University of Nevada, Reno

Effects of Discrimination Abilities on Functional Analysis Outcomes: An Extension

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Arts in Psychology

by
Janie A. Funk

Dr. W. Larry Williams/Thesis Advisor

December, 2015

THE GRADUATE SCHOOL

We recommend that the thesis
prepared under our supervision by

JANIE A. FUNK

Entitled

Effects Of Discrimination Abilities On Functional Analysis Outcomes: An Extension

be accepted in partial fulfillment of the
requirements for the degree of

MASTER OF ARTS

W. Larry Williams, Ph.D., Advisor

Matthew Locey, Ph.D, Committee Member

Stephen L. Rock, Ph.D., Graduate School Representative

David W. Zeh, Ph.D., Dean, Graduate School

December, 2015

Abstract

Despite established utility, functional analyses (FAs) have long been noted for limitations including inconclusive data as evident by the numerous modifications of the standard methodology since its development (Hagopian, Rooker, Jessel, & DeLeon, 2013). In some cases, undifferentiated data have been attributed to a deficit of discrimination skills of the individual (Hanley, Iwata, & McCord, 2003; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). As such, Greenwald, Senuik, & Williams (2012) evaluated the extent to which conditional discrimination abilities affected participants' differential responding during a FA. Conditional discrimination abilities were assessed by the Assessment of Basic Learning Abilities (ABLA) developed by Kerr, Meyerson, and Flora in 1977. They concluded that individuals who were unable to make conditional discriminations were less likely to differentially in an FA. The current study replicated and extended Greenwald et al., 2012 to further evaluate the ABLA-R (DeWiele, Martin, Martin, Yu, & Thomson, 2010) as a worthwhile assessment to administer prior to a formal functional analysis.

Dedication

This work is dedicated to my ever-supportive family, who have all made selfless sacrifices as I pursue my dreams. The clinicians committed to the ethical assessment and treatment of vulnerable populations—I also dedicate this work to you.

Acknowledgements

I thank Dr. W. Larry Williams for his ongoing advisement in my academic, clinical, and professional experiences. His support has facilitated my required contact with and use of the ABLA-R and FA assessments, use of his clinical facilities, networking with officials within the school district for participant recruitment, and more—all vital to the completion of this project. I thank Ashley A. Greenwald, who generously shared with me her experiences and resources from her inspiring research. I also have many thanks for the committed individuals who served as research assistants. They include Billy Rom, Katherine Gabrie, Kristen Flagtvedt, Ashley Beard, and Cathleen Corsun. Each of them provided outstanding dedication with great enthusiasm while succeeding in their many personal endeavors. Without their assistance, the many sessions of assessment, data entry, and data analysis would not have been feasible. I thank my previous advisors from McPherson College, Dr. Bryan Midgley and Dr. Laura Workman Eells, who introduced me to behavioral sciences research. Dr. Midgley provided invaluable insight and guidance—above and beyond his obligation. From Dr. Workman Eells, I was provided an admirable model of a woman succeeding in balancing her professional and personal pursuits. I thank Stephanie Kiersey for her patience, advice, and careful attention to my many editorial needs. For reliably engaging me in many conversations regarding conceptual and clinical issues, I thank Christina Peters. And, I thank my husband, Kaid Funk, who has continued to provide me more love, patience, and support than I deserve.

Table of Contents

List of Tables

List of Figures

Introduction

Functional Analysis

The analogue Functional Analysis (FA) is an assessment often utilized to aid in the identification of the function of aberrant behavior. Loosely speaking, the FA is a tool that aids in the identification and description of the purpose of the individual's behavior. It was developed in 1982 by Iwata, Dorsey, Slifer, Bauman, & Richman (1982/1994) secondary to the need for a method to identify the function of behavior prior to treatment. Especially relevant to disruptive and potentially harmful behaviors, the FA attempts to quickly identify significant variables maintaining the behavior. Standard FA methodology systematically manipulates environmental circumstances—both social and physical—that might differentially affect the individual's responding. Environmental circumstances are presented in separate conditions referred to as: Alone/Ignore, Attention, Demand, Tangible, and Play. Each condition consists of both antecedent and consequent manipulations.

The individual is alone during the Alone condition regardless of occurrence of the target behavior. When leaving an individual alone in a room is unsafe or impractical, or when the target behavior is relevant to another person (e.g., aggression), an Ignore condition is used in place of an Alone. Ignore conditions consist of a therapist that ignores (i.e., does not provide programmed consequences) occurrences of the target behavior in the room, which is devoid of tangibles and demands. During the Attention condition, a therapist is present and the individual receives attention contingent on the target behavior (social positive reinforcement). A series of demands are presented in the Demand condition from which the individual may receive a break contingent upon the occurrence of the target behavior (social negative reinforcement). The Tangible condition consists of brief access to a preferred item or activity contingent upon the occurrence of the target behavior (tangible positive reinforcement). Finally, the Play condition serves as a control condition during which there is no

programmed change for the occurrence of the target behavior while the individual has access to a rich social environment with abundant preferred items and activities that is also free of demands.

Data is collected on the occurrence of the target behavior during each condition from which conclusions may be made regarding the possible function of the target behavior. That is, the environmental variables that maintain the behavior may be identified when the occurrence of behavior in a given condition is relatively higher than that of the control (i.e., Play) or other conditions. FAs are typically conducted in a multi-element design in which the conditions are presented in a semi-random order (Martin & Pear, 2011) and are considered the most reliable method by which variables maintaining aberrant behavior might be identified (Beavers, Iwata, & Lerman, 2013).

When the behavior persists or is virtually absent throughout each of the presented conditions, the FA data may be considered inconclusive and therefore lacking identification of maintaining variables. With maintaining variables identified, the clinician may be more likely to implement an effective intervention informed by differential responding. In other words, following an FA that yields differentiated responses (i.e., identifies the maintaining variables), the clinician may develop an intervention that manipulates the relevant, maintaining variables. Thus, developing an effective intervention following an FA yielding undifferentiated results may prove more difficult.

Undifferentiated results have been attributed to several variables. One variable may be that the behavior is maintained by an automatic function. That is, the behavior is maintained by sensory-related positive or negative reinforcement and persists independent of social variables. Alternatively, the behavior might be sensitive to idiosyncratic variables that are not manipulated in the standard methodology (Werner, Carr, & York, 1997). Another variable may be that the behavior is multiply-maintained, or maintained by more than one variable (Beavers & Iwata, 2011). Finally, undifferentiated results have been attributed in part to discrimination issues that occur during the rapidly alternating conditions of the multi-element presentation of conditions characteristic of the standard FA

methodology (Conners et al., 2000; Iwata et al., 1982/1994). As the dominance of the FA has persisted over 30 years in the assessment literature, researchers have worked towards refining the standard methodology to address the potential discrimination effects of the rapidly alternating conditions (Beavers et al., 2013).

