to staffing and time limitations, structured observations were not able to occur during the course of this study. While this component of the functional assessment process better informs hypotheses, it is also an opportunity for the researcher to build a reinforcement history with the participants which may or may not influence responding. Direct or structured observations can provide more insight when defining the topography of the target behaviors or when designing an ecologically valid assessment. Future research should aim to include this component of the functional assessment process to better inform FAs.

Another limitation due to the confines of the setting is that therapists do not always have an opportunity to see or interact with participants before the FA. Because the

facility operates as an outpatient setting that is catered towards caregiver training, often only the caregivers will attend appointments in which it is not crucial for the child to be present (all appointments except the assessment). This requires the therapists to design FA procedures based solely on parent report. The lack of interaction prior to the assessment appointment and novelty of the setting could suppress responding in a way that makes the participant unlikely to engage in the target behaviors.

A possible history effect occurred during the second analysis (IISCA) for Margot, lowering the quality of internal validity during the study. During this assessment, Margot's caregiver reported that Margot had begun a new medication. However, before the third assessment (approximately one week apart), her caregiver reported that this medication had been discontinued. Unfortunately, the medication change could have been a confounding variable which suppressed responding during the second assessment. While Margot's second IISCA did produce meaningful and functionally similar results as the two FAs, results would have been inconclusive if only the first IISCA had been conducted. Regardless of the suppressed responding in the first IISCA, results from the two FAs and the second IISCA helped implementors draw similar conclusions about the function of her target behaviors.

In the instance in which none of the target behaviors were reliably evoked, it is possible that this was due in part to the low frequency at which the behaviors were reported to occur. During the semi-structured interview, Chas's caregiver reported that she would like to address the aforementioned target behaviors, but that overall, they had been occurring less frequently. However, when asked if therapists would be able to evoke the behaviors using the FA procedures described above, she said "yes." Unfortunately,

results from the FAs support that this behavior is a relatively low-rate behavior, especially as they related to the reinforcement history established by the therapists. Typically, FAs are used to assess higher-rate behaviors and there may be some limitations in the utility of these assessments as they relate to low-rate behaviors (Cooper et. al 2007, pg 506). Anecdotally, the absence of the target behaviors during these assessments may have been due to the participant's perception that he was "in trouble." During the semi-structured interview Chas's caregiver reported occasionally removing preferred items as a response to the target behaviors at home.

Another limitation relates to the nature of the IISCA and the synthesized test condition. While this assessment aims to include ecologically relevant stimuli in order to more reliably evoke challenging behavior, there could be competing stimuli that may yield false positive assessment results. During the semi-structured interview for Chas, his caregiver reported that challenging behavior occurs when his preferred activities are interrupted, and he is asked to do something else. However, a synthesized escape to tangible condition was unable to produce the reported outcome. It could be that the nonpreferred tasks were not nuanced enough or it could be that having another activity to engage with competed with the restriction of the tangible.

While an informal agreement was reached by the various data collectors, researcher, and clinic supervisors following the semi-structured interview in relation which conditions should be included during the assessments. A limitation in regard to this study was the lack of formal agreement between two outside observers regarding the inclusion or exclusion of various test conditions. Future research should include this

measure in order to strengthen the replicability of findings and internal validity of a comparison study.

While the IISCA's strength lies in its ecological validity as it is designed to capture the idiosyncrasies of a dynamic environment, it is also possible that the novelty of the setting limited findings during these assessments. Similarly, the lack of structured observation may have contributed to the overall suppressed responding during these assessments. Future research should incorporate the use of the structured observation procedures when conducing a comparison of these two FAs.

For several participants, responding did not occur in the first assessment. While assessments were counterbalanced across participants to control for sequencing effects, it is worth noticing this trend. Future research should also investigate the utility of an extended pre-exposure condition in which researchers probe test conditions, and implications for differentiation during a FA.

Conclusions

Results from both indirect and direct assessments provide useful information when determining environmental arrangements that immediately precede or follow challenging behavior. These assessments also have utility when determining idiosyncratic variables unique to the environments in which challenging behavior occurs. These assessments can inform the FA process but have little predictive validity when used on their own (Tarbox et. al., 2009). For the participants in this study, the utility of the indirect assessment in combination with the overall design of the FA proved useful in effectively and efficiently determining why the target behaviors occurred. Information obtained during the semi-structured interview (a process typically associated with the

IISCA), provided implementors with information that allowed the incorporation of nuanced items, escape materials, and consequent events. However, the IISCA provided mixed results across participants in concisely determining why the target behaviors occurred.

