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Christina Marie Sheppard

Rollins College, csheppard@rollins.edu

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**Validity Analysis of a Modified Questions About Behavioral Function (QABF)
Assessment:
Preliminary Analysis**

A Thesis
By
Christina M. Sheppard, BA, RBT

Submitted to the Faculty of the Department of Health Professions
at Rollins College in Partial Fulfillment
of the Requirements for the Degree of

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Abstract

The Questions About Behavioral Function (QABF) is a 25-item rating scale about the variables that are potentially maintaining problem behavior, and it is administered in an interview format to an informant. According to previous research, the psychometric soundness (such as validity) of the QABF and other indirect assessments is low, yet these instruments are used frequently in practice. The purpose of the current study was to determine whether specifying a recall period would improve the validity of the QABF (i.e., correspondence of QABF results with functional analysis results). A QABF, a modified version with timeframes (QABF-M), and a functional analysis (FA) were completed for each of five participants with developmental disabilities. Percentage correspondence between results of the QABF and FA versus the results of the QABF-M and FA were then compared. Average percentage correspondence for the original QABF, QABF-M 30-day, and the QABF-M 3-year were 20%, 40% and 40% respectively. Potential theoretical and applied implications as well as limitations are discussed.

Key words: functional analysis, Questions About Behavioral Function, psychometric soundness, recall period

Introduction

Aberrant behaviors such as self-injury and aggression are treated most successfully through function-based interventions (Geiger, Carr, & LeBlanc, 2010). Several methods, collectively known as functional behavior assessments (FBAs), have been developed to identify the variables maintaining aberrant behavior, and this information is used to design interventions. For example, if escape from instructional activities is the variable identified to be maintaining problem behavior (i.e., the function), a targeted function-based treatment can be selected (e.g., frequent breaks on a time-based schedule). If the function of the problem behavior is to obtain adult attention, a treatment that targets this function can be selected (e.g., functional communication training which may involve teaching a child to appropriately request attention).

These FBAs can be categorized as either direct or indirect. Two direct approaches are descriptive assessments and the functional analysis (FA). Descriptive assessments typically involve naturalistic observation (Pence, Roscoe, Bourret, & Ahearn, 2009). A functional analysis involves experimental manipulation of consequent variables (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994). In indirect approaches, therapists gather information about aberrant behavior by interviewing teachers or caregivers. Questions asked of interview informants concern the environmental events that are potentially related to aberrant behavior.

Several indirect methods of FBA have been generated including the Motivation Assessment Scale (MAS), the Functional Analysis Screening Tool (FAST), and the Questions About Behavioral Function (Kelley, LaRue, Roane, & Gadaire, 2011). The Questions About Behavioral Function (QABF) is a rating scale in which a teacher or caregiver completes questions about a range of variables that might be maintaining a client's aberrant behavior (Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2001). A broader range of

variables (i.e., tangible, physical discomfort, and social avoidance functions) is assessed through the QABF than through any other indirect method (Kelley et al., 2011).

Despite the development and use of indirect methods, the psychometric soundness (i.e., reliability and validity) of these approaches is often found to be low (Hall, 2005; Shogren & Rojahn, 2003; Sturmey, 1994). The internal validity (i.e., degree to which a test measures what it is designed to measure) of an indirect assessment of problem behavior can be most accurately determined through analysing treatment outcomes based on the indirect assessment or by correspondence of indirect assessment results with FA outcomes. This is because the ultimate goal of assessment is to gather information that can lead to treatments that allow for clinically significant behavior change, and interventions based on behavioral function have a higher probability of success than interventions selected in less systematic manners (Iwata et al., 1994).

The QABF is the most heavily researched indirect method, and researchers have demonstrated that it may have greater correspondence with an FA than the MAS (Smith, Smith, Dracobly, & Pace, 2012). Though Durand and Crimmins (1988) concluded that the validity of the MAS was high, they compared the MAS to a structural analysis (i.e., manipulation of antecedent variables) rather than a functional analysis (i.e., manipulation of antecedent and consequent variables). Iwata et al. (2013) found that the validity of the FAST was low (64%) when the FA was used as the standard of comparison. The low psychometric soundness of indirect assessments is particularly true when these assessments are completed by paraprofessionals or teachers or when they are administered in school settings (Dufrene, Kazmerski, & Labrot, 2017; May, Sheng, Chitiyo, Brandt, & Howe, 2014).

The FA (one of the two direct approaches mentioned above) is the gold standard approach to FBA (Iwata & Dozier, 2008). Nevertheless, indirect approaches (such as the QABF) are used more frequently in practice than the FA as the sole method of FBA (Oliver,

Pratt, & Normand, 2015). There should therefore be an increased focus on improving indirect methods. According to Roscoe, Phillips, Kelly, Farber, and Dube (2015), indirect methods may be preferred due to the short duration (approximately 15 min) of implementation. Some variations of the FA, such as the brief FA, are designed to be less time-consuming than the standard FA (Northup et al., 1991). However, indirect methods may still be preferred due to the ease of implementation and minimal training requirements in comparison to approaches such as the FA. Indirect methods may also be preferred when it is difficult to obtain buy-in from parents to have an FA conducted due to perceived risk to the client.

One reason to allocate resources toward the improvement of indirect methods over descriptive methods (one of the two direct approaches mentioned above) is that indirect methods are already superior to descriptive methods in terms of validity and efficiency. For example, Hall (2005) found that the results of descriptive assessments matched the results of functional analyses in only one of four cases of problem behavior, whereas the results of indirect assessments (i.e., QABFs) matched the results of functional analyses in three of four cases. Furthermore, descriptive assessments led to the identification of attention as the function in each case. This overestimation of attention functions may be due to the fact that descriptive assessments are minimally useful in distinguishing between attention and escape functions (Lerman & Iwata, 1993). The low correspondence with FAs seems to be consistent across various descriptive methods. Pence et al. (2009) compared the outcomes of three different descriptive analysis methods and found that all but one outcome differed substantially from the FA outcome. Kelley et al. (2011) discussed that along with being prone to identification of false positives (i.e., the conclusion that a particular functional relation exists though in reality, it does not exist), descriptive assessments can be costly and time-consuming which interferes with habilitative services for clients.

A final yet important reason to improve indirect methods is that best practice requires multiple forms of assessment. Kelly et al. (2011) argue that best practice for assessment involves using all categories of FBA (i.e., indirect, descriptive, and experimental assessments). Other researchers also suggest that using multiple forms of assessment to supplement each other is ideal for developing interventions (Koritsas & Iacono, 2013; Nicholson, Konstantinidi, & Furniss, 2006). For example, interviews may be used to gather information to design FA conditions (Iwata, DeLeon, & Roscoe, 2013). Indirect methods may provide anecdotal information that can supplement other techniques. However, as noted, the psychometric soundness of indirect methods should be improved if we will continue to use them frequently. One first step to improvement may involve identifying specific limitations that can be addressed.

