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ORIGINAL PAPER

A Comparison of Functional Behavior Assessment Methodologies with Young Children: Descriptive Methods and Functional Analysis

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Abstract The use of functional behavior assessment (FBA) to guide the development of behavior intervention plans continues to increase since they were first mandated in IDEA (Individuals with Disabilities Education Act Amendments of 1997, 20 U.S.C. Section 1400 et seq, 1997). A variety of indirect and direct instruments have been developed to facilitate this process. Although many researchers believe that a full functional analysis is necessary to identify the function of a behavior, more rapid and efficient FBA procedures are more commonly used. This investigation examined the correspondence between indirect and direct FBA procedures. Specifically, the results of three descriptive assessments and a functional analysis for four young children at risk for emotional and behavioral disorders were compared. Separation of all descriptive and experimental results was maintained and the assessment order was counterbalanced. Results of the descriptive assessments had low consistency with each other, and the results of two indirect FBA assessments (the Functional Assessment Interview and Motivation Assessment Scale) had low agreement with the results of functional analyses. On the other hand, the direct assessment procedure (ABC assessment) agreed with the results of functional analyses for all participants. These results support the use of direct

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observations and indicate that indirect measures should be used with caution as stand-alone assessments of the function of challenging behaviors.

Keywords Functional behavior assessment · Descriptive assessments · Functional analysis · Young children · Emotional and behavioral disorders

The use of functional behavior assessment (FBA) procedures continues to increase as a result of federal mandates (IDEA 2004) and widespread school reforms like Positive Behavioral Interventions and Supports (PBIS; http://www.pbis.org). Despite its prevalence, little research has been conducted that validates the effectiveness of the variety of functional behavior assessment processes currently used for children with emotional and behavioral disorders (Sasso et al. 2001). Even less research is available that evaluates FBA procedures for young children who demonstrate challenging behaviors (Chandler et al. 1999; Schill et al. 1998; VanDerHeyden et al. 2001). As Yarbrough and Carr (2000) observe, "Given the different options available for conducting a functional assessment, the question regarding which approach practitioners ought to use to assess problem behavior is paramount" (p. 132). The increasing prevalence of challenging behavior reported in early childhood settings (Blair et al. 1999; Webster-Stratton 1997) heightens the importance of this quest. In order for the FBA process to be effective and useful, educators need to be equipped with strategies that determine the function of a challenging behavior reliably and accurately. Without an accurate method for determining the function of problem behavior, the interventions based on this process are likely to be ineffective.

In most educational settings, information for FBAs is gathered using a combination of both indirect and direct descriptive assessments (Johnston and O'Neill 2001). Indirect measures are those that do not require direct observation of the student. These include interviews with parents, teachers, and children via the use of questionnaires, rating scales and record reviews. In contrast, direct measures typically consist of scatter plots (Touchette et al. 1985) and observation worksheets that reflect a running narrative of antecedents, behaviors and consequences (ABCs) (Bijou et al. 1968) in natural settings.

An additional component of a functional behavior assessment used to determine the function of a challenging behavior is conducting a functional analysis (Sasso et al. 2001). Functional analysis involves the manipulation of variables to systematically identify antecedents and consequences as they relate to the function of a behavior (Sugai et al. 1999). These variables typically include access to teacher attention, access to tangible items, escape from a non-preferred task, an alone or ignore condition and a free play condition that serves as a control. These variables may be described as contingencies of reinforcement that are designed to mimic those present in the natural environment but are delivered on a rich or near continuous schedule. Following the manipulation of each of these variables, the one associated with the highest level of behavior is identified as the function of behavior. The difference between a functional analysis and the aforementioned direct and indirect descriptive methods is that descriptive methods establish a

correlation between the behavior and antecedent or consequent variables, whereas a functional analysis identifies causal relationships (Lerman and Iwata 1993). Therefore, while substantially more complex and time-consuming, a functional analysis is regarded as more valid for identifying behavior function (Sasso et al. 2001). However, the use of a standard protocol in which any of these procedures (either the indirect or direct descriptive methods or a functional analysis) is used singly or in combination has not been universally accepted either by the research literature or federal mandates (Scott et al. 2004).

A strategy for evaluating the descriptive methods of functional assessment and functional analyses is to use multiple methods of assessment (direct, indirect and experimental) for the same student's target behavior and to then compare the results across measures. Although researchers have provided evidence of agreement among indirect assessment measures as well as with results of function analyses (Arndorfer et al. 1994; Calloway and Simpson 1998; Cunningham and O'Neill 2000; Ellingson et al. 2000; Murdock et al. 2005; Newcomer and Lewis 2004; Sasso et al. 1992; Yarbrough and Carr 2000), evidence has also been provided that the consistency and technical adequacy of indirect assessments should be questioned (Barton-Arwood et al. 2003; Conroy et al. 1996). Those studies which supported the consistency of indirect assessment methods should also be interpreted with caution due to several factors. First, in each of the studies that evaluated different methods for determining the function of challenging behavior, the results of the descriptive assessments informed one another and were not conducted independently, thereby rendering the objective, direct comparison of separate results impossible. A second factor, related to the assimilation of assessment methods, is that the order in which the FBA procedures were administered was not counterbalanced. Third, functional analysis procedures were compromised due to being directly informed by descriptive assessments. In studies that directly compared the results of different assessment methods, only Cunningham and O'Neill (2000), and Sasso et al. (1992) conducted functional analysis procedures with five analog conditions: free play, tangible, escape, attention, and alone. In the remaining studies, only the analog conditions that matched the results of the descriptive assessments were tested. This difference is subtle yet critical. By only evaluating those hypothetical functions identified through descriptive assessment, it is possible to confirm the results as *a* function but not *the* function because all potential functions were not evaluated.