Recent Modifications

One recent modification relevant to the current study was evaluated in Hagopian et al. (2013) in which 176 standard functional analyses were conducted, only 82 (47%) of which resulted in differentiated data. Function was ultimately identified for 87% of cases following up to two modifications of the methodology. One of the modifications was the use of pairwise presentations of treatment conditions with control conditions, referred to as the "pairwise design." The second modification was noted in the Beavers et al. (2013) exhaustive summary of the various efforts to refine the standard methodology. Specifically, the authors recommend programing inclusive discriminative stimuli (S^Ds) to facilitate discrimination of conditions. Methodology of the standard functional analysis often includes the use of S^Ds in attempts to aid in the discrimination of conditions (Conners et al., 2000).

Stimulus Control and Discrimination

Martin and Pear (2011) define an S^D as a stimulus, the presence of which has been paired with reinforcement for a specific behavior. Through pairing, the occurrence or non-occurrence of the behavior comes under the control of the stimulus. When the behavior occurs reliably in the presence of the S^D, the individual has made a simple discrimination. Discrimination may increase in complexity as additional stimuli or stimulus dimensions are present. Consider the following examples of a simple and conditional discrimination. An individual may learn that when they press a lit green lever, their favorite candy is dispensed. The lit green lever is an S^D for the lever-pressing behavior. A conditional discrimination occurs when the individual learns to press the green lever only when it is lit. That is, they learn the candy is dispensed following the press of a lit green lever but not following the press of an

unlit green lever. Conditional discriminations follow an "if-then" logic occurring within or across sensory modalities. In the provided example, the conditional discrimination is described by "if lit, pressing the green lever will dispense candy."

Conditional discriminations are relevant to FAs with respect to differential responding, which provides indication of maintaining variables. Differential results are observed when the individual conditionally discriminates the antecedents to and consequences of the target behavior characteristic of each condition. Conners et al. (2000) evaluated the effects of programmed salient stimuli on participants' abilities to respond differentially during a multi-element FA. Their results suggest that the inclusion of salient cues may indeed increase the likelihood of obtaining differentiated FA results. What their evaluation illustrates is the facilitation of conditional discrimination. The participants learned that their behavior was followed by different consequences in the presence of various S^Ds throughout the assessment (e.g., if green, attention; if red, escape). Inclusion of the salient cues did not result in differentiated responses for all participants, however, to which Conners et al. (2000) suggested may be in part due to participants who lacked the ability to make conditional discriminations between the alternating conditions.

To facilitate differential responding (i.e., conditional discriminations), and secondary to interaction effects of rapidly changing conditions and a lack of continuous control of the multi-element design of the standard FA, a less complex design than the multi-element was introduced by Iwata, Duncan, Zarcone, Lerman, & Shore (1994). Iwata et al. (1994) proposed a sequential, test-control methodology—the pairwise design—during which the control condition is presented in an alternating fashion with various test conditions. Conditions used in the standard FA methodology are presented by alternating pairs of the conditions. The Play condition serves as the continuous control and is alternated in presentation with a single test condition (Attention, Demand, or Alone/Ignore). FAs utilizing the pairwise design may consist of three phases: Demand sessions (test) paired with Play sessions (control),

Attention paired with Play, and Alone/Ignore paired with Play. An additional pairing of Tangible and Play may also be assessed if suspected maintaining variables include access to a preferred tangible item. Presentation of pairings may be determined arbitrarily and introduction of the different pairings is appropriate following a clear trend of differential (or lack thereof) responding in the previous phase (Iwata et al., 1994).

Formal Assessment of Discrimination Abilities

Discrimination abilities may be formally assessed with the Assessment of Basic Learning Abilities (ABLA), originally developed in 1977 (Kerr, Meyerson, & Flora, 1977). A revised version (ABLA-R) has since been introduced (DeWiele et al., 2010). The ABLA-R measures an individual's ability to learn to perform the position, visual, and auditory discriminations involved in many daily tasks. During administration of the ABLA-R, the teacher attempts to teach the individual to engage in six levels of discrimination ranging from a simple motor response to a more complex, two-choice auditory-visual discrimination. The six levels of discrimination are assessed in order of increasing difficulty and are outlined as follows:

Level I: Simple Motor Response

Level II: Position Discrimination

Level III: Visual Discrimination

Level IV: Visual Quasi-Identity Match-to-Sample Discrimination

Level V: Visual Non-Identity Match-to-Sample Discrimination

Level VI: Auditory-Visual Combined Discrimination

Levels I through III assess the individual's ability to acquire simple motor responses and make simple visual discriminations, while the remaining levels assess the increased complexity of conditional discriminations both within and across senses (see Williams in press for an overview and issues).

Since its development in 1977 and revision in 2010, the predictive validity of learning performance in a variety of tasks, as assessed by the ABLA-R, has been supported. Its application is demonstrated in common domains of interest to the clinician, including presentation modes for preference assessments, predicting compliance, and predicting object name recognition. Moreover, its place in future research is warranted in the evaluation of matching individuals to appropriate training tasks, specifically three- and four-choice discriminations, a mission of great significance to individuals with developmental disabilities (Martin, Thorsteinsson, Yu, Martin, & Vause, 2008).

Purpose of the Present Study

In the most widely-referenced article on FAs (Iwata et al. 1982/1994) from which standard methodology originates, three of nine participants failed to show differentiated responses across the conditions. The authors provide the following explanation:

> Although it is impossible to determine what may have accounted for these results, several possibilities appear likely. Each of these subjects was either quite young or profoundly retarded, and it is possible that the different conditions were not clearly discriminable to them (p. 206).

Undifferentiated results attributed to the individuals' discrimination abilities are not unique to Iwata et al. (1982/1994). Approximately half of participants in a large-scale evaluation lacked differentiated data, which the authors partially attributed to discrimination barriers (Derby et al., 1992).

As previously discussed, one modification of the standard FA methodology to help facilitate discrimination of conditions is the use of salient stimuli paired with each presented condition (Conners et al., 2000). While Conners et al. (2000) found the inclusion of salient stimuli aided in discrimination between conditions for half of the participants, they suggest that more clear results might be observed from individuals with more developed discriminative abilities. Despite the discussions pointing to discrimination abilities as a relevant variable in differential responding, the participants' discrimination

skills were not assessed. In response, Greenwald, Senuik, & Williams (2012) examined the extent to which conditional discrimination abilities were associated with differential responding in multi-element FAs with the standard methodology.

Greenwald et al. (2012) assigned participants to groups according to ABLA scores. Those who scored Level III and below (i.e., demonstrated only simple discrimination skills) comprised one group, while participants with ABLA scores of Level IV and above (i.e., demonstrated conditional discriminations) comprised the second group. Both groups were subject to identical methodology, but were separated for the purpose of evaluating correlation of ABLA levels and differential FA results. The authors also evaluated the effect of including salient S^Ds, concluding the inclusion may facilitate discrimination of conditions. With respect to discrimination skills and differential responding, the authors concluded that assessing conditional discrimination abilities with the ABLA assessment prior to conducting FAs may inform clinicians to the likelihood of obtaining differentiated FA data.

Unlike descriptive analyses often used prior to FA assessment, the ABLA-R does not attempt to predict FA outcomes or inform the clinician of the function of the target behavior. Rather, the utility of the ABLA-R lies in its potential to provide insight as to whether the individual has the skills to differentiate antecedents and consequences of different conditions. As FA conditions are rapidly alternated in the standard multi-element methodology, the discrimination is critical for the differentiation of responses. Conducting FAs requires relatively significant resources in comparison to the ABLA-R, and the ABLA-R may inform a more efficient assessment plan. Thus, the current study extended Greenwald et al. (2012) to further evaluate the relationship between conditional discrimination skills as assessed by the ABLA-R and differential responding within an FA.