A practical implication as it relates to results from this study, may support the use of the traditional FA procedures (isolated contingencies) in an outpatient setting when time constraints are present due to practical issues, such as strategically utilizing available resources (e.g., assessments conducting when there a pre-established number of visits). While the traditional FA took more time to conduct overall, this assessment generally produced outcomes that better informed treatment because target behaviors were typically evoked during sessions. However, it might be worth considering combining procedures from the traditional FA with that of the IISCA. Particularly, with the use of a semi-structured interview when considering time restrictions as well as increasing ecological validity. In combination with the indirect assessment process, a traditional FA can be conducted so idiosyncratic variables may be included and implementors can determine if and when it is appropriate to conduct all conditions associated with this assessment.

Appendix A
Semi-Structured Interview

Perspectives

Appendix

Open-Ended Functional Assessment Interview

Date of Interview: _____

Child/Client: _____

Respondent: _____

Respondent's relation to child/client: _____

Interviewer: _____

RELEVANT BACKGROUND INFORMATION

1. **His/her date of birth and current age: ____-_____-_____ ____yrs ____mos**
   Male/Female
2. **Describe his/her language abilities.**
3. **Describe his/her play skills and preferred toys or leisure activities.**
4. **What else does he/she prefer?**

QUESTIONS TO INFORM THE DESIGN OF A FUNCTIONAL ANALYSIS

To develop objective definitions of observable problem behaviors:

5. **What are the problem behaviors? What do they look like?**

To determine which problem behavior(s) will be targeted in the functional analysis:

6. **What is the single-most concerning problem behavior?**
7. **What are the top 3 most concerning problem behaviors? Are there other behaviors of concern?**

To determine the precautions required when conducting the functional analysis:

8. **Describe the range of intensities of the problem behaviors and the extent to which he/she or others may be hurt or injured from the problem behavior.**

To assist in identifying precursors to dangerous problem behaviors that may be targeted in the functional analysis instead of more dangerous problem behaviors:

9. **Do the different types of problem behavior tend to occur in bursts or clusters and/or does any type of problem behavior typically precede another type of problem behavior (e.g., yelling preceding hitting)?**

To determine the antecedent conditions that may be incorporated into the functional analysis test conditions:

10. **Under what conditions or situations are the problem behaviors most likely to occur?**
11. **Do the problem behaviors reliably occur during any particular activities?**
12. **What seems to trigger the problem behavior?**
13. **Does problem behavior occur when you break routines or interrupt activities? If so, describe.**
14. **Does the problem behavior occur when it appears that he/she won't get his/her way? If so, describe the things that the child often attempts to control.**

To determine the test condition(s) that should be conducted and the specific type(s) of consequences that may be incorporated into the test condition(s):

15. **How do you and others react or respond to the problem behavior?**
16. **What do you and others do to calm him/her down once he/she engaged in the problem behavior?**
17. **What do you and others do to distract him/her from engaging in the problem behavior?**

In addition to the above information, to assist in developing a hunch as to why problem behavior is occurring and to assist in determining the test condition(s) to be conducted:

18. **What do you think he/she is trying to communicate with his/her problem behavior, if anything?**
19. **Do you think this problem behavior is a form of self stimulation? If so, what gives you that impression?**
20. **Why do you think he/she is engaging in the problem behavior?**

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Appendix B
Procedural Fidelity Data Sheet Example

Toy Play

Session #:
Start Time:

Possible responses: *+ = Occurrence, - = Non-occurrence, NA = No opportunity for behavior to occur*

Target Implementer Behaviors	1	2	3	4	5
Provides verbal or physical attention at least once every 20s.					
Preferred item(s) in child's reach and/or unrestricted by implementer.					
Implementer refrains from prompting the child to complete a task directive, including asking questions.					
Implementer ignores all target behavior or other inappropriate behavior.					

End Time:

Other Behaviors	Response
Session-specific materials present in room prior to session start (i.e., preferred toys, correct poster).	
Therapist waits for 30s of child calm prior to session start.	
At onset of session, implementer verbally indicates start of play session to child (e.g., "Okay, let's play).	

Assessment #:
Date:
Client:
Implementer:

Procedural Fidelity	
# Implementer behaviors observed	
# Implementer behaviors planned	
% PF	#DIV/0!

Appendix C
Assessment Data Sheet Example (IISCA & FA)

FA Type: IISCA Analogue

Data Collector _____
Primary Reli

Client: Assessment #:						Behaviors		
Date	Session	Condition	Therapist	Time Start	Time End			
	1	TP						
	2	Test						
	3	Tan						
	4	Esc						
	5	Tan						
	6	TP						
	7	Esc						
	8	Tan						
	9	TP						
	10	Tan						
	11	TP						
	12	Esc						

Behavior		Definition	
1			
2			
3			
Condition		EO/Antecedent	Consequence
	Acclimation		
1	TP	Control	Block and Ignore
2	Tan	Tangibles Restricted	Access to tangibles for 20 s
3	Esc	Demands Placed	Demands removed for 20 s

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