A final factor which impacts the comparison of results of different types of functional assessment procedures is the issue of multiple functions. Different functions may serve the same behavior in the same setting as a result of differing establishing operations. Furthermore, the function of the same behavior may change in different settings (Umbreit et al. 2007). Many behaviors may simply be maintained by more than one function at the same time. Hanley et al. (2003) estimated that 15% of functional analyses revealed multiple functions of challenging behavior. These factors are indicative of the complexity involved with conducting accurate functional behavior assessments.

As the need for effective function-based interventions increases, it is essential to research the patterns of agreements and disagreements between methods of assessment, particularly in terms of the primary function that is identified. The

primary function is defined as the one function that is identified above all others. Because multi-component interventions can be arduous and few studies have documented the effectiveness of such interventions absent pronounced researcher involvement (Sasso et al. 2001), the need to determine a primary function around which an intervention can be based is imperative. Further, in order to provide clear comparisons of function determined by different methods of assessment, identifying a primary function has been the most prevalent methodology for studies that have compared functional assessment instruments and methods. Thus, while multiple functions may exist, particularly in different contexts, determining the primary function by means of different methodologies is an important area of research.

The fundamental need to meet the demand for effective FBAs leads to an important area of research. The purpose of this study is to conduct a series of indirect and direct descriptive assessments to evaluate agreement between the primary functions determined by these assessments to each other and to the outcomes of a functional analysis. An additional consideration is the need to approach the FBA process in ways that are more similar to school-based processes; this includes allowing the teachers to dictate how the challenging behaviors would be defined and having teachers serve as the 'therapists' during functional analysis conditions. In addition, the descriptive assessments are completed in a manner similar to the way that school personnel would complete them. Thus, for all assessments, the individual conducting the assessment are asked to determine the primary function of student problem behavior based upon their interpretation of their data. The rationale for selecting a primary function of student problem behavior as opposed to allowing for the identification of multiple functions is twofold. First, comparing primary function determined by each assessment method allows for a clear demonstration of agreements and disagreements across measures. Second, as noted by Sasso et al. (2001), teachers continue to struggle with effective implementation of FBA-based interventions, especially in concert with their countless other duties and responsibilities. Thus, it is logical that generating one primary function and a limited number of sound, function-based interventions targeting a challenging behavior is a way to allow teachers to implement this technology more effectively.

The purpose of this study was to extend the current body of literature examining indirect assessment measures frequently employed in the indirect assessment phases of FBAs methods. In contrast to previous studies (e.g., Arndorfer et al. 1994; Calloway and Simpson 1998; Ellingson et al. 2000; Murdock et al. 2005; Newcomer and Lewis 2004;Yarbrough and Carr 2000), the functional analysis procedures employed in this study were conducted independent of the descriptive assessment results, thus allowing for an unbiased comparison of descriptive and experimental methodologies. This study also differs in that results of both direct and indirect descriptive assessments were recorded independently, and separation of the results was maintained until the conclusion of the study. Finally, this study is unique in that the order of administration of the descriptive assessments was counterbalanced across participants to maintain independence.

Method

Participants and Setting

Students included four males ranging from 4–6 years of age who were identified by their teachers as engaging in challenging behaviors that were interfering with their learning and warranted an FBA. The teacher report form of the *Child Behavior Checklist* (CBCL-TRF) (Achenbach and Rescorla 2000; Achenbach and Rescorla 2001) for 1.5–5 year olds or 6–12 year olds indicated that all four participants scored within the at-risk or clinical range for the Total Problem Scale during participant screening. All students attended a preschool or school in a suburban area of the Southeast United States. The challenging behaviors were operationally defined for each child by the primary teacher. It was necessary to ensure that the challenging behavior was evaluated in the same context across methodologies. Thus, participants' challenging behavior was evaluated during free play settings across assessment methodologies.

Ramon was a 4 year-old Hispanic male who attended a university-sponsored daycare. His primary teacher had 30 years of experience and had known Ramon for 7 months. Ramon's challenging behaviors were defined by the teacher as raising his voice above the classroom volume level, asking more than three questions in a 10-s interval and using profanity or "bathroom talk." Anthony was a 5 year-old African-American male who attended a university sponsored daycare. His primary teacher had 4 years of experience and had known Anthony for 6 months. Anthony's challenging behaviors were defined by his teacher as crying, yelling "Mom" or "Mama", raising his voice above the classroom volume level and being more than 6 feet away from his assigned area. Jimmy was a 5 year-old African-American male who attended a university-sponsored daycare. His primary teacher had 25 years of experience and had known Jimmy for 7 months. Jimmy's challenging behaviors were defined by the teacher as screaming, teasing, saying 'No', crying or whining. Greg was a 6 year-old African-American male who attended kindergarten in a self-contained special education classroom in a local public school. Greg's teacher had 1 year of experience and had known Greg for 7 months. Greg's challenging behaviors were defined by his teacher as tapping his pencil, whistling and raising his voice above the classroom volume level.

