Functional Assessment of Challenging Behavior

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Abstract

Purpose of Review The purpose of this review is to evaluate recent research on functional assessment procedures to identify recent advances and best practices.

Recent Findings Indirect assessments are the most limited form of functional assessment, but their value increases when conducted by behavior analysts rather than caregivers. Direct assessments produce more valid outcomes than indirect assessments, but do not demonstrate a functional relationship between the environmental contingencies and the behavior. Functional analysis procedures are the most rigorous and valid approaches. Recent research has evaluated functional analysis variations, such as the interview-informed synthesized contingency analysis, that are more efficient and flexible for use in a variety of settings.

Summary The implementation of a functional assessment continues to be best practice for developing effective functional interventions for challenging behavior. Indirect assessments have value for informing direct assessments and functional analyses. Using indirect assessment findings to develop functional analysis procedures can increase their efficiency while maintaining the validity of the functional assessment process.

Keywords Functional analysis · Functional assessment · Indirect assessment · Direct assessment

Introduction

Functional assessment or functional behavior assessment (FBA) is the standard practice used by behavior analysts to identify environmental variables that evoke and reinforce challenging behavior. Behavior analysts use information on the antecedents and consequences of challenging behavior derived from the FBA to develop functional interventions for the behavior. The three types of FBAs are indirect assessment, direct assessment, and functional analysis (FA). This article will summarize each assessment type and discuss current findings.

Indirect Assessment

Indirect assessment is the first step in the FBA process. The researcher or therapist asks caregivers questions to obtain information about the challenging behavior and relevant environmental variables. Indirect assessments should gather information on the following: (1) clear descriptions of the target behavior, (2) situations in which the target behavior is most and likely to occur, (3) antecedents that evoke the target behavior, and (4) consequences that follow the target behavior [1•]. Indirect assessments, conducted through interviews [2, 3], rating scales [4], and questionnaires [5], lead to hypotheses about the antecedents and consequences that are functionally related to the challenging behavior.

Indirect assessments can be open-ended and closed-ended [6•]. In closed-ended indirect assessments, the questions and possible answers are pre-selected (i.e., the interviewer cannot deviate from the structured questions, and the respondent selects answers from the already existing options). Examples of closed-ended assessments include the Motivation Assessment Scale [4], Questions About Behavior Function [3], and the Functional Analysis Screening Tool [2]. Close-ended assessments are advantageous in that they are typically easier to conduct, ensure a focus on behavioral events, and can be employed by less experienced individuals. Their limitations include missing information about setting events or other relevant environmental variables, producing false positives, and being misused or misinterpreted when used by individuals without experience in applied behavior analysis (ABA) [6•].

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Alternately, open-ended indirect assessments include questions that require the production of information, allowing respondents to answer questions as they wish, rather than selecting from a set of options. Examples of open-ended assessments include the Functional Assessment Interview Form [7], the Open-Ended Functional Assessment Interview [8], or any interview conducted by a behavior analyst asking questions about the behavior and antecedent and consequent events. The main advantage of open-ended assessments is the range of information that can be obtained, as the interviewer can ask the respondent to elaborate on information being provided and ask about contextual variables that may serve as setting events for the target behavior. The limitations of open-ended assessments are that they may be more effortful and time consuming as there is more discussion between the interviewer and the interviewee. Open-ended indirect assessments require the behavior analytic skills needed to guide the interview questions and interpret the results and the interpersonal skills necessary to develop rapport with the informant [6•].

Despite being commonly used in practice [9, 10], there is limited and mixed research supporting the reliability and validity of indirect assessments [11•, 12]. For example, when comparing the outcomes of indirect assessments and functional analyses (FAs), some studies have found adequate correspondence [3, 13], whereas other researchers have found low agreement [2, 14]. Recently, Fee et al. [15•] compared the results of close-ended indirect assessments with the results of brief functional analyses [16]. They found unreliable agreement between the indirect assessments and the brief functional analyses except when identifying an automatic function. Smith et al. [17] found improved agreement between indirect assessments and FAs when the number of respondents increased to four or five. Another factor which may improve the reliability and validity of indirect assessments is the level of experience of the individual conducting the assessment [18•]. Dracobly and colleagues [18•] found improved reliability (interrater agreement) and validity (agreement with FA results) when indirect assessments were conducted by experts (Board Certified Behavior Analysts who were PhD students with several years of experience) compared with caregivers (parents and teachers) without formal behavior analysis training or FBA experience.