Results on the current version of the QABF do not always correspond to results of the FA (Hall, 2008; Healy, Brett, & Leader, 2013; Paclawskyj et al., 2001). Iwata et al. (2013) stated that accurate answers on indirect assessments require recalling many details while completing the checklist, including conditional probabilities of events. The current version of the QABF does not specify a time period for considering details regarding behavioral function. The reference period may therefore be perceived as the child's general lifespan. According to Hanley (2012), functional reinforcers of problem behavior may change over time. This may cause the QABF to be particularly difficult to complete for informants who have known the client for an extended period of time as they may have observed different functional relations over the lifespan. Similarly, Matson and Williams (2014) stated that discerning the maintaining variables may be difficult when the history of challenging behavior is longer because other maintaining variables may be established over time. Recalling events over an indefinite period can make the informant's task difficult and result

in increased biases and errors, especially when considering ongoing, long-term problem behaviors.

Choi and Pak (2004) identified several biases in questionnaires related to health research. Recall bias often occurs in studies in which participants are required to evaluate exposure to variables retrospectively. Through a systematic literature review, Bhandari and Wagner (2006) identified recall timeframe as a factor affecting the accuracy of self-report of health service utilization. The authors noted that recall timeframes longer than 12 months should be avoided and that the optimal timeframe for recall is 6 months or less. Bachman and O'malley (1981) found similar results with the accuracy of self-reported drug use frequency. Though self-reported frequencies were not compared to actual frequencies, the authors found that the frequency reported for a timeframe of one year was three times lower than the frequency reported when a timeframe of one month was referenced. According to Gryczynski et al. (2015), even the way in which a timeframe is phrased in a questionnaire can affect the respondent's perception; the authors found that the terminology "past 12 months" yielded fewer discrepancies than the terminology "past year." To improve the accuracy and validity of indirect assessments such as the QABF, it is important to address biases and consider appropriate timeframes for the type of information being sought.

Methods have been identified to overcome recall bias in indirect assessments. Martin (2006) discussed using reference periods with a definite duration as a strategy to improve temporal accuracy. Althubaiti (2016) determined that a short recall period (i.e., recalling events in close temporal proximity to the administration of the questionnaire) is superior to a long one (i.e., recalling events not in close temporal proximity to the administration of the questionnaire). It was determined that this effect was most prominent when asking participants about events that occurred frequently and routinely.

Other researchers have suggested specific optimal timeframes, though there are varied findings regarding what this value may be. Arnold et al. (2013) found that seven days was optimal for caregiver report of illness, whereas Sudman and Bradburn (1973) found that a 3-month timeframe was sufficiently accurate. According to Kjellsson, Clarke, and Gerdtham (2014), events that are salient require a longer recall period and events that are frequent require a shorter recall period. Additionally, they found that though the probability of recall error increases with longer recall periods, the amount of information provided also increases. Authors have discussed the unfortunate “trade-off” between recall error and information (Clarke, Fiebig, & Gerdtham, 2008; Kjellsson et al., 2014). In the current study, we aimed to avoid this “trade-off” in the QABF by including two timeframes in a modified QABF (QABF-M) in determining whether the inclusion of a timeframe will improve correspondence with the FA. We assessed the validity of the original QABF and the QABF-M by conducting a QABF, QABF-M, and FA for five individuals. We then compared the concordance of outcomes of each QABF version with outcomes obtained from FAs.

Method

Participants and Settings

Participants were five individuals diagnosed with autism or an intellectual ability who attended local behavior analysis clinics or schools in Florida. The age range of participants was 3 to 12 years. Age, sex, ethnicity, and diagnosis of each participant were collected (Table 1). Assessments and FAs were administered in a small room in the participant’s home, clinic, or school.

Target Behaviors

Target behaviors included were inappropriate voice volume, self-injury, dropping to the ground, and motor stereotypy. An experimenter determined which behaviors were to be excluded due to high risk of injury and constraints of the assessment environment.

Operational definitions were developed by the individual conducting the FA (i.e., either the participant's service provider or an experimenter). Descriptions of target behaviors are illustrated in Table 2. Only one target behavior was addressed per participant (i.e., the behavior that the service provider or respondent deemed "most significant"). The QABF, QABF-M, and an FA were completed for each target behavior.

Respondents

The respondent was a biological parent or grandparent who knew the participant for a minimum of three years prior to completing the questionnaire (see Table 1). There was only one respondent per participant. The respondent was able to read, speak, and understand English. None of the respondents had any training background in applied behavior analysis.

Materials

Materials used during the interview included a stopwatch to record timing of administration, writing materials, and two copies of each version of the QABF. One copy was read aloud and scored by the interviewer and the other copy was available for the respondent to read along. Prior to the interview, the interviewer filled in the sections of the assessment related to names of respondent and participant, date, and the target behavior in question. The QABF includes 25 questions and five subscales and is scored on a four-point Likert-type scale. For a more complete description of the original QABF, see Matson and Vollmer (1995). The QABF-M was identical to the original QABF except that in the QABF-M, two specific time periods (i.e., whether the function had been observed in the past 30 days or in the past 3 years) for recalling behavioral function were differentiated (see Appendices A & B). Materials used during the FA included a video camera to record sessions, high- and low-preference tangible items, materials for task demands, a phone, and the applications Countee™ and Insight™.

Administration Procedures

Four graduate students were trained to administer the QABF. The primary author served as an interviewer for Damien due to availability. For all other participants, neither author served as an interviewer in an effort to control for unintentional bias. Training included reading and discussing QABF journal articles with a senior experimenter and reading and discussing an instruction script written by the primary author (see Appendix C). Both the QABF and QABF-M were administered to each respondent. To moderate the risk of sequence effects, the order of administration was counterbalanced across respondents (i.e., three of the respondents (for participants Damien, Will, and Alexa) completed the QABF prior to completing the QABF-M, and two of the respondents (for participants Ryan and Sam) completed the QABF-M prior to completing the QABF). The typical administration time for a QABF is 15 min. Administration times for the QABF and QABF-M were recorded using a stopwatch. For further details on duration recording, see Appendix C. Two brief videos (5-min and 10-min) were shown to the participants as a distractor task between the administration of the assessments (Andrews & Mason, 2019; Wiley, 2012). The content of the videos was unrelated to behavioral functions. Topics covered were an overview of behavior analysis and prompting methods.

Prior to the assessment, the operational definition of the target behavior was confirmed and agreed upon through discussion among the respondent, the participant's service provider, and the experimenters. Target behaviors were operationally defined for each participant (see Table 2). At the beginning of the assessment, the interviewer confirmed the duration the respondent had known the participant as well as the participant's demographic characteristics and read the operational definition of the target behavior aloud to the respondent. The QABF was then administered based on the procedures of Matson and Vollmer (1995) in a direct interview format (i.e., the questions were read exactly as written to the respondent, the respondent produced a verbal response, and the interviewer recorded this

response on the assessment sheet). The QABF-M had two timestamps (i.e., 30-day and 3-year) for each question. The interviewer read each question referring to both timestamps before proceeding to the following question. For example, the interviewer stated, “In the past 30 days, he engages in the behavior to get attention.” Following the respondent’s rating, the interviewer asked, “What about in the past 3 years?” Following the respondent’s rating, the interviewer proceeded to the next question.