Materials

The indirect descriptive methods were selected because they represent the measures most often studied in the FBA process (Floyd et al. 2005). Three different functional assessment instruments were used for the descriptive assessment procedure: the *Functional Assessment Interview* (FAI) (O'Neill et al. 1997), the *Motivation Assessment Scale* (MAS) (Durand and Crimmins 1992), and an *Antecedent Behavior Consequence* direct observation worksheet (ABC) (Bijou et al. 1968). The FAI (O'Neill et al. 1997) is a multi-step structured interview form designed to identify the function of a child's challenging behavior. The FAI includes 11 sections that ask

the third-party about problem behaviors, antecedents, setting events, communication skills, previous interventions and medical issues. The final section develops hypotheses regarding possible functions for the challenging behaviors. A review of the literature by (Floyd et al. 2005) which evaluated the measurement properties of indirect FBA methods reported no evidence of studies investigating the psychometric properties of the FAI. The MAS is a 16-item checklist designed for determining the hypothetical function of problem behaviors, and asks informants to rate different situations from 1 to 7 (ranging from *Never* to *Always*), creating a rank order of possible functions of the challenging behavior. Original reports of MAS items reveal good test-retest (.89–.98) and interrater reliability (.66–.92), and MAS scores demonstrated good predictive validity when compared with analog conditions using the four factor model of sensory, attention, tangible and escape (Durand and Crimmins 1988). In the ABC assessment, a running record of directly observed events is created using a paper divided into three columns with Antecedent, Behavior and Consequence listed at the top (Bijou et al. 1968). From these observations, a hypothetical function is developed based on patterns of antecedents, behaviors and consequences.

In the functional analysis phase, materials within conditions differed across children based upon teacher recommendations. The tangible condition required a toy or an object identified as preferential for the participant. For the attention, free play and ignore conditions, materials for a neutral activity (crayons and a coloring book) were used. Handwriting worksheets and a pencil were used for the non-preferred task in the escape condition. The preferential, neutral, and non-preferred materials were identified in an interview conducted by the first author with the child's teacher.

Procedures

Phase 1–Pre-screening

The first four children to return signed parental consent forms were recruited for this study. The first author conducted an initial review of cumulative school records to obtain basic demographic information (e.g. age and gender). Then, the first author conducted an interview with each child's teacher to determine what the child's challenging behaviors were and to identify materials for use in the functional analysis. Finally, the first author conducted a one-hour individual workshop for each teacher to establish a baseline of requisite information regarding the purposes and procedures for conducting FBAs. This workshop reviewed the following: (1) What is a problem behavior? (2) What is functional assessment? (3) What is the rationale behind functional assessment and functional analysis? (4) What are these three descriptive assessments (the MAS, FAI and ABC)?

Because a primary goal of this study was to evaluate the individual outcomes of various descriptive functional assessment methods, it was necessary to ensure that the outcome obtained from one instrument (i.e., a statement regarding behavior function) did not confound the results of the other instruments. To protect against

such influence, three research assistants (second- and third-year doctoral students with at least two years of previous experience as classroom teachers or school counselors) independently conducted the descriptive assessments in Phase 2. All research assistants participated in a two-hour training to learn definitions of challenging behavior and became familiar with the descriptive assessment methodology. The two research assistants conducting the direct observations, using the ABC worksheet, achieved reliability at 80% or better by comparing the number of occurrences of the challenging behavior for each participant after the first 15 min observation. The level of agreement was calculated by dividing the smaller total occurrences of behavior by the larger total occurrences of behavior and multiplying by 100 (Sasso et al. 1992). The first author conducted the functional analysis procedures described in Phase 3.

Phase 2–Descriptive Assessments

Prior to conducting the descriptive assessments, the research assistant was given a packet with the operational definitions of the target behaviors and copies of the MAS and the FAI. Each child's teacher was given the MAS either prior to or following the research assistant having conducted the FAI, depending on the predetermined order of administration. When conducting the MAS, the teacher was asked to rate each of the 16-MAS items by circling 1–7 on the Likert-type scale. Results were not calculated until all other assessments were completed in order to prevent the results of this assessment from confounding the results of other assessments.. Teachers and the research assistant were asked to base their assessments on the occurrences of the behavior in a free play, unstructured setting. Following completion of the FAI, the research assistant identified a primary hypothetical function for the targeted challenging behaviors based on the teacher's responses to the interview, writing down one of the four options of possible functions (attention, tangible, escape, or sensory) for the specific challenging behavior in the identified classroom context (free play settings).

Within 2 weeks prior to or following the indirect assessments a second research assistant conducted eight 15-min direct observations using A–B–C recording procedures while students were engaged in free-play settings. The research assistant reviewed the data collected across the eight observations and then chose a hypothetical function of the challenging behavior, from the four possible functions. A third research assistant conducted direct observations for three of the eight 15-min intervals for each participant in order to assess inter-observer agreement. The order of the descriptive assessments was counterbalanced to control for an order effect.

Phase 3–Functional Analysis

In the next phase, the first author and the participating teacher completed the functional analysis (FA), without access to the results of the descriptive assessments. The functional analysis occurred in the primary classroom and the participant's teacher provided appropriate consequences across all sessions. The first author

monitored the time intervals, and provided prompts for the delivery of the appropriate consequence for each demonstration of the challenging behavior. Prompts consisted of laminated cards with the teacher's scripted verbal responses printed on them.