Because the validity and reliability of indirect assessments are mixed at best, we recommend that practitioners do not rely solely on indirect assessments to develop hypotheses about the function of challenging behavior and develop function-based interventions. We recommend that behavior analysts conduct open-ended interviews to obtain as much information about the target behaviors and antecedent and consequent variables as possible, and use the information to guide direct assessments or FAs.

Direct Assessment

Direct assessment, or ABC recording, consists of directly observing the challenging behavior and recording the antecedents and consequences as they naturally occur. After recording the events, the behavior analyst identifies patterns in environment-behavior relations to develop a hypothesis about the function of the target behavior. Direct assessments are an improvement from indirect assessments because the antecedents, behavior, and consequences are actually observed, rather than reported from memory. However, the relationships identified between the behaviors and environmental events are correlational; because no variables are manipulated, direct assessments do not demonstrate a functional relationship [19]. Nonetheless, a well-conducted direct assessment that identifies the antecedents and consequences that occur in relation to the behavior will allow the behavior analyst to develop a strong hypothesis about the controlling variables and develop a function-based treatment [1•, 20]. In fact, direct assessments are the most commonly used FBA method by practicing behavior analysts [9, 10].

Direct assessments can be conducted by describing the antecedents and consequences each time the behavior occurs, a process called narrative recording. The data are then organized and coded for specific antecedents, behaviors, and consequences, which leads to hypothesis development and facilitates further analysis. For example, the behavior analyst can report the percentage of times the target behavior is followed by a specific consequence or preceded by a specific antecedent. Alternatively, conditional probabilities can be calculated to quantify the extent to which specific antecedent and consequent events occur in relation to the behavior [20]. Another approach to direct assessment is the use of interval recording during ABC data collection. For example, Lerman and Iwata [21] recorded frequency within 10-s intervals for self-injurious behavior, antecedent events, and consequent events. They found that the results of the direct assessments agreed with the results of the FAs for identifying automatic versus social contingencies, but agreement was inconsistent for identifying positive versus negative social reinforcement contingencies.

In a pilot study, Lanovaz and colleagues [22] compared the function identified by ABC narrative recording with the function identified by FAs and the Questions About Behavior Function (QABF) for the behavior of four children with developmental disabilities. First, an interviewer administered the QABF to a caregiver. Then, the researchers trained the caregivers (through behavioral skills training) to collect ABC narrative data on at least 20 occurrences of the target behavior. Twelve expert reviewers (BCBAs with at least 5 years of experience, blind to the results of the other assessments) then interpreted the ABC narrative data and identified a maintaining function. Finally, an expert (blind to the results of the other

assessments) conducted an FA. The function identified by the 12 experts through interpretation of the ABC narrative data partially or exactly matched the function identified by the FA for three of the four participants, and for the two participants with clear QABF results, there was statistically significant match with the ABC narrative data. For the fourth participant, only three of the experts' interpretation of ABC narrative data partially or exactly matched the function identified by the FA and QABF. Additionally, half of the ABC narrative data sets omitted the topography of the behavior (providing only antecedent and consequent events), and they found no statistically significant influence on access to the topography on the expert's accuracy compared with the other assessment methods. The results may support the use of ABC narrative recording to hypothesize the function of the behavior; however, further replications demonstrating the validity of ABC narrative recording are needed. More recently, Leon et al. [23•] conducted direct assessments on inappropriate vocalizations by individuals diagnosed with dementia. The researchers recorded inappropriate vocalizations, antecedents, and consequences in continuous 10-s intervals. They then calculated conditional and unconditional probabilities to identify relationships between the vocalizations and the antecedent or consequent events. Although the study did not include a treatment component, the descriptive assessment identified at least one antecedent event that correlated with inappropriate vocalizations for all four participants and, for three out of the four participants, identified attention as a consequent event. Another type of direct assessment is a scatterplot [24]. With scatterplots, frequency data are collected within continuous intervals. The frequency data are then plotted on a grid to visually portray intervals when the target behavior occurred more frequently. Because scatter plots provide information on the timing of the behavior, rather than its relation to antecedents and consequences, the information gathered cannot be used to hypothesize the function of the behavior. However, the information can be used to guide further functional assessment procedures. For example, Castillo et al. [25•] collected frequency data on participants' target behaviors using scatterplots with 30-min intervals. The intervals in which target behaviors occurred were then targeted for video data collection. From the videos, they then conducted direct assessments of children's problem behavior during transitions. The assessment results showed that the children were more likely to engage in problem behavior when transitioning to activities with lower densities of reinforcement.