If respondents asked questions that were likely to interfere with the validity of the data (e.g., asking whether they should think of a timeframe while completing the original QABF), the interviewer redirected the respondent by saying, “Please answer the questions to the best of your ability.” At the end of the interview, the respondents were thanked for their time and the interviewer exited the room. The interviewer then scored each assessment. The experimental FA was not begun until after the QABFs were administered when logistically possible (i.e., for all participants except Ryan) so that both the interviewer and the respondent remained blind to the actual function of the target behavior. For Ryan, although the FA was conducted before the QABF, the results of the FA were not discussed with the respondent until after the administration of the QABFs. The respondent did not observe or participate in any FA sessions.

Functional Analysis

For all participants except Ryan, the FA was begun immediately following the indirect assessments. However, the information gathered through the QABF was not used to design the FA (e.g., was not used to determine included conditions). Data were collected on the same target behaviors as those assessed in the QABFs. If the participant’s service provider was intending to conduct an FA (as was the case for all participants), the service provider’s FA results were used provided that specific characteristics were met. A summary

of these characteristics is illustrated in Table 3. The procedures for the FAs are outlined below.

Pre-FA Procedures

A preference assessment (e.g., MSWO [DeLeon & Iwata, 1996], PSPA [DeLeon et al., 2001], SSPA [Hagopian, Rush, Lewin, & Long, 2001]) was conducted for each participant.

Functional Analysis Procedures

Measurement and interobserver reliability. Prior to the assessment, the operational definition of the target behavior was established through discussion among the respondent, the participant's service provider, and the experimenters. The operational definitions of target behaviors that were established prior to the indirect assessments were identical to the operational definitions utilized in the FA. Data were collected continuously throughout the session on the phone applications, Countee™ or Insight™. Reliability data were collected by an independent observer for 33% of Damien's FA sessions, and for 33% of Sam's FA sessions. Interobserver reliability was calculated by dividing the number of intervals for which there was an agreement by the total number of intervals (for each 10-s interval) and multiplying by 100. Average interobserver agreement (IOA) across Damien and Sam's FAs were 94.7% and 97.4%, respectively.

FA conditions. A standard multielement design was used in which alone or no interaction, attention, escape, and play conditions were included. Tangible conditions were only included if indicated (i.e., for Damien and Sam). The assessment ceased once a function was identified by the clinical Board Certified Behavior Analyst via visual analysis of the graphed data.

Data Analysis and Scoring

QABF Versus FA Comparison

The QABF outcome was the functional category with the highest score, and the FA outcome was the condition with the highest rate of responding. Comparison of the QABF and FA was scored as either a match, a partial match, or no match.

A match was defined as the FA results being identical to the QABF outcome (i.e., the same functional category and the same number of functional categories are identified).

Functional categories in an FA were attention, tangible, escape, and automatic. Variables in both QABF versions were attention, escape, tangible, non-social, and physical. A match was scored if automatic was the maintaining variable identified through the FA and either non-social, physical, or both was the potential function identified through the QABF. If the informant's QABF responses resulted in a tie for the identified function (i.e., more than one potential function was identified), this was recorded as a partial match if either function matched the FA outcome. The percentage correspondence between the QABF and FA results was then determined. This was done by dividing the number of cases for which the functions identified by the QABF and FA matched by the total number of cases and multiplying by 100.

QABF-M Versus FA Comparison

The correspondence between QABF-M outcomes and FA outcomes was determined following the exact procedure described above. This calculation was performed for both timeframes (i.e., 30-day and 3-year) of the QABF-M.

Results

In Tables 4 and 5, the assessment outcomes as well as percentage of cases for which results of each version of the QABF and the results of FAs matched function can be seen. The FA results for Damien, Sam, and Ryan are illustrated in Figure 3. For Damien, Will, and Ryan, the function identified through the FA was escape. For Alexa, FA results were indicative of an automatic function and for Sam they were indicative of a multiply maintained

(automatic and escape) function. The average percentage match between the FA and QABF-M 3-year was 40%. For the QABF-M 30-day and original QABF, the percentages matched to the FA were 40% and 20%, respectively. The original QABF yielded false positive identification of attention as a function in three of the five cases. For the QABF-M, there were no cases of false positives for an attention function.

There was little differentiation across functional categories, and this was true for both versions of the QABF (see Figures 1 & 2). The function identified by the QABF and QABF-M was often determined by one-question differences in scores. In Table 6, the administration duration for each QABF and QABF-M is reported for each participant. The average increase in administration time of the QABF-M relative to the QABF was 1 min.

Discussion

Results of both QABF-M timeframes had greater percentage correspondence with FA outcomes than did the results of the original QABF. The QABF-M may therefore be considered more valid than the original QABF. One potential explanation for this finding may be that, as with some indirect measures in other fields, distinguishing temporally distal versus proximal events reduces recall bias (Althubaiti, 2016). These findings are consistent with previous research that indirect methods of FBA have low validity when the standard for comparison is an FA (Dufrene et al., 2017; Iwata et al., 2013; May et al., 2014). However, inconsistent with previous literature, the validity of the original QABF in current study is much lower than the validity of the original QABF reported in prior studies. The percentage correspondence of the QABF with FAs in the current study and research by Paclawskyj et al. (2001) were 20% and 56.3%, respectively. As in previous studies on indirect methods of FBA, there was minimal differentiation across functional categories (Iwata et al., 2013).

Consistent with previous literature on closed-ended indirect methods, the existence of an attention function was overestimated in the original QABF (Fryling & Baires, 2016). For

the QABF-M, this phenomenon was not observed. Though the increase in administration time (+1 min) of the QABF-M may be viewed as a limitation, this minimal increase may be considered negligible, especially given the improved validity and potential additional information gained with the QABF-M. In comparison to the total duration of the FA (e.g, 4 h for Damien), the additional minute of the QABF-M is particularly insignificant.

From the QABF-M, experimenters obtained information regarding perceived rate of change or persistence of a function. Wunderlich et al. (2019) found that for six cases of vocal stereotypy maintained by automatic reinforcement, function remained stable over a 1-year period or longer. In the current study, Alexa's data provide preliminary evidence that this stability of function may generalize to other topographies (such as motor stereotypy) of automatically maintained target behaviors. For Alexa, a non-social (i.e., automatic) function had a perceived persistence across the 30-day and 3-year QABF-M timeframes. It may be inferred that this function should be the first to be addressed in treatment. A longer history of reinforcement may imply an increased difficulty in extinguishing the behavior (Lerman & Vorndran, 2002).