The FA procedures employed were based on Iwata et al. (1994). Five conditions, each lasting 5 min, were used for the functional analysis phase of this study: (1) tangible, (2) attention, (3) escape/ avoidance, (4) ignore, and (5) free play (control). A detailed description of each condition is provided in Appendix. There was a one- to two-min break between each condition in order to review the details of the next condition with the teacher and to set up necessary materials. The order of conditions was randomly selected in an attempt to control for order effects. With the exception of Jimmy's FA, only the teacher, the first author, and the target child were present. For Jimmy, it was necessary to include a peer confederate in the FA sessions due to the nature of his target behavior. Jimmy's teacher indicated that he did not engage in challenging behavior when he was by himself, but would engage in these behaviors when he was competing with other children for access to preferred objects and attention. All sessions were videotaped. Target behaviors were recorded for each condition using a paper and pencil, and rate was calculated by summing the frequency and dividing it by 5 min. A primary function of the challenging behavior was determined for each participant based on the results of the functional analysis. All five conditions were presented for a minimum of three sessions. However, after the third session, the principal investigator and a researcher with extensive experience in single subject design reviewed all data and only conditions that continued to elicit challenging behavior and a control condition (either Free Play or Alone) continued to be tested (Northup, et al., 1991). This was done to minimize the time required to conduct the functional analyses. Only those conditions which were possibly primary functions were conducted. Procedural integrity data were collected to ensure that the teacher provided the appropriate consequence (depending on the functional analysis condition) upon demonstration of the challenging behavior.

Interobserver Agreement and Procedural Integrity

Interobserver agreement (IOA) data were collected for both the ABC direct observations and the functional analyses using total count IOA (Cooper et al. 2007). For the ABC assessments, a third research assistant observed 38% of the same 15-min intervals for all participants. Both observers maintained a frequency count of occurrences of the challenging behavior. Agreement for occurrence of behaviors was computed by dividing the smaller total occurrences of behavior by the larger total occurrences of behavior and multiplying by 100 (Sasso et al. 1992). For Ramon, agreement between the two observers ranged from 90–100% ($M = 97\%$). For Anthony, agreement between the observers ranged from 83–100% ($M = 96\%$). For Jimmy, agreement between the two observers ranged from 60–100% ($M = 87\%$). For Greg, interobserver agreement was 100%. Additionally, both observers were asked to separately formulate a hypothetical function of the challenging behavior, based on their ABC observations. They agreed on the hypothetical function of the

behavior for 3 of the 4 participants. It should be noted that their one disagreement on hypothetical function seemed to be a result of the primary observer noting behaviors exhibited by this specific participant only when the second observer was not present.

A second data collector observed an average of 39% of the FA sessions. Average agreement percentages were computed using a session-by-session basis by dividing the smaller total occurrences of behavior by the larger total occurrences of behavior and multiplying by 100 (Sasso et al. 1992). For Ramon, interobserver agreement was calculated for 38% of these sessions and ranged from 75–100% ($M = 95\%$. For Anthony, interobserver agreement was calculated for 42% of the FA sessions and ranged from 80–100% ($M = 98\%$). For Jimmy, interobserver agreement was calculated for 37% of the sessions and ranged from 66–100% ($M = 97\%$). For Greg, interobserver agreement was calculated for 38% of the FA sessions and ranged from 80–100% ($M = 97\%$). Procedural integrity data for functional analyses conditions was collected for 21% of all conditions for each participant. Procedural integrity for Ramon ranged from 84–100% ($M = 91\%$), Anthony 80–100% ($M = 95\%$), Jimmy 75–100% ($M = 97\%$) and Greg 80–100% ($M = 95\%$).

Results

In this section, the summative results of the comparisons of the descriptive assessments are presented. Then, results from the three descriptive assessments and the functional analyses are presented for each student.

Descriptive Assessments Compared to Each Other.

Table 1 presents summative data regarding the results of all descriptive assessments and the FA for each participant. Although the results of all descriptive assessments focused on the primary function, the MAS provides a rank order of the functions; these results are presented in Figs. 1 and 2. In general, the consistency among the three descriptive assessments was low. The total number of agreements with other descriptive assessments was calculated across all four participants (Agreements/ Number of Participants). When comparing across descriptive assessments, the MAS findings were consistent with the ABC data for 2 of the 4 students. This is greater than agreements between the FAI and the MAS (1/4) and the FAI and the ABC (1/4). Calculating the number of agreements over the opportunities for agreement for all descriptive assessments [agreements/ number of

Table 1 Summary of the functions of challenging behaviors across assessments

Participant	MAS	FAI	ABC	FA
Ramon	Tangible	Tangible	Attention	Attention
Anthony	Tangible	Escape	Tangible	Tangible
Jimmy	Tangible	Attention	Tangible	Tangible
Greg	Sensory	Attention	Attention	Attention