Method

Phase I: Assessment of Basic Learning Abilities

Subjects and Setting

Five individuals participated, all of which had been diagnosed with intellectual disabilities, had normal hearing and vision, were between the ages of 3-17, and engaged in teacher- or guardian-reported disruptive behaviors. Sessions were held in either a 3.9 m x 4.7 m therapy room after operation hours at a day-treatment program clinic for adults with intellectual disabilities or in a 4 m x 4.8 m designated room at the school from which they were recruited. Experimental rooms contained a table, chairs for the participant and experimenter, and materials relevant to the assessment.

Dom was an eight-year-old boy diagnosed with autism. Jake was an eight-year-old boy diagnosed with Down syndrome. Kale was an eight-year-old boy diagnosed with autism. Tyra was a 17-year-old girl diagnosed with autism. Sam was a four-year-old boy diagnosed with autism.

Preference Assessment

Prior to the ABLA-R, either a paired-stimulus (PS) preference assessment (Fisher & Piazza, 1992) or multiple stimulus without replacement (MSWO) (Windsor, Piché, & Locke, 1994) was administered to each participant to identify highly-preferred edible and/or leisure items.

Materials

The ABLA-R consists of six levels, each requiring the stimuli described by DeWiele et al. (2010). The large containers consisted of a large yellow can (15.5 cm in diameter and 17.5 cm in height), as well as a box (14cm x 14cm x 10cm) covered in red and white diagonal stripes. The opening of the can was approximately 188 sq cm, while the opening of the box was about 196 sq cm. Additional stimuli included a small yellow cylinder (approximately 9 cm long and 3 cm in diameter), a small cube with red and white stripes (approximately 5 cm x 5 cm x 5 cm), and an irregularly-shaped piece of dark grey foam (approximately 5 cm in diameter). Secondary to a modification of the original ABLA assessment,

additional materials included separate wooden words, “can” and “BOX,” colored silver and purple, respectively.

Response Measurement and IOA

Agreement on target behavior responses between experimenters were computed on a trial-by-trial basis. Data were recorded using paper and pen, and inter-observer agreement (IOA) was assessed by a second experimenter simultaneously collecting data during each level for 100% of participants. Percentage of agreement was calculated by dividing the number of responses in agreement by the total number of responses. Mean IOA across sessions was 100%.

Procedural integrity checks were conducted to evaluate adherence to main procedural components (i.e., appropriate materials, teaching trials and error corrections, continuous reinforcement for correct responses). Checks were conducted via video recording. Procedural integrity was assessed for each assessment level for 60% of participants. Mean procedural integrity scores for the ABLA-R were 100%.

Procedures

The experimenters and participant were seated facing one another. For each level, the participant was provided a three-step prompting sequence consisting of a demonstration of the task, a guided trial, and an opportunity to perform the response independently. Testing began following the participant’s demonstration of two consecutive independent correct responses. A continuous reinforcement schedule was be used throughout all testing sessions, where a preferred item and praise were delivered contingent on each independent correct response. Errors were followed by a correction procedure identical to the three-step prompting sequence provided prior to testing. Following standard ABLA-R testing criteria (DeWiele et al., 2010), testing continued for each level until eight consecutive correct responses (pass) or eight cumulative errors (fail) were observed. Correct responses during the three-step prompting sequences did not constitute a correct response for pass/fail criteria, though

incorrect responses during error corrections constituted an incorrect response for pass/fail criteria. Incorrect responses consisted of placing the object anywhere other than the level-designated container or holding onto the object for an extended period of time (i.e., 15 seconds).

ABLA-R Level 1, Motor Response. The participant was required to place the foam in the red box four consecutive trials and in the yellow can four consecutive trials. A model was provided prior to each opportunity for independent completion at this level. Passing Level 1 demonstrated the ability to perform a simple motor task.

ABLA-R Level 2, Position Discrimination. Both the red box and yellow can was presented in fixed positions in each trial. The participant was required to place a piece of foam into the container on the left when both the red box and yellow can were present in a fixed position. This level assessed the participant's skill of discriminating position, though may have also involved visual discrimination of color, shape, or size (i.e., box versus can).

ABLA-R Level 3, Visual Discrimination. The participant was required to place the foam in the yellow can when the position of the red box and the yellow can were randomly rotated. Passing this level required a visual discrimination relevant of color, shape, or size.

ABLA-R Level 4, Visual-Visual Quasi-Identity Match-to-Sample Discrimination. The participant was required to place the small yellow cylinder in the yellow can and a small red cube in the red box when the position and presentation order of the can and the box were randomly alternated. This type of discrimination was a conditional visual-visual quasi-identity match relevant to color or shape.

ABLA-R Level 5, Auditory Discrimination. This level was identical to Level 4 with one exception of required stimuli: the small yellow cylinder and red cube are replaced with the wooden words "can" and "BOX," respectively. Level 5 required a conditional auditory-visual nonidentity discrimination of auditory and visual cues, or position.

ABLA-R Level 6, Auditory-Visual Discrimination. The participant was required to place the foam in the appropriate, randomly alternated container when the tester randomly said, “red box” in a high-pitched, rapid cadence or “yellow can” in a low-pitched, slow cadence. This type of discrimination was a conditional auditory-visual nonidentity discrimination requiring auditory and visual cues excluding position.

Phase II: Functional Analysis

Method

Subjects and Setting

Each participant from the Assessment of Basic Learning Abilities phase participated. Sessions were held in either a 3.9 m x 4.7 m meter therapy room after operation hours at a day-treatment program clinic for adults with intellectual disabilities or in a 4 m x 4.8 m designated room at the school from which they were recruited. Experimental rooms contained a table, chairs for the participant and experimenter, and materials relevant to the assessment.

Dom’s target behavior was grabbing (contact with another person or objects in another person’s possession with the palm of one or both hands with a pushing or pulling momentum), which was reported by his mother as a behavior regularly reported by teachers as disruptive. Jake’s target behavior was climbing on furniture (on the table without foot/ground contact; on the chair without buttocks/chair contact while the bottom of feet or bottom of one foot is flat on the chair), also reported by his teacher to disrupt and provide inappropriate models to his peers. Kale’s target behavior was hand-mouthing (the outside of either hand breaking the threshold of the teeth), a behavior reported disruptive by his teacher. Tyra’s target behavior was crying (whining sounds or vocalizations above normal conversation level, not requiring tears and not including echolalia), reported by Tyra’s mother as a barrier to their family participating in community events. Sam’s target behavior was pica (placement of non-edible—not meant for or to aid in consumption—items into mouth, not requiring chewing or

swallowing, but must break the threshold of teeth or make contact with the tongue), reported by his mother as problematic. To ensure safety, Sam was not provided access to inedible items throughout the assessment. Placing any non-nutritive items in his mouth was considered an occurrence of the target behavior.