Different scores on QABF-M timeframes (i.e., shifts in potential function over time) cued researchers to obtain more information to form hypotheses regarding potential environmental causes of behavioral change. For several participants, anecdotal information volunteered by respondents facilitated determination of potential stimulus changes (e.g., new teacher or new medication) correlated with changes in function. This information could have applied implications for design of interventions. For example, for Will, the respondent reported that during QABF-M administration, they took into account that the participant lost their vision within the year prior to the administration of the questionnaires. This was evident in the data. The scores for a tangible function on the QABF-M 30-day and QABF-M 3-year were 1 and 9, respectively. The score for a tangible function on the QABF was 4.

Presumably, the lower score on the 30-day timestamp is attributable to the fact that the participant can no longer visually access tangible stimuli in the environment. Visible tangible stimuli may have previously served as discriminative stimuli for access contingent on self-injurious behavior. In contrast, for Ryan, though a new medication was introduced approximately three weeks prior to the assessments, the potential functions identified for both QABF timeframes were identical.

For Sam, escape and tangible functions were identified only on the 30-day timeframe of the QABF-M. In informal conversation, the respondent mentioned that the participant only recently started to speak. Thus, it may be hypothesized that increased frequency of vocalizations provided increased opportunities to contact an increasing variety of contingencies. Vocalizations therefore may have been shaped, acquiring novel functions (e.g., tangible) and topographies (e.g., increased volume). These data on shifts in function (particularly with regard to social functions) are consistent with previous literature in which it has been stated that function can change over time (Hanley, 2012). Though it is currently unknown how often behaviors acquire novel functions, the QABF-M may provide some preliminary insight into this phenomenon.

The results provided by the QABF-M may have other methodological implications for related questionnaires or surveys that use similar scales. Introducing the timeframe and accounting for recall bias may improve other indirect assessments. Future research could therefore be aimed at determining whether findings generalize to other FBAs that have been demonstrated to have low validity and researchers may consider a more in-depth group comparison of the modified QABF.

Researchers may also assess other modifications that could improve indirect assessments, which is important as these are more commonly used than functional analyses (Oliver et al., 2015). Iwata et al. (2013) suggested that the only way to improve the validity of

indirect assessments may be by having an expert behavior analyst serve as the respondent. However, caregivers typically know participants for longer durations. None of the respondents in the current study had training regarding functions of behavior prior to administration of the questionnaires. To combat the trade-off between expertise and familiarity, one potential modification could be the inclusion of a brief training on the functions of behavior prior to indirect FBAs so that respondents learn to attend to and consider the relevant variables.

Results of the current study should be interpreted with caution due to several limitations. Some of these limitations can be attributed to time constraints. Future research should extend the current investigation by expanding the data set to a larger variety of target behaviors (e.g., aggression, elopement, noncompliance, property destruction, self-injury, and stereotypy). Another limitation is the comparison of questionnaire results only to FA results and not to treatment outcomes. This is a limitation because though FAs are the gold standard of FBA, FA results do not always lead to successful treatment outcomes (Iwata et al., 1994). A comparison to treatment results would have been a superior measure of validity. In future research, there should be continued monitoring of participants to determine whether intervention based on the QABF-M outcome resulted in socially significant improvements in behavior.

Another possible methodological limitation is the reliance on service providers' FA results. Though the collection of IOA data and predetermined procedural standards for FAs included in the study may moderate this issue, IOA data was not collected for all FAs. Further, when tangible conditions were not included in FAs (i.e., for Will, Ryan, and Alexa), there was no opportunity to get a full match with the QABF or QABF-M; both QABF versions include tangible subscales. One experimenter error regarding the operational definition for Damien could have reduced methodological rigor; for their FA, the operational

definition was for loud vocalizations only, whereas for the QABF versions, the operational definition included both loud and quiet vocalizations. A final methodological limitation is the lack of formal social validity data. Though subjective, it may be helpful to know whether the timeframe affected ratings of clarity of the questionnaire.

One potential limitation of the QABF-M may be that listing the timeframes in succession have autocorrelation effects (Parsonson & Baer, 1992). Responding on one interval may influence responding on the other interval. However, in this case, autocorrelation effects may have the advantage of cuing the respondent to differentiate temporally proximal versus distal events. A final limitation of the QABF-M is the possibility that an informant may not know the client for the three years prior to the questionnaire administration. However, this modified version simply allowed for collection of additional information while preserving the original information, so the limitation did not affect the ability to determine potential function. Though all respondents in the current study knew the participants for their entire lives (i.e., each was a biological parent who lived with the participant from birth), it would be interesting to determine whether the current findings would generalize to other informants (e.g., teachers or direct service providers).

It is important to emphasize that indirect methods of FBA should not be used as a substitute for FAs (Iwata et al., 2013). However, the data indicate that indirect methods are predominantly used in practice for design of interventions (Roscoe et al., 2015). The current study provides data from which it can be suggested that the addition of a reference timeframe may improve validity of the QABF and make the recollection of past events slightly more systematic. Continued efforts to systematize these scales could have theoretical and applied benefits.

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Table 1

Participants' Demographic Characteristics and Respondents' Status

Participant	Sex	Ethnicity	Age in Years	Diagnosis	Status of Respondent
Damien	M	African American	7	ASD	Biological Mother
Sam	M	Caucasian	8	ASD	Biological Grandmother
Will	M	African American	12	ASD	Biological Mother
Ryan	M	Caucasian	3	ASD	Biological Father
Alexa	F	Caucasian	6	ASD	Biological Mother

Note. ASD= Autism Spectrum Disorder; M= male; F= female.

Table 2

Target Behaviors and Operational Definitions

Participant	Target Behavior	Operational Definition
Damien	Inappropriate voice volume	rate measure: when communicating, child speaks at inappropriate volume e.g., speaking too loudly (can be heard by someone not in conversation or directly next to him) or too quietly (not audible to someone next to him)
Sam	Inappropriate voice volume	rate measure: when communicating, child speaks at inappropriate volume e.g., speaking too loudly (can be heard by someone not in conversation or directly next to him) or too quietly (not audible to someone next to him)
Will	Self-injury	rate measure: hand-to-head hitting or head hitting on the floor
Ryan	Dropping to the ground	rate measure: falling from a standing or seated position to laying on the floor (not including accidental falls)
Alexa	Motor stereotypy	duration of grasping items (e.g., toy or chewy) with one hand and striking objects (e.g., table, PECs book) from a distance of at least 1 in. or more OR holding one hand stationary and smacking it with the other hand more than one time (0-s onset/ offset)

Table 3

Summary of Inclusion Criteria of FA Characteristics

Characteristic	Description
Safety/ Medical	Appropriate considerations regarding medical clearance, termination criteria, protective equipment, crisis management procedures
Overseen By	BCBA or BCBA-D who has previously conducted an FA
Session Duration	5 OR 10 min
FA Type	Standard
FA Design	Multi-element
Conditions	Attention, escape, alone/ no interaction, tangible (only if indicated), play
Sequence of Conditions	alone → attention → tangible (only if indicated) → play → escape
Design Considerations Based on QABF	QABF results not used to design FA

Table 4

Summary of Matches Between QABF and FA and QABF-M and FA

Participant	FA Outcome	QABF Outcome	QABF-M 30-day Outcome	QABF-M 3-year Outcome
Damien	Escape	Attention	Escape	Escape
Sam	Automatic, Escape	*Escape, Non-social, Tangible	*Escape, Non-social, Tangible	*Non-social
Will	Escape	Attention	Physical	Non-social
Ryan	Escape	Escape	*Escape, Tangible	*Escape, Tangible
Alexa	Automatic	*Attention, Non-social	Non-social	Non-social

Note. Bold text indicates a match and single asterisks indicate a partial match.