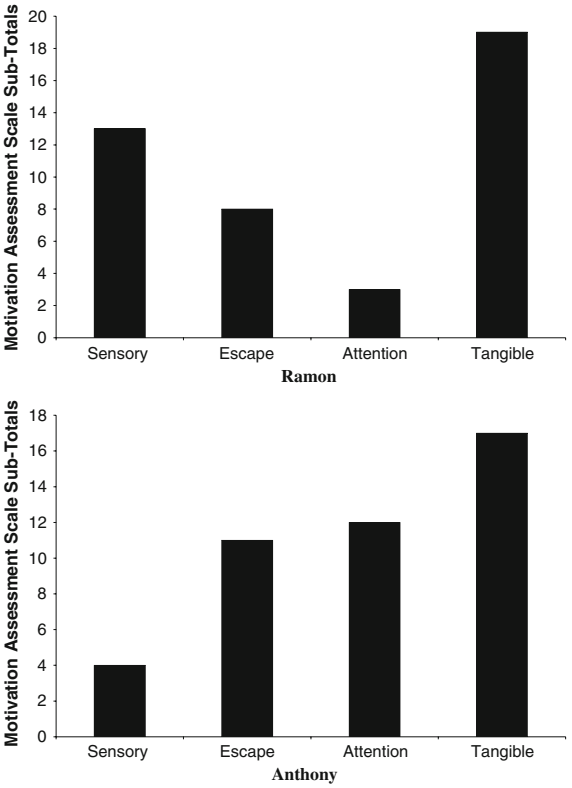

Fig. 1 Subtotals of the motivation assessment scale for Ramon and Anthony

assessments × total number of participants)/(3 × 4)] indicates that they agreed with one another in 33% (4/12) of all cases.

Descriptive Assessment and FA Results

Ramon

The MAS and the FAI that were completed based on Ramon's challenging behavior indicated that the primary function of his challenging behavior was access to tangible items in free play settings. On the other hand, the ABC identified access to attention as the function of the challenging behavior during classroom free play settings. As seen in Fig. 3, Ramon's FA indicated that the attention condition was associated with the highest rate of the challenging behavior ($M = 2.6$ responses per minute with a range = 1.8–3.2 responses per minute). However it should be noted that the tangible condition ($M = 1.73$, range = .8–2.2) also elicited a relatively high level of challenging behavior. The other FA conditions were associated with substantially lower rates of challenging behavior: escape ($M = 0.6$, range = 0–1.2), free play ($M = 0.3$, range = 0–.6), and ignore ($M = 0.2$, range = 0–.5). Based on visual analysis of the magnitude of the differences between conditions and the

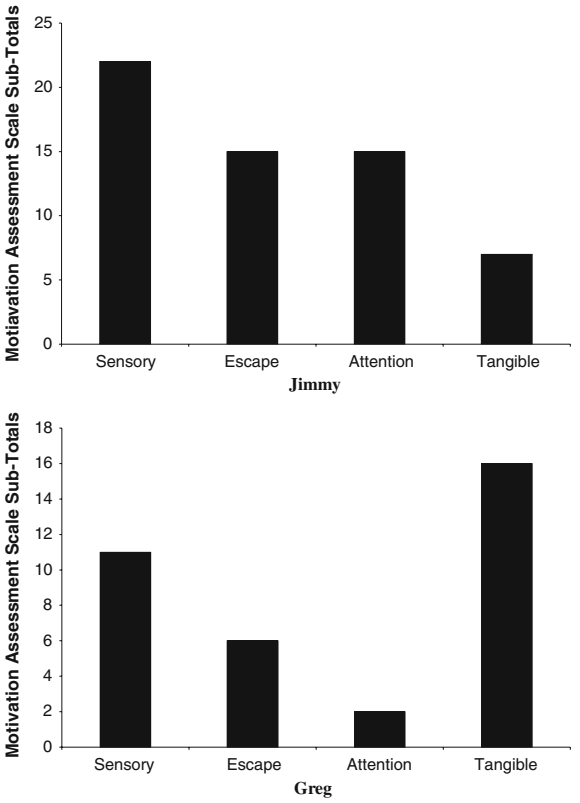

Fig. 2 Subtotals of the motivation assessment scale for Jimmy and Greg

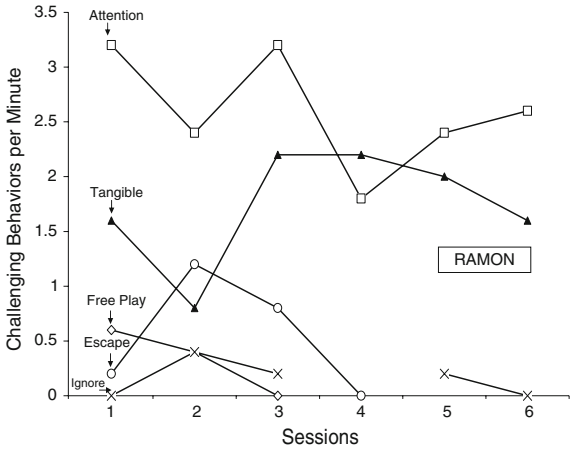

Fig. 3 Challenging behaviors per minute during functional analysis for Ramon

trends of the data path in each condition, these results suggest that Ramon's challenging behavior was maintained by attention. This conclusion of attention as the primary function agrees only with the ABC direct observation conclusion.

Anthony

The MAS and ABC data on Anthony's challenging behavior indicated that the primary function for the challenging behavior was access to tangible items in a classroom free play setting. The FAI indicated that the primary function of the challenging behavior was to escape activities during classroom free play. As seen in Fig. 4, for Anthony, data collected across the FA sessions indicated that his challenging behavior occurred at the highest rate in the tangible condition ($M = 1.0$ response per minute across all sessions). The other conditions occasioned challenging behaviors at lower rates, attention ($M = 0.3$, range = 0–.6), followed by escape ($M = 0.1$, range = 0–.2), free play ($M = 0$) and ignore ($M = 0$). Results of the FA suggest that Anthony's challenging behavior was maintained by access to tangible items, which is in agreement with results from the MAS and the ABC direct observations but not with the FAI.