Materials

In addition to the materials needed for each condition described in following, the Functional Analysis conditions included programmed discriminative stimuli, consisting of colored t-shirts worn by the experimenters with a large white shape (approximate area of 20 sq cm) printed on the front. Each color and shape corresponded to one condition: black with no shape to signal the Alone/Ignore condition, green with a circle to signal the Attention condition, yellow with a star to signal the Play condition, red with a triangle to signal the Demand condition, and blue with a square to signal the Tangible condition. A projector was used to project the corresponding color and shape onto one wall of the session room with the exception of the Alone/Ignore condition for which no color was projected on the wall. Whereas Greenwald et al. (2012) programmed discriminative stimuli for only half of the sessions, the present study included programmed discriminative stimuli for each FA session.

Response Measurement and IOA

Responses of target behavior were recorded as percentage of intervals in which the behavior was observed (i.e., partial interval recording). Inter-observer agreement (IOA) was assessed for at least 33% of sessions of each condition by two observers who independently collected data. Participant target behavior data was compared on an interval-by-interval basis for the total number of intervals per session, length of 10-s each. Agreement percentages were calculated by dividing the total number of agreement intervals by the total number of intervals. Mean IOA for the Play, Attention, Demand, Alone/Ignore, and Tangible conditions were 99.12%, 96.43%, 99.05%, 96.22%, and 98.61%, respectively. Exact agreement for all conditions combined was 98.19%.

Procedural integrity was evaluated via video recordings following the sessions for at least 33% of each participant's sessions. One observer collected experimenter behavior data (i.e., providing attention, escape, and tangibles) relevant to each condition. Mean procedural integrity for the Play, Attention, Demand, Alone/Ignore, and Tangible conditions were 100%, 96%, 100%, 100%, and 99%, respectively.

Procedures

The present study utilized methodology similar to that provided by Iwata et al. (1994) as subjects were exposed to four assessment conditions (Alone/Ignore, Attention, Play, and Demand) in a pairwise design. If a tangible function maintaining the target behavior was suspected, the participant was also presented with a Tangible condition. Duration of each condition was extended to a total of 15 minutes to further facilitate differentiation of responses (Beavers et al., 2013). Each condition was presented until a pattern of differential responding or clearly undifferentiated responding was observed, as determined by visual inspection.

Approximately five-minute-long breaks were provided between each presentation of conditions. Sessions were conducted once per day, one to three days per week, depending on participant availability. To address the potential variability of establishing operations throughout the period of assessment, the final sessions consisted of 10-minute presentations of each condition. That is, the duration of each condition was reduced to 10 minutes, and participants were presented each condition in a pairwise manner with Play as the control. Jake and Kale were both available for additional sessions, allowing for a second cycle of 10-minute conditions. Dom was the only participant for which the behavior occurred exclusively in a single condition (i.e., Tangible), therefore the final eight sessions were a return to the Tangible and Play pairings. Typical levels of background noise were present throughout each condition (e.g., doors closing throughout the clinic, noise typical of the school setting). As

previously discussed, wall projections and the experimenters' shirt color and printed shape corresponded to the particular condition being presented.

Demand. Demands presented were selected based upon typical demands within the participants' daily routines as reported by teachers and guardians. For example, the participants recruited from the school were presented with instructions that were regularly presented to them in their classroom (e.g., discrete trial matching tasks). Moreover, if the participant typically engaged in demand situations while seated on the floor, the instructions during the FA were presented accordingly. The experimenter provided continuous instructions while using a three-prompt sequence (instruction, instruction plus model, instruction plus physical guidance) for incorrect responses. Correct responses were followed by brief praise. Occurrence of the target behavior resulted in a 30 second break from demands and close proximity to the experimenter (i.e., a break from potential conditioned aversive stimuli).

Attention. The participant and experimenter were seated in an empty room. The experimenter began the condition engaged in a solitary activity, such as reading. Attention in the form of concern or disapproval was delivered contingent on the target behavior (e.g., don't do that, ouch—stop hurting yourself, etc.). The experimenter provided attention for the entire duration the participant engaged in the target behavior and approximately five seconds following the offset.

Alone/Ignore. For the Alone condition, the participant was seated alone in an empty room. The experimenter was not present in this condition, though watching from a separate room via video monitors. The Ignore conditions consisted of the experimenter present to intervene, though not providing any attention other than presence. Occurrence of the target behavior did not occasion any programmed change in environment on the behalf of the experimenter.

Play. The experimenter and participant was seated in room with preferred leisure and edible items. Leisure and edible items were available for the participant to manipulate without experimenter

interference. Items were identified as preferred in the preference assessments preceding the ABLA-R. The experimenter delivered verbal interactions and brief physical contact on a 30 second fixed-time (FT) schedule, independent of problem behavior, as cued by a stopwatch. Attention was provided beyond the 30 second FT schedule if initiated by the participant. No programmed response on behalf of the experimenter was provided contingent upon the occurrence of the target behavior.

Tangible. Prior to the start of the condition, the experimenter will provided brief access to a highly preferred leisure items. Upon beginning the condition, the experimenter blocked the participant's access to the leisure items. The leisure items were re-presented to the participant for 30 seconds contingent on occurrence of the target behavior. Aside from presence, the experimenter did not provide attention throughout the entirety of the session.

Results

Assessment of Basic Learning Abilities-Revised

Table 1 displays the participants' ABLA-R score. Kale passed one level of the ABLA-R, receiving a score of Level 1. Jake passed four levels, receiving an ABLA-R score of Level 4. Dom, Tyra, and Sam passed all six levels of the ABLA-R, receiving scores of Level VI. Scores corresponded with anecdotal observations of each participants' communication skills. Kale was not observed engaging in any recognizable form of conventional communication while Jake was observed utilizing gestures. Dom, Tyra, and Sam were all observed communicating in each or a combination of full sentences, multi-word phrases, sign, and writing. Dom and Tyra were also observed reading.

Table 1. Participant Diagnosis, Anecdotal Communication Abilities, and ABLA-R Score

Participant Name	*Age*	*Diagnosis*	*Communication*	*ABLA-R Score*
Kale	8	Autism	No Conventional Language	1
Jake	8	Down Syndrome	Gesture	4
Dom	8	Autism	Vocal	6
Tyra	17	Autism	Vocal	6
Sam	4	Autism	Vocal	6

Functional Analysis

Responses were graphed and subject to visual inspection for identification of differential responding (Michael, 1974). Figure 1-4 depicts the results for the participants with an ABLA-R score of Level IV or above: Jake, Dom, Tyra, and Sam. Figure 1 displays Jake's results.

Figure 1 depicts the results of the FA for Jake, who received an ABLA-R score at Level IV (i.e., Level IV). Jake was observed climbing on furniture exclusively in test conditions. Differential responding was to be expected, as Jake received an ABLA-R score of Level IV.