Table 5

Summary of Percentage Correspondence Between QABF and FA and QABF-M and FA

FA Outcome	# Cases (Total)	# Cases (Matches to QABF)	# Cases (Matches to QABF-M 30-day)	# Cases (Matches to QABF-M 3-year)	% Match to QABF	% Match to QABF-M 30-day	% Match to QABF-M 3-year
Attention	0	N/A	N/A	N/A	N/A	N/A	N/A
Tangible	0	N/A	N/A	N/A	N/A	N/A	N/A
Escape	3	1	1	1	33.3	33.3	33.3
Automatic	1	0	1	1	0	100	100
Multiply maintained	1	0	0	0	0	0	0
Total	5	1	2	2	20	40	40

Note. N/A= Not applicable.

Table 6

Administration Durations of QABF and QABF-M

Participant	Administration Time (min) of QABF	Administration Time (min) of QABF-M
Damien	4.03	4.90
Sam	3.57	4.67
Will	3.85	5.78
Ryan	3.38	4.65
Alexa	3.77	4.55

Figure 1. QABF and QABF-M Scores by Functional Category for Damien, Sam, and Will.

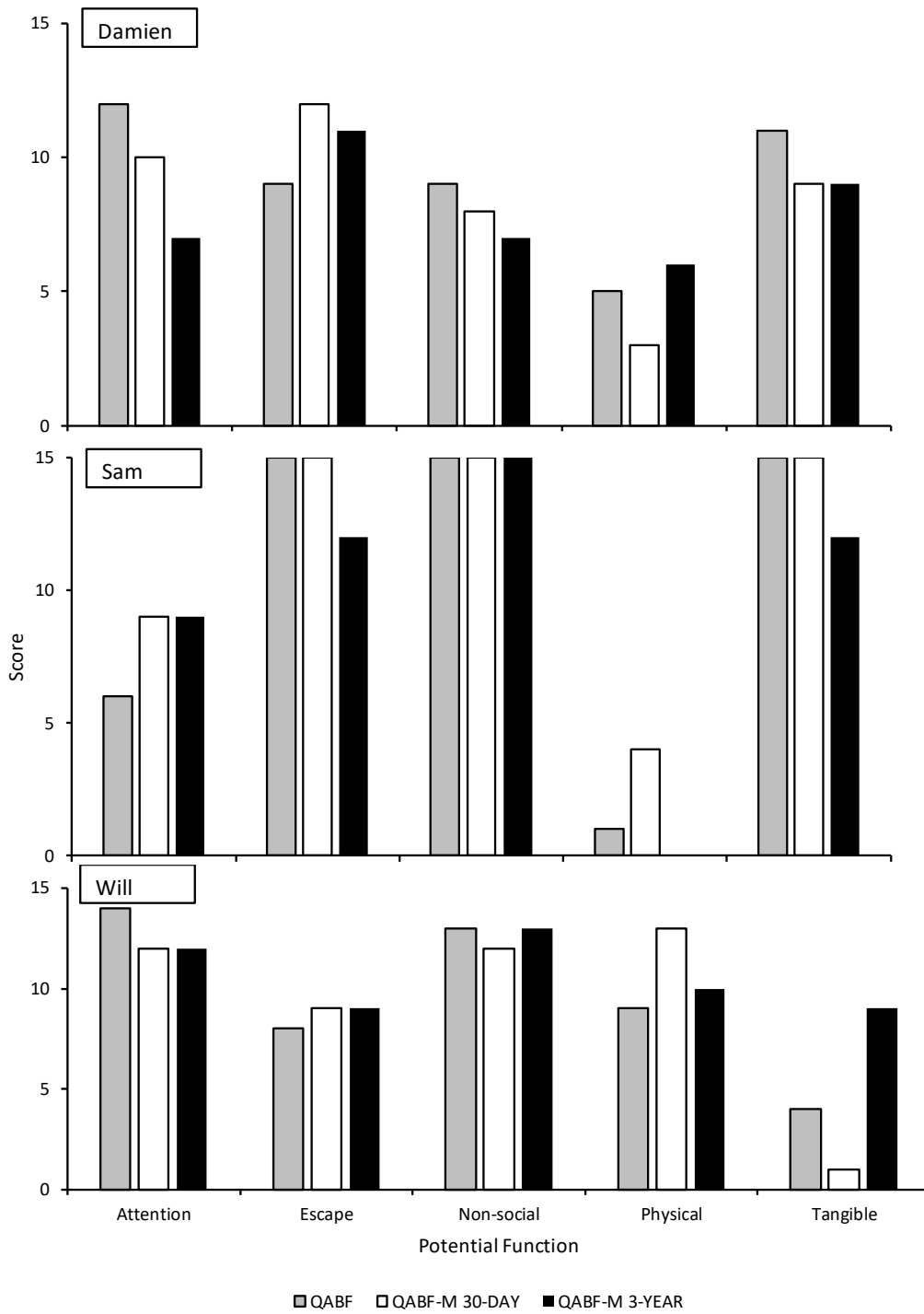


Figure 2. QABF and QABF-M Scores by Functional Category for Ryan and Alexa.