Jimmy

Data from both the MAS and the ABC indicated that the primary function of Jimmy's challenging behavior was access to tangible objects in the classroom free play settings. On the other hand, the FAI indicated that function of the challenging behavior was access to attention. The first FA conducted with Jimmy resulted in low and non-differential results of observed behavior across conditions: attention ($M = 0.15$, range = 0–.4), tangible ($M = 0.10$, range = 0–.4), escape ($M = 0.05$, range = 0–.2), free play and ignore ($M = 0$). Therefore, two FA conditions (no peer confederate present v. peer confederate present) were designed specifically for Jimmy. The two conditions included a peer confederate in an attempt to replicate naturally occurring classroom conditions in which there was competition for access to adult attention or tangible objects.

As seen in Fig. 5, during the second FA, the highest mean rate of challenging behavior ($M = 0.34$ responses per minute, range = 0.2–0.8) occurred in the tangible condition, with an accelerating 3-point data path during the last three

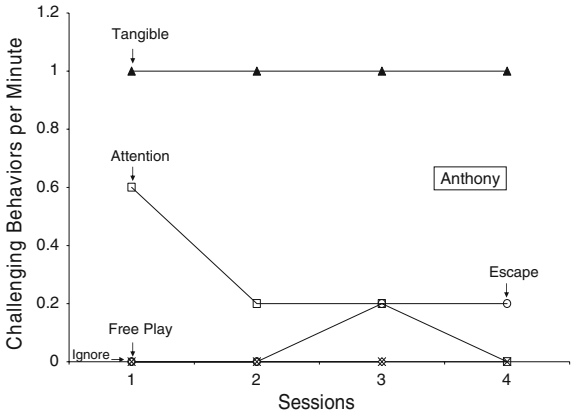

Fig. 4 Challenging behaviors per minute during functional analysis for Anthony

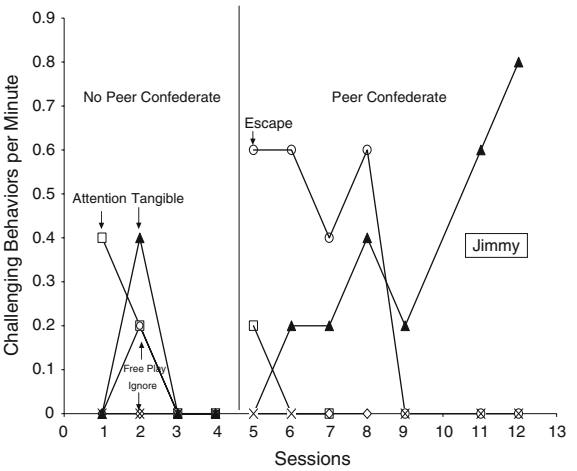

Fig. 5 Challenging behaviors per minute during functional analysis for Jimmy

sessions. The other conditions occasioned responses at considerably lower rates: escape ($M = .275$, range = 0–.6), attention ($M = 0.10$, range = 0–.2) ignore ($M = 0$, range = 0) and free play (M = 0). Although the escape condition did appear to serve as a function for the first four peer confederate sessions, access to tangible objects ultimately increased over escape after multiple sessions. Thus, visual analysis of the FA data suggests that Jimmy's challenging behavior was maintained by access to tangible objects, which agrees with the conclusions drawn from the MAS and the ABC but not the FAI.

Greg

The MAS that was completed based on Greg's challenging behavior indicated that the primary function of his challenging behavior was access to intrinsic or sensory stimulation during classroom free play settings. On the other hand, the function identified by both the FAI and the ABC was access to attention. During the FA, the attention condition occasioned the highest rate of challenging behaviors ($M = 1.5$ responses per minute, range = 1.0–1.8), with an accelerating trend across the last three sessions (see Fig. 6). The next highest average rates of challenging behaviors per minute occurred during the tangible condition ($M = 1.2$, range = .8–1.8), followed by ignore ($M = 0.3$, range = 0–.8), escape ($M = 0.2$, range = 0–.6), and free play ($M = 0.03$). Because of continued high rates of challenging behavior precipitated by the attention condition primarily and the tangible condition to a lesser degree, these conditions ceased after the third session. The remaining three conditions were tested during one more session. Visual analysis of the FA data suggests that Greg's challenging behavior was maintained by access to attention, but that access to tangible objects may have played a role as a secondary function. The conclusion of attention as the primary function agrees with the FAI and the ABC, but not the MAS data.

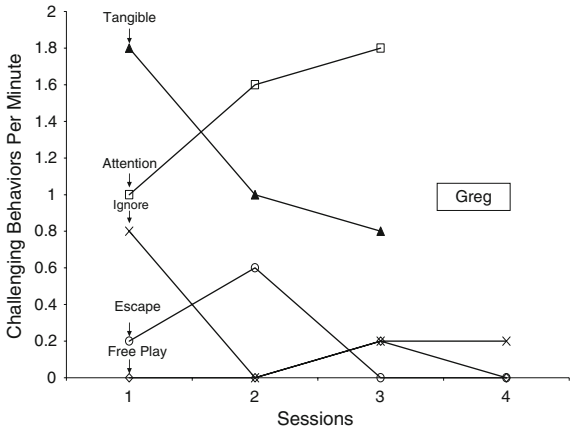

Fig. 6 Challenging behaviors per minute during functional analysis for Greg

Discussion

This study compared the outcomes of two indirect assessments and one direct descriptive assessment with each other and with the outcomes of functional analyses in order to address two research questions**:** (a) How do the hypothetical functions of target behaviors identified through various descriptive functional assessments compare with each other for young children's challenging behavior? and (b) How do the hypothetical functions of target behaviors identified through various descriptive functional assessments compare with functions identified through a functional analysis?