Freeman et al. [26] built upon direct assessment methods by developing the structured descriptive assessment (SDA). The SDA is conducted in the natural environment and includes the manipulation of antecedent events to evoke the target behavior. There are no programmed consequences; rather the implementer is told to respond to the challenging behavior as he/she normally would. This approach combines direct assessment with an experimental analysis by manipulating antecedent events to evoke the challenging behavior so the behavior analyst has opportunities to record the naturally occurring consequences of multiple instances of the behavior. The results of SDAs have been compared with FAs with promising agreement in a few studies [26, 27].

Functional Analysis

Since Iwata et al. [28] published the first systematic set of procedures for conducting a functional analysis (FA), the FA approach has been established as best practice in the assessment and treatment of challenging behavior. It involves the systematic manipulation of antecedent and consequent events to establish a functional relationship between these environmental events and the challenging behavior. In an FA, one or more test conditions are compared with a control condition. In the test condition, a possible reinforcer (e.g., attention, escape) is delivered each time the problem behavior occurs and, in the control condition, the reinforcer is delivered non-contingently. The function of the problem behavior is established when the occurrence of problem behavior is high in one or more test conditions relative to the control condition. Because an FA identifies the reinforcer for the problem behavior, treatment based on FA results is likely to result in more robust, clinically significant behavior change [29]. The validity of conducting an FA to inform treatment development has been established in hundreds of research articles over the last 35 years. Nonetheless, several criticisms of the FA approach have been voiced over the years and research in this area has focused on overcoming implementation barriers and disseminating new findings to behavior analysts [8].

One limitation in the use of FAs is their ability to identify the function of problem behavior that occurs at low rates. Often, these behaviors cannot be directly observed during FA sessions or cannot be reliably evoked to produce differentiated results across test and control conditions [30]. To address this challenge, Kahng et al. [31] evaluated a modified FA procedure where the individual test sessions were extended from 10 min to 7 h. This adjustment in session length yielded clear responding and the function was further confirmed by improvements in behavior following treatment. Although this represented a creative solution and a strong demonstration of the FA approach, such long assessment sessions are not feasible in most settings. Subsequently, Tarbox et al. [30] presented an alternative modification where the FA started upon the first instance of problem behavior. In this case, the researchers waited until the opportunity presented itself (i.e., the low rate problem behavior occurred) to begin each session, rather than designating specific session times. The results suggest that the modified FA accurately identified a function for each participant, confirmed by reductions in problem behavior following

a function-based intervention. This "opportunity-based" FA [8] may not only facilitate the use of the FA in multiple settings, it may also potentially capture relevant environmental events that otherwise could not be replicated in an analogue setting. This is consistent with research which suggests that the setting in which the FA takes place may affect the results of the assessment [32]. Given the potential the "opportunity-based" FA has for increasing the efficiency of FA methodology, researchers should replicate and extend this research.