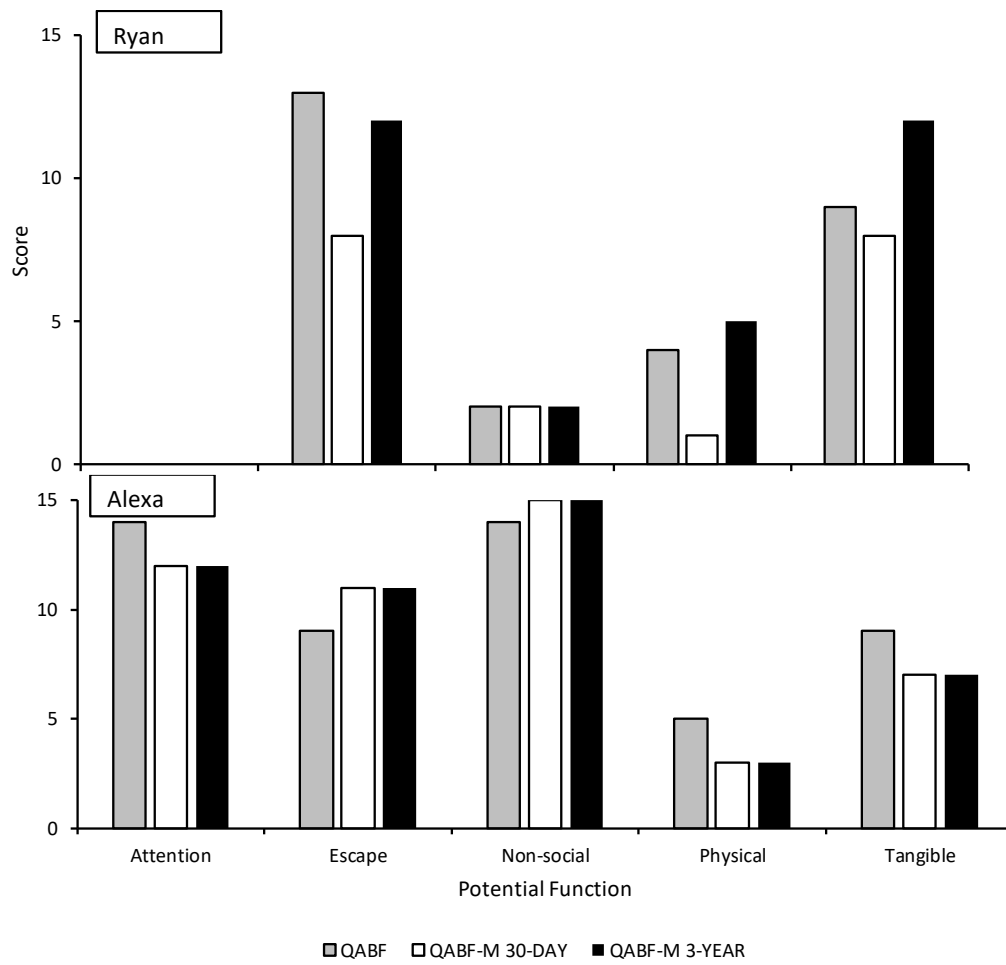
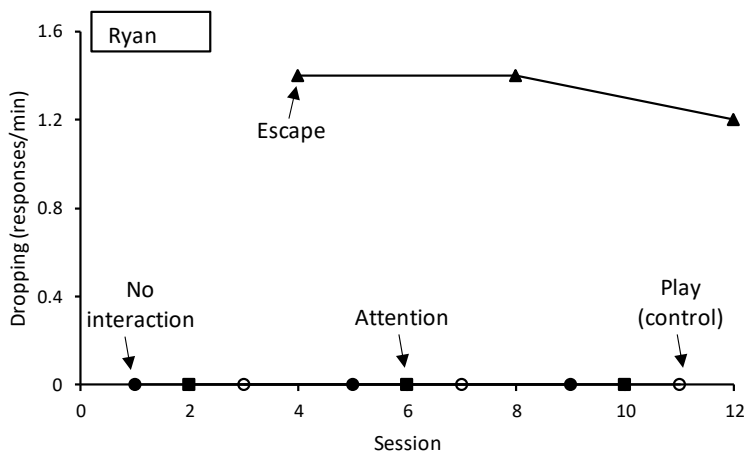
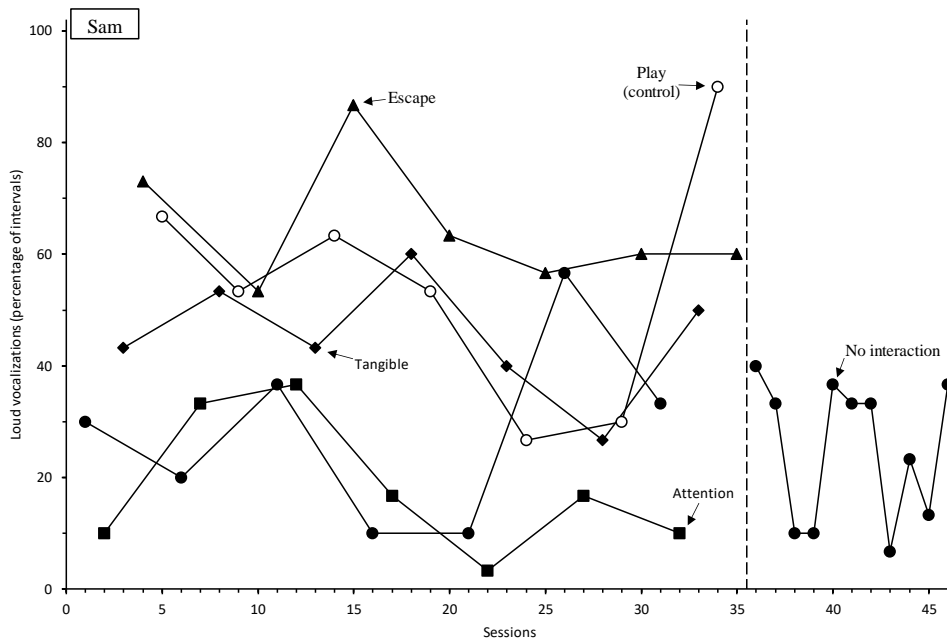
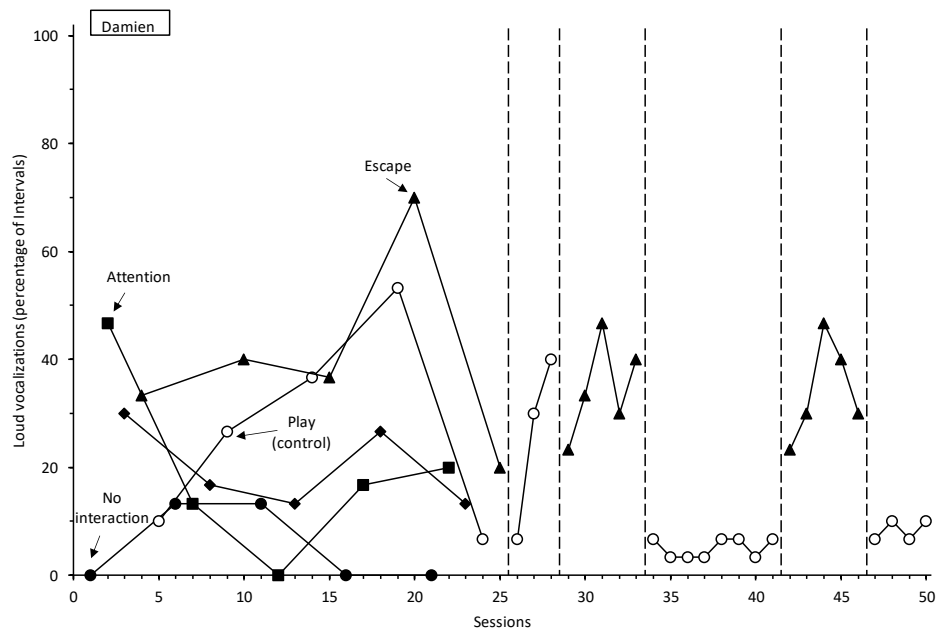


Figure 3. FA Results for Damien, Sam, and Ryan.