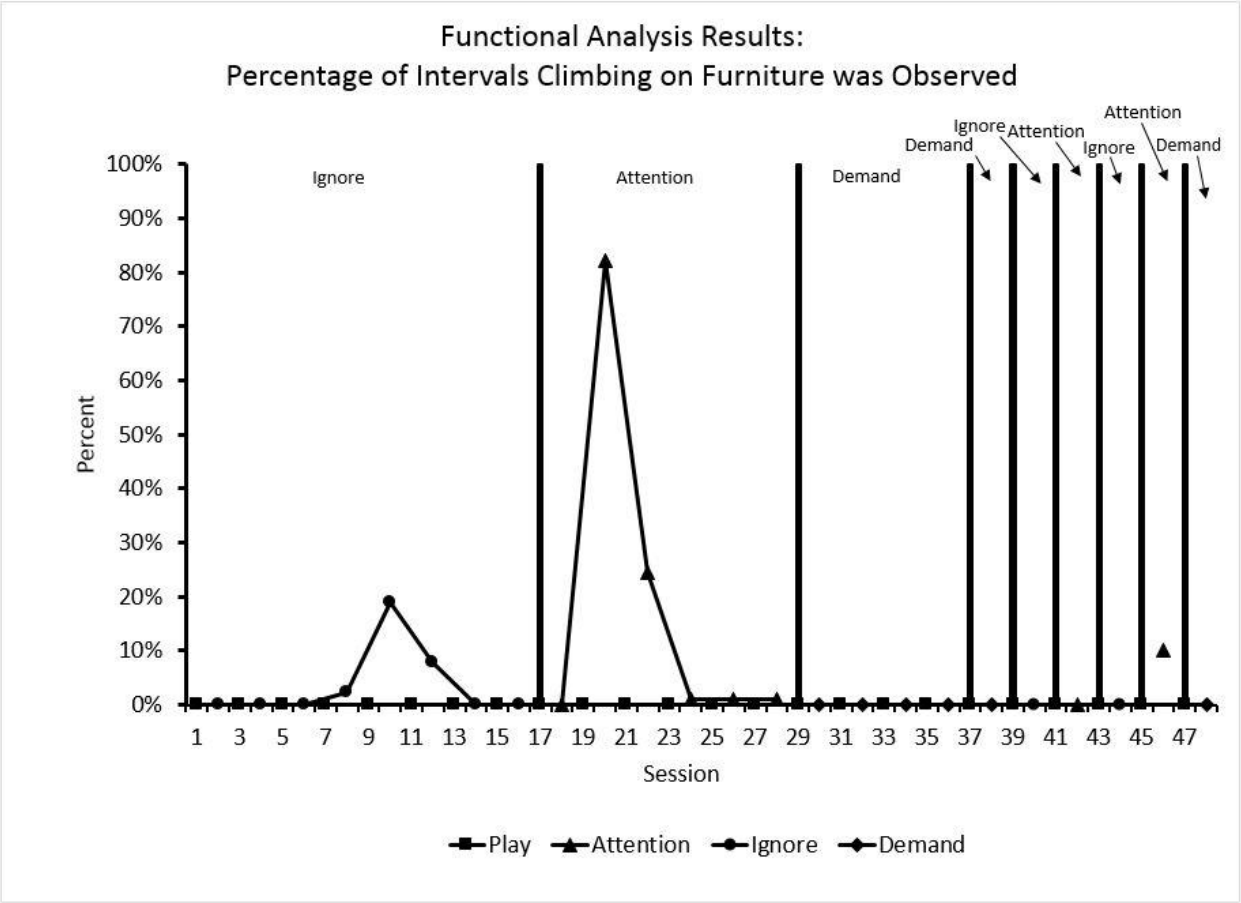

Figure 1. FA data for Jake, who demonstrated conditional discriminations (at or above ABLA-R Level IV). The figure indicates the percentage of session 10-second intervals that contained occurrence of the target behavior. Conditions were presented in a pairwise manner with Play as the control followed by an

alternative condition type. The last 12 sessions consisted of a one-time presentation of each condition plus control.

Figure 2 depicts the results of the FA for Dom, who received an ABLA-R score above Level IV (i.e., Level VI). A clear separation of responding in the Tangible condition from those of the control and other test conditions is observed. Grabbing occurred exclusively in the Tangible condition, indicating conditional discrimination. Differential responding was to be expected, as Dom received an ABLA-R score of Level VI.

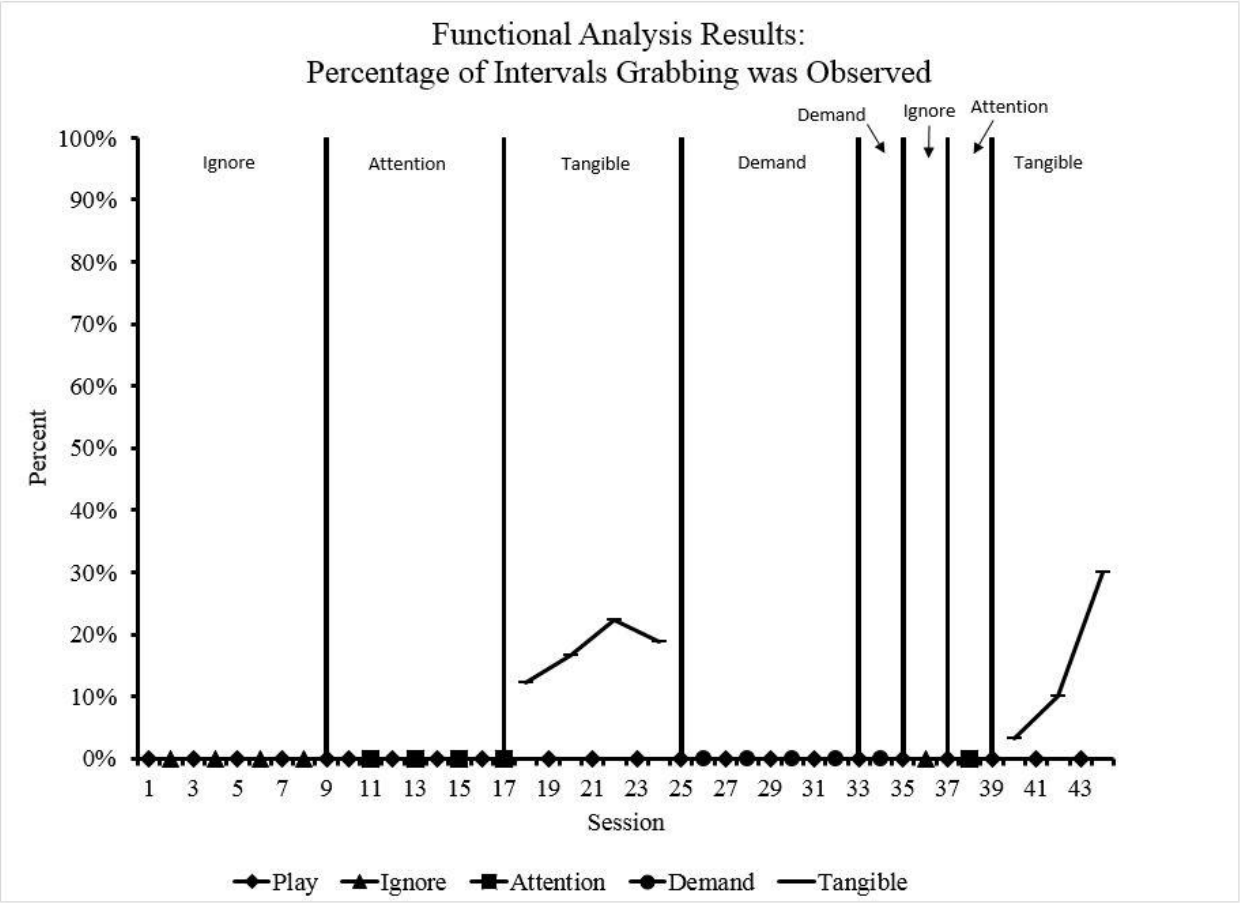

Figure 2. FA data for Dom, who demonstrated conditional discriminations (at or above ABLA-R Level IV). The figure indicates the percentage of session 10-second intervals that contained occurrence of the target behavior. Conditions were presented in a pairwise manner with Play as the control followed by an

alternative condition type. Session 33-38 consisted of a one-time presentation of each condition plus control. The last six sessions were a return to the Play and Tangible pairings.