Another way to increase the efficiency of the FA and its usefulness in multiple settings is the trial-based FA. First proposed by Sigafoos and Saggers [33], the trial-based FA attempts to increase the efficiency and validity of the FA by embedding the trials into naturally occurring opportunities. LaRue et al. [34] compared the outcomes of the trial-based FA with the functions obtained from a traditional FA as proposed by Iwata et al. [28]. The results showed strong correspondence between both assessments, a finding that was later reported by Bloom et al. [35]. Subsequent studies have focused on increasing the accessibility of the trial-based FA by training teachers and caregivers, showing that, with adequate training, the trial-based FA can be implemented proficiently by individuals without extensive knowledge of ABA [36, 37]. The acceptability and utility of the trial-based FA in school settings can potentially open opportunities for increased interdisciplinary collaboration in both research and practice. A recent quantitative review of the efficiency of FAs found that trial-based FAs were the most efficient FA approach in terms of duration (minutes per function tested) [38•].

In a survey of 724 practicing behavior analysts, Oliver et al. [9] reported that 57% of participants considered lack of time as a barrier to conducting FAs. Often, practicing behavior analysts are given a short time to complete an FBA and develop a treatment plan. This can make it challenging for practicing behavior analysts to conduct multiple observations or assessment sessions required of traditional FAs. Hanley et al. [39] decreased the time required to complete an FA by exposing the participants to a single test condition with a control condition matched to the test condition. Although this article does not specify how the authors selected the components of the test condition for each participant, a later article by Hanley [8] suggests conducting a thorough open-ended interview with brief observations to gather sufficient information to guide the FA. Hanley et al. [40] used this approach to treat challenging behavior exhibited by three children diagnosed with autism spectrum disorder. The results of the interview and observations identified the idiosyncratic reinforcement contingencies that were functionally related to the problem behavior for each participant (e.g., granting previously denied requests, resuming access to interrupted activities, gaining access to a specific item); therefore, the FA test conditions incorporated these idiosyncratic reinforcement contingencies for challenging behavior. Based on these synthesized

assessments, multicomponent treatment plans were developed that resulted in substantial reductions in the challenging behaviors. This format for conducting a synthesized analysis is now referred to as the interview-informed, synthesized-contingency analysis (IISCA). A recent study by Jessel et al. [41••] described 30 applications of the IISCA, all of which showed differentiated responding. Particularly appealing for practicing behavior analysis is the time it took to conduct the IISCA. According to the authors, each assessment was completed in approximately 25 min, which is substantially less than the time it generally takes to conduct most other variations of an FA [1•, 16]. Jessel et al. [42••] expanded on these findings by putting forth 25 replications of the IISCA and evaluating treatment based on the assessment results. Decreases in problem behavior were reported for all participants following individualized interventions that incorporated the multiple reinforcement contingencies identified by the IISCA. The analysis of FA efficiency by Saini et al. [38•] found that the multielement (traditional) FA and the IISCA required a similar mean number of sessions per function tested to identify the function. However, the mean duration per function tested for the IISCA was about half the mean duration per function tested of the multielement FA. Although perhaps limited in its experimental precision, the ease and speed of the IISCA, and its efficacy at guiding effective treatments could increase the use and acceptability of FAs by practicing professionals.

The FA as proposed by Iwata et al. [28], and all subsequent variations of the FA, implement test and control conditions to verify experimentally what reinforcer is maintaining the problem behavior. Across different types of FAs, the test condition (a) presents an establishing operation and discriminative stimulus to evoke the behavior and (b) delivers the relevant consequence contingent on the target behavior. When differentiated results are obtained between the test and control conditions, one can be more certain that a clear function has been identified. Although a review of the literature showed that differentiated results from FAs have been reported in 94% of participants in published research [43, 44], FAs conducted by Hagopian et al. [45] for 176 individuals receiving treatment for severe problem behavior at an inpatient clinic yielded undifferentiated responding 53% of the time. For FAs where a clear function was not identified, additional modifications were made. These modifications included changes in antecedents such as changing the session location, changes in design such as conducting extended alone sessions, changes to consequences such as an extinction analysis, and combined modifications. Often, multiple iterations of the FA were needed before differentiation was obtained. As a way to work towards increasing the efficiency and adoption of the FA, Hanley [8] suggests considering and employing these modifications a priori when designing the functional assessment. Using indirect and direct assessments to guide the design of FA

conditions is one such approach [8, 40, 41••, 42••]. By eliminating the need to test for multiple functions (as is the case with the traditional multielement FA), the number of sessions and duration of the FA are reduced. The analysis of FA efficiency by Saini et al. [38•] found that overall, the multielement FA required around three times more sessions on average and lasted around 6 times longer in duration on average than the IISCA. The IISCA exemplifies this approach to increasing the efficiency of conducting an FA [41••, 42••].