APPENDIX A: ORIGINAL QABF

Student's Name _____ Date: _____

Behavior: _____ Respondent: _____

QUESTIONS ABOUT BEHAVIORAL FUNCTION (QABF)

Rate how often the student demonstrates the behaviors in situations where they might occur. Be sure to rate how often each behavior occurs, not what you think a good answer would be.

X = Doesn't apply 0 = Never 1 = Rarely 2 = Some 3 = Often

Score	Number	Behavior			
	1.	Engages in the behavior to get attention.			
	2.	Engages in the behavior to escape work or learning situations.			
	3.	Engages in the behavior as a form of "self-stimulation".			
	4.	Engages in the behavior because he/she is in pain.			
	5.	Engages in the behavior to get access to items such as preferred toys, food, or beverages.			
	6.	Engages in the behavior because he/she likes to be reprimanded.			
	7.	Engages in the behavior when asked to do something (get dressed, brush teeth, work, etc.			
	8.	Engages in the behavior even if he/she thinks no one is in the room.			
	9.	Engages in the behavior more frequently when he/she is ill.			
	10.	Engages in the behavior when you take something away from him/her.			
	11.	Engages in the behavior to draw attention to himself/herself.			
	12.	Engages in the behavior when he/she does not want to do something.			
	13.	Engages in the behavior because there is nothing else to do.			
	14.	Engages in the behavior when there is something bothering him/her physically.			
	15.	Engages in the behavior when you have something that he/she wants.			
	16.	Engages in the behavior to try to get a reaction from you.			
	17.	Engages in the behavior to try to get people to leave him/her alone.			
	18.	Engages in the behavior in a highly repetitive manner, ignoring his/her surroundings.			
	19.	Engages in the behavior because he/she is physically uncomfortable.			
	20.	Engages in the behavior when a peer has something that he/she wants.			
	21.	Does he/she seem to be saying, "come see me" or "look at me" when engaging in the behavior?			
	22.	Does he/she seem to be saying, "leave me alone" or "stop asking me to do this" when engaging in the behavior?			
	23.	Does he/she seem to enjoy the behavior, even if no one is around?			
	24.	Does the behavior seem to indicate to you that he/she is not feeling well?			
	25.	Does he/she seem to be saying, "give me that (toy, food, item)" when engaging in the behavior?			
	Attention	Escape	Non-social	Physical	Tangible
	1. Attention <input type="checkbox"/>	2. Escape <input type="checkbox"/>	3. Self-stim <input type="checkbox"/>	4. In pain <input type="checkbox"/>	5. Access to items <input type="checkbox"/>
	6. Reprimand <input type="checkbox"/>	7. Do something <input type="checkbox"/>	8. Thinks alone <input type="checkbox"/>	9. When ill <input type="checkbox"/>	10. Takes away <input type="checkbox"/>
	11. Draws <input type="checkbox"/>	12. Not do <input type="checkbox"/>	13. Nothing to do <input type="checkbox"/>	14. Physical problem <input type="checkbox"/>	15. You have <input type="checkbox"/>
	16. Reaction <input type="checkbox"/>	17. Alone <input type="checkbox"/>	18. Repetitive <input type="checkbox"/>	19. Uncomfortable <input type="checkbox"/>	20. Peer has <input type="checkbox"/>
	21. "Come see" <input type="checkbox"/>	22. "Leave alone" <input type="checkbox"/>	23. Enjoy by self <input type="checkbox"/>	24. Not feeling well <input type="checkbox"/>	25. "Give me that" <input type="checkbox"/>
	Total	Total	Total	Total	Total

APPENDIX B: MODIFIED QABF

Student's Name: _____

Date: _____

Behavior: _____

Respondent: _____

MODIFIED QUESTIONS ABOUT BEHAVIORAL FUNCTION (QABF-M)

Rate how often the student demonstrates the behaviors in situations where they might occur. Be sure to rate how often each behavior occurs, not what you think a good answer would be.

X= Doesn't apply 0= Never 1= Rarely 2= Some 3= Often

Score for In the Past 30 Days	Score for In the Past 3 Years	Number	Behavior								
		1.	Engages in the behavior to get attention.								
		2.	Engages in the behavior to escape work or learning situations.								
		3.	Engages in the behavior as a form of "self-stimulation".								
		4.	Engages in the behavior because he/she is in pain.								
		5.	Engages in the behavior to get access to items such as preferred toys, food, or beverages.								
		6.	Engages in the behavior because he/she likes to be reprimanded.								
		7.	Engages in the behavior when asked to do something (get dressed, brush teeth, work, etc).								
		8.	Engages in the behavior even if he or she thinks no one is in the room.								
		9.	Engages in the behavior more frequently when he/she is ill.								
		10.	Engages in the behavior when you take something away from him/her.								
		11.	Engages in the behavior to draw attention to himself/herself.								
		12.	Engages in the behavior when he/she does not want to do something.								
		13.	Engages in the behavior because there is nothing else to do.								
		14.	Engages in the behavior when there is something bothering him/her physically.								
		15.	Engages in the behavior when you have something that he/she wants.								
		16.	Engages in the behavior to try to get a reaction from you.								
		17.	Engages in the behavior to try to get people to leave him/her alone.								
		18.	Engages in the behavior in a highly repetitive manner, ignoring his/her surroundings.								
		19.	Engages in the behavior because he/she is physically uncomfortable.								
		20.	Engages in the behavior when a peer has something that he/she wants.								
		21.	Does he/she seem to be saying, "come see me" or "look at me" when engaging in the behavior?								
		22.	Does he/she seem to be saying, "leave me alone" or "stop asking me to do this" when engaging in the behavior?								
		23.	Does he/she seem to enjoy the behavior, even if no one is around?								
		24.	Does the behavior seem to indicate to you that he/she is not feeling well?								
		25.	Does he/she seem to be saying, "give me that (toy, food, item)" when engaging in the behavior?								
		Attention		Escape		Non-social		Physical		Tangible	
1. Attention		2. Escape		3. Self-stim		4. In pain		5. Access to Items			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year
6. Reprimand		7. Do something		8. Thinks alone		9. When ill		10. Takes away			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year
11. Draws		12. Not do		13. Nothing to do		14. Physical problem		15. You have			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year
16. Reaction		17. Alone		18. Repetitive		19. Uncomfortable		20. Peer has			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year
21. "Come see me"		22. "Leave alone"		23. Enjoy by self		24. Not feeling well		25. "Give me that"			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year	30-day	3-year
Total		Total		Total		Total		Total			
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

APPENDIX C: INDIRECT ASSESSMENT ADMINISTRATION INSTRUCTIONS

QABF Validity Protocol and Instruction Script**QABF AND QABF-M ADMINISTRATION****Materials**