Figure 3 depicts the results of the FA for Tyra, who received an ABLA-R score above Level IV (i.e., Level VI). Overall, Tyra engaged in crying during a low percentage of intervals, and identifying a function may be more difficult with such few observations of the behavior. However, the data is indicative of Tyra engaging in conditional discriminations, as crying was observed in only one of the Play conditions. Moreover, Tyra contacted the programmed consequence in multiple conditions, and shows a pattern of responding—contacting the consequence and not engaging in the behavior again in that condition. Such responding may indicate an absence of relevant maintaining variables in the analogue conditions. Again, differential responding was expected as Tyra received an ABLA-R score of Level VI.

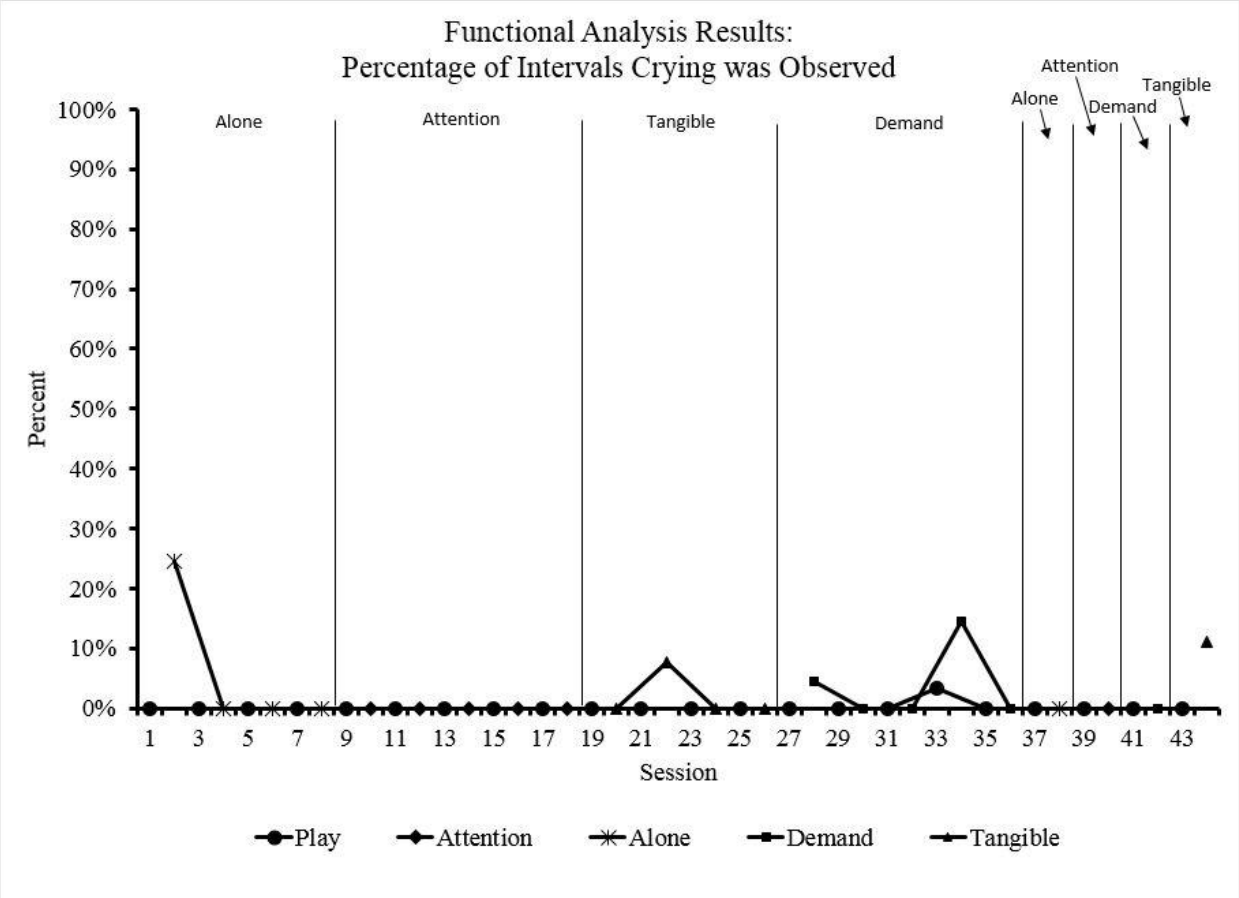

Figure 3. FA data for Tyra, who demonstrated conditional discriminations (at or above ABLA-R Level IV). The figure indicates the percentage of session 10-second intervals that contained occurrence of the target behavior. Conditions were presented in a pairwise manner with Play as the control followed by an alternative condition type. The last eight sessions consisted of a one-time presentation of each condition plus control.

Figure 4 depicts the results of the FA for Sam, who received an ABLA-R score above Level IV (i.e., Level VI). Sam's data is indicative of conditional discriminations, with pica observed in only two of the total presentations of the Play condition. As Sam scored above ABLA-R Level IV, differential responding was to be expected.