Because FA involves the experimental manipulation of variables (O'Neill et al. 1997), it may be assumed that this procedure more accurately identifies a functional relationship between target behaviors and predictor variables. The overall agreement between the descriptive assessments and the FAs was 56% (7/12), but there was a clear difference between the number of agreements for direct and indirect assessments. The direct descriptive observations (ABC) agreed with the FA conclusions for all four students. However, the functions identified from the two most prevalent indirect descriptive assessments in FBA research, the MAS and the FAI (Floyd et al. 2005), agreed with the FA results on only 50% (2/4) and 25% (1/4) of comparisons, respectively. Similarly, the level of agreement between indirect (FAI and MAS) and direct (ABC observations) descriptive methods was low, with only 38% (3/8) agreements.

One possible explanation for the low levels of agreement between the indirect assessments and the FA results was that the indirect assessment was actually identifying secondary reinforcers of the challenging behavior. However, when examining the data for agreement between the primary reinforcer identified in the indirect assessments and the FA condition that elicited the second highest rate of challenging behavior, the only agreements were in Ramon's MAS and FAI and Greg's FAI conclusion. This indicates a level of agreement of only 38% (3/8) between the primary function of the indirect assessment and a secondary function of the FA.

The two indirect descriptive methodologies (FAI and MAS) were in agreement with each other for the hypothetical function of only one of the four participants. This level of agreement is puzzling as it indicates that these procedures led teachers to identify different functions of the same behaviors. The overall low levels of agreement between descriptive assessments are in contrast with other studies that have compared descriptive assessments (Arndorfer et al. 1994; Cunningham and O'Neill 2000; Ellingson et al. 2000; Murdock et al. 2005; Newcomer and Lewis 2004). One explanation for the level of disagreement in this study may be that an indirect, third-party assessment is only as valid as the perceptions of the third party. The limited training and experience of the teachers in these early childhood settings may have contributed to inconsistency among the instruments. Therefore, an implication of these results is that specific training is needed before practitioners are asked to participate in conducting FBAs. Related to this idea, a limitation of this study is that it was impossible for the teachers giving information to isolate their perceptions of the functions of challenging behaviors to one context. In other words, although the questionnaire and interview only asked about these behaviors in free play settings, it was impossible for teachers not to let occurrences of these behaviors during other activities (e.g. circle time, nap time) influence their responses.

Limitations

Interpretations of these findings should be tempered by recognition of several limitations of the study. First, the limited sample size of four students impacts the generality of these findings, and replication studies are necessary to improve the external validity of these findings. Unfortunately, given the time intensive nature of this work, this limitation is prevalent among studies in the literature that involve direct evaluations of various FBA components. The second limitation is related to the method and results of interobserver agreement. There are two considerations in regard to this limitation. First, within the ABC analysis it was not feasible to calculate other interobserver agreements either for the antecedents or the consequences of target behaviors because of the open response and anecdotal nature of the ABC direct observation method. In other words, because observers are simply writing down what occurred in their own words, no adequate decision-making rules existed in the literature to determine when observers were and were not in agreement unless the descriptions had exact word for word correspondence (e.g. Observer 1 notes in the Antecedent column "Peer pokes target student," but Observer 2 notes in the Antecedent column "Peer hits target student."). Second, the resulting levels of agreement for the lower end of the ranges for the functional analyses and ABC direct observation were below 80% (Ramon's FA 75%, Jimmy's FA 66% and the ABC observation 60%). This is a result of relatively few occurrences of the challenging behavior during some sessions—in Jimmy's FA session the primary observer observed two occurrences while the reliability observer observed three, resulting in a ratio of 2/3 or 66%. Finally, for Ramon's FA, in one session, the primary observer noted three occurrences while the reliability observer noted four (3/4 or 75%). Thus, although they only disagreed on the

occurrence of the behavior once or twice, this caused the percent agreements to be considerably low. The averages for all interobserver agreement calculations were above 90%.

Third, no single discrete challenging behavior was exhibited by any of the participants at rates high enough to accurately assign function without unrealistic and perhaps impossible assessment procedures. Therefore, the operational definitions for the challenging behaviors were broadly defined. As is often the case with young children identified as exhibiting challenging behaviors, all of the participants had a large repertoire of behaviors through which they moved seamlessly and sequentially. Thus, no single discrete behavior could be identified by their teachers as the child's one challenging behavior. Unfortunately this raises the possibility that different functions served the different behaviors in their repertoire. Furthermore, the definitions reflected what the teachers identified as the challenging behavior(s) that they wanted to assess using FBA methodologies during the pre-screening interviews. While they do represent the teachers' best effort at operationally defining behaviors, they lack the rigor of definitions typically crafted by researchers. Additionally, the use of a frequency count for these behaviors (the simplest and often most palatable method of data collection for teachers) may have been inappropriate for the behaviors that are continuous in nature (e.g. crying, yelling, tapping pencil, whistling). This also may have contributed to lower limits of IOA calculations. While this may have limited the internal validity in multiple ways, these operational definitions mimic those which are used in schools, and therefore increases the external validity of the study. The use of the exact same behavioral definitions for both teachers and observers was necessary to main consistency for the sake of fair comparisons across different functional assessment methods.