Door sign

Phone for timer

Laptop for video

Folder and plastic sheets for materials

On researcher's clipboard	On respondent's clipboard
Instruction script	
Participant record (which includes which QABF variant was delivered first etc)	
Copy of consent form*	Consent form to be signed
	Demographic survey
Pen	Pen
Whichever QABF is being administered first (1 copy for researcher; whichever QABF is being administered second (2 copies- 1 for researcher, 1 to give respondent)	Whichever QABF is being delivered first (1 copy for respondent)

*means that it is a copy for respondent to leave with after session

Summary of materials

- 1) *Door sign*
- 2) *Instruction script*
- 3) *Participation record (which includes which QABF variant was delivered first etc)*
- 4) *Consent form (2- 1 for researcher's record, 1 for respondent to keep)*
- 5) *Demographic survey*
- 6) *QABF (2 copies- 1 for researcher, 1 for respondent)*
- 7) *QABF-M (2 copies- 1 for researcher, 1 for respondent)*
- 8) *Clipboard (2- 1 for researcher, 1 for respondent)*
- 9) *Pen (2- 1 for researcher, 1 for respondent)*
- 10) *Phone for timer*
- 11) *Laptop for video*
- 12) *Folder and plastic sheets for materials of QABF and FA*

Participant Should Bring:

No requirements

Target Response

Individually defined

Sessions**Before the date of session**

1. Add the target behavior and definition to this form.
2. Print and gather all relevant materials.
3. Send a confirmation email to Kara.

4. Send a confirmation email AND phone call to the site (1 week prior, 1 day prior).
5. Send a confirmation email AND phone call to the respondent (1 week prior, 1 day prior).

Before the participant arrives

1. Set up phone timer. Put up door sign. Set up laptop with distractor videos
<https://www.youtube.com/watch?v=2EquXRtHf5Q&t=176s> 5 min
<https://www.youtube.com/watch?v=TDijJjKHMVQ&t=227s> 10 min of the 15 min
2. Refer to Participation Record to determine which QABF to put on respondent's clipboard.
3. Put appropriate materials on each clipboard (Refer to Materials table above).
4. Fill out all 4 forms with student name, respondent, behavior, date.
5. Write down operational definition of target response on researcher copies of both QABF variations.
6. Fill out participation record.

When the participant arrives

1. Greet the participant
 - a) "Hi! Nice to meet you. I'm __. Thank you for taking the time to come here to complete some questions."
 - b) Seat participant and self.
2. Informed consent
 - a) Give participant clipboard and pen with informed consent.
 - b) "This first sheet is an informed consent form. We want to make sure that you are comfortable with participating, and that you understand that you can leave at any time. During the study, I'm just going to ask you a series of questions- there's 25 on one form, and 25 on the other form. So one questionnaire, then a video, then another questionnaire. It should take approximately 30 mins of your time."
 - c) "Please read the description of the study, and ask me any questions. Sign the bottom if you still wish to participate. A part of this form is requesting permission to video tape sessions with your child as a record of your child's responses for scoring data. You can agree to participate in the study, but refuse to have your child's sessions recorded." Clarify that FA might be another day.
 - d) "Thank you."
 - e) "I have a copy of the informed consent forms for you to take with you after today's sessions. It contains contact information for the primary researcher, the researcher overseeing the study, and the Institutional Review Board should you want to contact later for questions. Results will be provided after data from the questionnaires and functional analysis are analysed. [Site] will provide the results to you."
3. Demographic survey
 - a) "Please fill out this survey."
4. Instructions to participant
 - a) "This study will involve one questionnaire with 25 questions, followed by 15-mins of video, followed by another questionnaire with 25 questions. I will read the questions and will be recording your verbal responses. You can read along with a copy provided if you wish. You do not need to write anything."
 - b) "Because this is research for a thesis, experimental control requires that we ask the questions exactly as they are typed in the forms. If you would like, clarification can be provided after administration of both forms before you leave, and any specific questions about the forms can be answered at that point. For any

requests for clarification during the interview, I will have to respond with- ‘Please answer the questions to the best of your ability.’”

c) Do you have any questions before we begin?

During active session time

1. Start timer (out of sight from respondent) (to record how long it takes from beginning to end of questionnaire)
2. State target behavior
 - “you have identified [*insert here, prior to session; e.g., hand flapping*] as the target behavior.
3. Define target behavior
 - “the behavior we will refer to in the questionnaire is defined as [*insert here, prior to session; e.g., rapid movement of the hands back and forth at least 2 times in front the individual, with or without objects*].
4. Give participant a copy of QABF/ QABF-M: whichever being delivered first based on Participation Record (*do not give it to them before I explain instructions or they will start reading rather than listening*)
5. Administer (QABF)
 - a) “Rate how often the student demonstrates the behaviors in situations where they might occur. Be sure to rate how often each behavior occurs, not what you think a good answer would be.”
 - b) If the participant asks clarifying questions during administration
 - “Please answer the questions to the best of your ability.”
6. Stop timer
7. “Thank you for your responses.”
8. Video
 - “Please watch these videos (one is 5-min, then 10 mins of a 15-min video) prior to answering the next questionnaire.”
9. Replace first QABF with second QABF on respondent’s clipboard.
10. Start timer (out of sight from respondent) (to record how long it takes from beginning to end of questionnaire)
11. Administer (*QABF-M*)
 - a) - “The behavior is [*e.g., hand flapping; defined as rapid movement of the hands back and forth at least 2 times in front the individual, with or without objects*].”
 - “Rate how often the student demonstrates the behaviors in situations where they might occur. Be sure to rate how often each behavior occurs, not what you think a good answer would be.” “Now on this form, you’ll be considering two time periods for the same behavior: past 30 days vs past 3 years.”
 - “In the past 30 days, he engages in the behavior to get attention. What about in the past 3 years?”
 - “In the past 30 days, he engages in the behavior to escape learning or work. In the past 3 years?”
 - If the participant asks clarifying questions during administration
“Please answer the questions to the best of your ability.”
12. Stop timer
13. When there are 10 minutes left in the appointment:
 - a) Thank the participant and end the appointment
 - “Thank u so much. Questionnaires have been found to be less accurate than actual behavioral tests. Clinically, we can use this information to help determine why your child engages in the behavior. With regards to research, we can now we can use this information to attempt to improve the validity of this assessment by

evaluating whether the one with the timeline aligns better with the functional analysis that will be done on_.”

- b) Give the participant a copy of the consent form
- c) “Remember to contact us if you have any questions.”
- d) “Remember your results will be provided after data from the questionnaires and functional analysis are analysed. [Person] will provide the results to you via [meeting/ email/ all].”
- e) “Thanks again I will send confirmation email for scheduling the functional analysis.”

After the participant leaves

- 1. Organize folder
- 2. Edit the Participant Record/ Session Log

After QABF and FA

- 1. Provide results