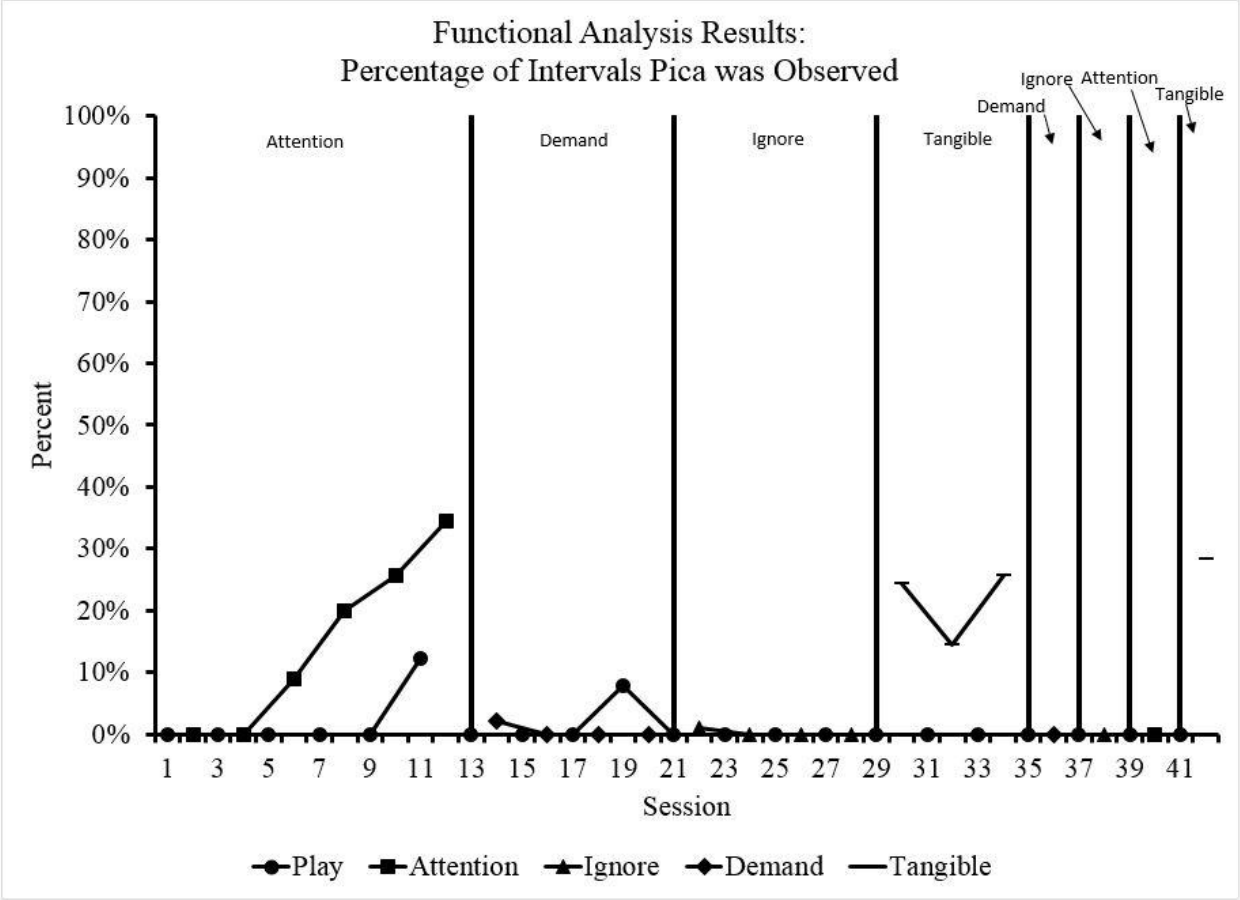

Figure 4. FA data for Sam, who demonstrated conditional discriminations (at or above ABLA-R Level IV). The figure indicates the percentage of session 10-second intervals that contained occurrence of the

target behavior. Conditions were presented in a pairwise manner with Play as the control followed by an alternative condition type. The last eight sessions consisted of a one-time presentation of each condition plus control.

Figure 5 depicts the results of the FA for Kale, who received an ABLA-R score below Level IV (i.e., Level I). Kale's responding throughout the FA was variable. Hand-mouthing was observed in each condition, and the data is not especially indicative of conditional discrimination, particularly in the Ignore and Demand conditions in which patterns of responding in the test conditions closely resemble those of the control condition. Slightly more differential responding is observed in the Attention condition and throughout the shorter, 10-minute presentations of conditions. Variable responding from Kale was to be expected, as he scored below ABLA-R Level IV, indicating he could not make conditional discriminations.

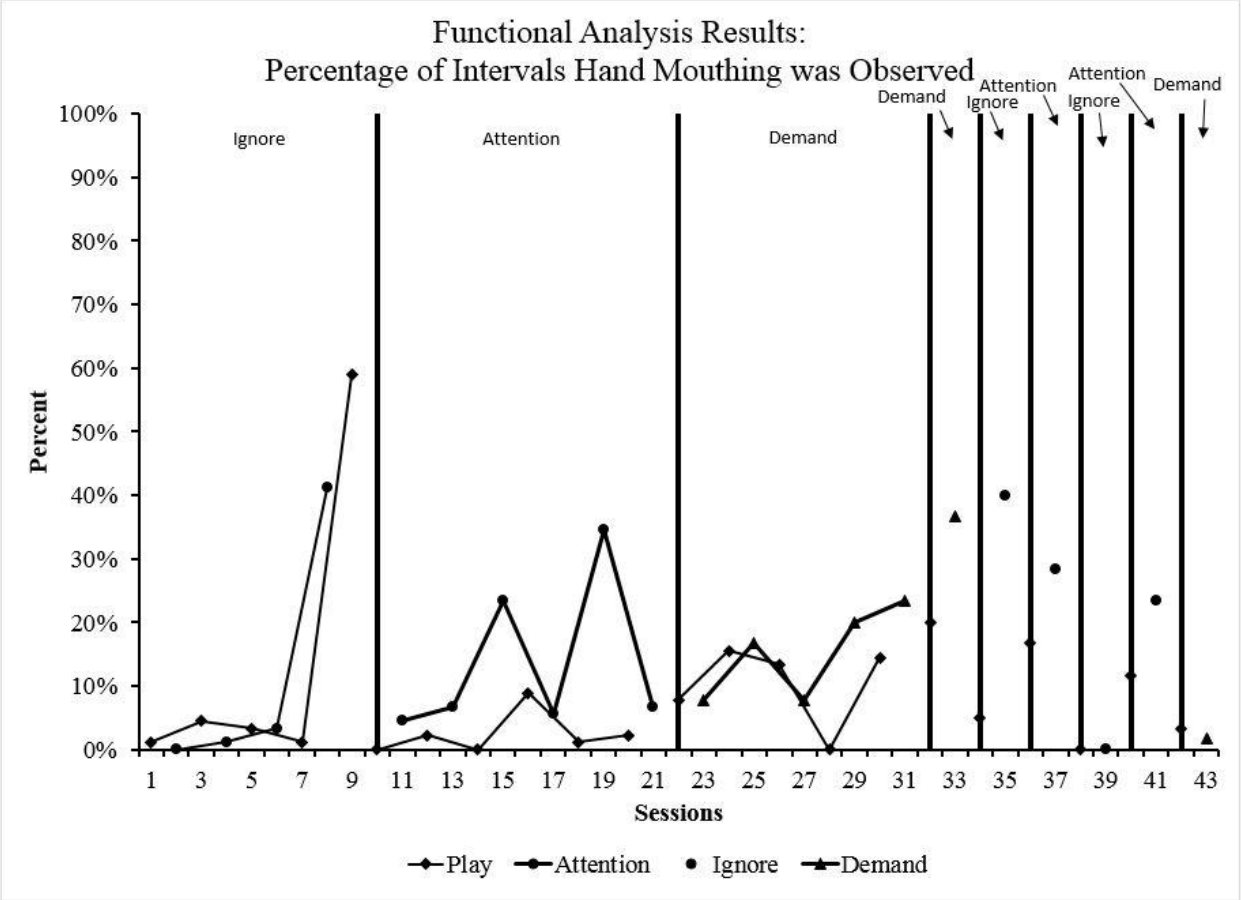

Figure 5. FA data for Kale, who was unable to demonstrate conditional discriminations (below ABLA-R Level IV). The figure indicates the percentage of session 10-second intervals that contained occurrence of the target behavior. Conditions were presented in a pairwise manner with Play as the control followed by an alternative condition type. The last 12 sessions consisted of a one-time presentation of each condition plus control.