Fourth, while this study strove to maintain the same contexts for the different assessments, the higher level of environmental control necessary for the FAs could have impacted the function of the child's behavior. Additionally, the fact that questionnaires and interviews were subject to the teachers' memories and biases regarding behavior in different settings (Shores et al. 1999) could have impacted their decisions concerning the function of the students' behavior. In consideration of this, it is inaccurate to brand descriptive results that differ from the functional analysis as wrong. Rather, these differing results may be caused by the teacher observing the behavior in a different setting for which it serves a different function. These differences are indicative of the fluidity with which the function of a behavior changes and the difficulties in real-world application.

Fifth, although a strength in the design of this study was the use of different persons to conduct the various assessments in order to maintain blind comparisons across assessment methodologies, this may have contributed to the variability of the data. That is, the differences in assessment outcomes may be a result of the person completing the assessment, as opposed to the assessment itself. While all data collectors had similar experiences and education levels, it is feasible that different people have different interpretations of environmental stimuli. For example, when a student engages in challenging behavior and gains access to a toy but also gains access to teacher attention in the form of a reprimand, one data collector may view

this event as evidence that access to tangible objects is the hypothetical function, while another data collector may interpret it as evidence that access to teacher attention is the hypothetical function.

Directions for Future Research

Clearly, this study is only a beginning. The most illustrative aspect of the study may be the goal of improving external validity. Although these aspects also led to the aforementioned limitations, decreasing the role of the researcher and increasing the role of the teacher, as well as conducting all assessments in the natural setting are potential areas of future investigation. Another notable area of future investigation is examining the impact of extending the amount of time for direct observations. Conducting eight 15-min direct observations, which is higher than typical total amount of direct observation time, may have had an impact on the accuracy of direct observation methodologies. Future research with young children examining comparisons of descriptive assessments with each other and with a functional analysis for is necessary. Additionally, continuing to research effective ways to train teachers in all aspects of generating effective FBAs, including operationally defining challenging behaviors for FBA purposes and evaluating combinations of assessments to generate effective FBAs, are other important areas of future research. Finally, it is important to link results of different methodologies to function-based interventions and to evaluate their efficacy, as the goal of all FBA processes is to create effective interventions that decrease challenging behavior and increase pro-social behaviors.

The level of agreement between the ABC and the FA offers further support to the value of direct natural observations (O'Neill et al. 1997). Additionally, the low level of agreement between the indirect assessments supports Scott et al.'s (2004) observation that "we have little or no evidence that alternative methods such as interview, questionnaire or rating scales protocols can be valid stand-alone methods of behavior analysis" (p.197). Results of this study suggest that practitioners should be extremely cautious in using these instruments. This is especially salient if practitioners are using similar indirect methods by themselves to identify functions of challenging behavior. The results also emphasize the importance of conducting extensive and objective direct observations of student behavior as a means of systematically evaluating the antecedents and consequences of student behavior.

Appendix

The following is a description of each FA session.

Free Play

The free play condition was used as a control for the other four conditions. During free play, the participant had access to preferred toys, neutral activities and the

teacher provided positive attention in a continuous, non-contingent rate, approximately 5 times per minute per free play session. No instructional demands were placed on the participant.

Tangible

During the tangible condition, the participant was presented with the preferred item, which was previously determined by pre-assessment interview. The item was removed after a set interval of 20 s. The teacher maintained a distance of three to six feet from the participant. Upon demonstration of a disruptive behavior, the teacher presented the participant with the tangible reinforcement with the statement "Now it's your turn with the toy." After 30 s, the tangible item was removed again with the statement "Now it's my turn with the toy." Demonstration of the behavior resulted in the item being returned. No other demands were placed on the child. All other behaviors that did not meet the response definition criteria were ignored and the teacher provided non-contingent attention statements to the participant on a fixed 30-s interval.

Attention

In the attention condition, the teacher maintained a distance of three to six feet from the participant and pretended to be occupied with paperwork. When the participant engaged in the disruptive behavior, the teacher approached the participant, placed a hand on the child's back and gave a verbal reprimand that represents what might typically happen during demonstrations of this challenging behavior (e.g."Stop doing that. You shouldn't do that because it is against the rules. You are not following directions when you do that.") Participant children had access to the neutral activity and no other demands were placed on them. When the behavior was not occurring, the teacher did not engage in social attention.

Escape

In the escape condition, the participants were assigned a predetermined task that was determined by the teacher to be challenging, but within their intellectual ability (i.e., copying his name 10 times). Verbal instructions and modeling of the task were provided at the beginning of the session. When the participant engaged in the target behavior, the task was removed for 30 s and the teacher said, "Time to take a break." Following a 30-s break, the task and demand was presented again. The neutral activity was not available. The teacher provided non-contingent attention statements to the participant on a fixed 30-s interval.

Ignore

During the ignore condition, the participant was directed to stay in the assigned area. The preferred tangible item and neutral activity materials were accessible but

no direct interaction with the teacher occurred and no demands were place on the participant child.

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