Discussion

For over 30 years, the field has been working towards refining the FA methodology to facilitate the most ethical and efficient assessment of individuals engaging in aberrant behavior (Beavers et al., 2013). The present study sought to further contribute to the evaluation of ABLA-R results and differential responding within FAs, a line of research initiated by Greenwald et al. (2012). The first modification to Greenwald et al. (2012) was the use of the ABLA-R as opposed to the original ABLA. Additional modifications and extensions of Greenwald et al. (2012) in the present study were with respect to FA methodology.

One point of discussion in Greenwald et al. (2012) was the influence of programmed discriminative stimuli on differential responding in the FA. Only half of the sessions included programmed discriminative stimuli. Results indicated that the influence of inclusion of programmed discriminative stimuli was unclear. Considering the research previously discussed encouraging the inclusion of programmed discriminative stimuli, the present study included programmed discriminative stimuli for each FA session (i.e., colors and shapes on experimenters' shirts and wall projections). An additional modification in the present study involved additional effort to facilitate differential responding across FA conditions. Greenwald et al. (2012) exclusively utilized a multi-element design for the FAs. The present study presented the conditions with a pairwise design, which was expected to counter a significant disadvantage of a multi-element design, namely the rapid presentation of different conditions.

Even despite the inclusion of programmed discriminative stimuli and presentation of conditions in a pairwise design, we expected participants with ABLA-R scores below Level IV to show undifferentiated responding in the FA, as their ABLA-R scores suggested the lack of necessary conditional discrimination abilities to do so. Moreover, we expected participants with ABLA-R scores at or above Level IV to respond differentially in the FA, as their ABLA-R scores suggested they have the necessary conditional discrimination abilities to do so. Overall, we expected that attempts to facilitate differential responding for participants below, at, or above ABLA-R Level IV would provide relevant information for the evaluation of the predictive validity of ABLA-R for differential responding in an FA. Results of each participant with an ABLA-R score at or above Level IV support our expectations. Differential responding was observed throughout the entirety of the FA sessions for each of the four participants. The data for the participant scoring below ABLA-R Level IV are suggestive of a lack of conditional discriminations, though the evaluation is limited to a single participant.

Though the data suggests the ABLA-R scores may correlate with responding within an FA, the study presents limitations. First, additional participants with an ABLA-R score below Level IV would allow for a stronger comparison between the differential responding during FAs for those scoring at or above Level IV to those below. Second, selecting hand-mouthing as a target behavior may also limit conclusions, as hand-mouthing is often maintained by an automatic function. While hand-mouthing may typically be described in context of automatic function, Kale's teacher, family, and treatment team all suspected a social function. A third limitation may be the duration of participation. Sessions were scheduled according to participant availability. For the majority of participants, all sessions were completed in approximately three weeks. Dom's sessions were completed within two months. However, Dom's responding on the final session, during which all conditions were presented in a single day, was consistent throughout the entirety of his participation.

The current study is young in a program of research evaluating the discrimination abilities of candidates for an FA. Results consist of limited participants, particularly below Level IV. However, data from the current study in consideration alongside Greenwald et al. (2012)'s provide evidence of a need for further evaluation of the utility of assessing an individual's skills in conditional discrimination prior to conducting a formal FA.

References

Beavers, G. A., & Iwata, B. A. (2011). Prevalence of multiply controlled problem behavior. *Journal of Applied Behavior Analysis*, *44*(3), 593–597. doi:10.1901/jaba.2011.44-593.

Beavers, G. A., Iwata, B. A., & Lerman, D. C. (2013). Thirty Years of Research on the Functional Analysis of Problem Behavior. *Journal of Applied Behavior Analysis*, *46*(1), 1–21. doi:10.1002/jaba.30.

Conners, J., Iwata, B. a, Kahng, S. W., Hanley, G. P., Worsdell, a S., & Thompson, R. H. (2000). Differential responding in the presence and absence of discriminative stimuli during multielement functional analyses. *Journal of Applied Behavior Analysis*, *33*(3), 299–308. doi:10.1901/jaba.2000.33-299.

Derby, K. M., Wacker, D. P., Sasso, G., Steege, M., Northup, J., Cigrand, K., & Asmus, J. (1992). Brief functional assessment techniques to evaluate aberrant behavior in an outpatient setting: a summary of 79 cases. *Journal of Applied Behavior Analysis*, *25*(3), 713–721.

DeWiele, L., Martin, G., Martin, T. L., Yu, C. T., & Thomson, K. (2010). The Kerr Meyerson Assessment of Basic Learning Abilities Revised : A Self Instructional Manual.

Fisher, W., & Piazza, C. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis*, *2*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1901/jaba.1992.25-491/abstract.

Hagopian, L. P., Rooker, G. W., Jessel, J., & DeLeon, I. G. (2013). Initial Functional Analysis Outcomes and Modifications in Pursuit of Differentiation: a Summary of 176 Inpatient Cases. *Journal of Applied Behavior Analysis*, *46*(1), 88–100. doi:10.1002/jaba.25.

Hanley, G. P., Iwata, B. A., & McCord, B. E. (2003). Functional analysis of problem behavior: a review. *Journal of Applied Behavior Analysis*, *36*(2), 147–185. doi:10.1901/jaba.2003.36-147.

Iwata, B. a, Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (n.d.). Toward a functional analysis

of self-injury. *Journal of Applied Behavior Analysis*, *27*(2), 197–209. doi:10.1901/jaba.1994.27-197.

Iwata, B. A., Duncan, B. A., Zarcone, J. R., Lerman, D. C., & Shore, B. A. (1994). A sequential, test-control methodology for conducting functional analyses of self-injurious behavior. *Behavior Modification*, *18*(3), 289–306.

Kerr, N., Meyerson, L., & Flora, J. A. (1977). The measurement of motor, visual, and auditory discrimination skills. *Rehabilitation Psychology*, *24*(3), 95–112.

Martin, G. L., Thorsteinsson, J. R., Yu, C. T., Martin, T. L., & Vause, T. (2008). The assessment of basic learning abilities test for predicting learning of persons with intellectual disabilities: a review. *Behavior Modification*, *32*(2), 228–47. doi:10.1177/0145445507309022.

Michael, J. (1974). Statistical inference for individual organism research: Mixed blessing or curse? *Journal of Applied Behavior Analysis*, *7*(4), 647–653.

Werner, J., Carr, E., & York, N. (1997). Effects of idiosyncratic stimulus variables on functional analysis outcomes. *Journal of Applied Behavior Analysis*, *4*(4), 673–686.

Williams,W. L. (In Press). The Assessment of Basic Learning Abilities and Translational Research in Behavior Analysis. International Journal of Behavior Analysis and Autism 1, 1.

Windsor, J., Piché, L. M., & Locke, P. A. (1994). Preference testing: A comparison of two presentation methods. *Research in Developmental Disabilities*, *15*(6), 439–455. doi:10.1016/0891-4222(94)90028-0.