Although the procedures for implementing FAs vary, the FA approach is unparalleled in the assessment and treatment of problem behavior. Baer, Wolf, and Risley [46] describe the functional analysis of behavior as a "...believable demonstration of the events that can be responsible for the occurrence or non-occurrence of that behavior" (pp. 93–94). In essence, this refers to a behavior analyst's ability to arrange the environment in such a way that it exercises reliable control over the challenging behavior. The development of the FA propelled the field of applied behavior analysis into an era of function-based interventions that have been successful at treating multiple topographies of problem behaviors in a variety of settings [43, 47]. Iwata et al. [28] offered a blueprint for the experimental analysis of the variables maintaining problem behavior [1•]. Since then, several variations of the FA have been developed such as the antecedent only FA [48], trial-based FA [33, 35], latency FA [49], precursor FA [50], and IISCA [40]. These approaches are designed to increase efficiency and flexibility of the FA process.

Often, the validity of some new variation of the FA is established by comparing its results with those obtained by the traditional FA described by Iwata et al. [1•, 28]. The logic of validating a new variation of an FA by comparing it with the traditional version of the FA is based on the assumption that the traditional FA is itself always valid (always identifies the maintaining variables). When the results are inconsistent between the new FA and the traditional FA, the validity of the new FA is questioned, although perhaps unnecessarily so as research has shown these variations of the FAs also lead to interventions that produce clinically significant behavior change [42••, 51]. We would argue that a better way to validate a new version of an FA is to evaluate the effectiveness of treatments based on its results. Recent research by Fisher et al. [52••] compared outcomes of the IISCA and the traditional FA. They showed both FAs produced differentiated results although they did not evaluate treatment based on the outcomes of the two FA procedures. Slaton et al. [53••] also compared the IISCA and traditional FA with nine children with challenging behavior. They showed differentiated results in the IISCA for nine children but differential results in the traditional FA for only four. Further, Slaton et al. [53••] compared treatments based on the results of the IISCA and traditional FA for four children. They showed that treatments developed based on the results of the IISCA were effective at reducing problem behavior for four individuals but interventions based on standard FA were effective for only two children.

One possible cause of non-correspondence between FAs is the setting in which the assessment is conducted [32]. The same behavior might be controlled by different reinforcement contingencies across different settings. A study by Sanchez et al. [54•] compared the trial-based FA with the traditional FA. All trial-based FA sessions took place in the classroom and the traditional FA took place in a separate room. Although correspondence was obtained for four out of five participants, one participant did not exhibit problem behavior during the traditional FA but engaged in self-injury in the trial-based FA. A subsequent treatment using the function identified by the trial-based FA led to substantial decreases in problem behavior in the classroom.

As researchers continue to develop different variations of the FA and conduct research that compares the outcomes of the variations, it is important to make the point that the ultimate value of any FA variation is its ability to provide information that leads to effective intervention. The effectiveness of treatment is the "acid test" that confirms the function identified in the FA and validates the FA. Once an FA leads to effective intervention, no further analysis or comparison between FAs is necessary [55]. This focus on the treatment validity of assessment presents the opportunity for clinicians and researchers to be creative in their development of different variations of an FA that suit the needs of their clients or their research questions.

Conclusion

Functional assessment, designed to identify the antecedents and consequences controlling a challenging behavior, can be conducted in three ways, by asking (indirect assessment), by observing (direct assessment), and by testing (functional analyses). The ultimate value in different functional assessment methods is their ability to lead to effective interventions. Although the degree of experimental rigor increases from indirect assessments to direct assessments to FAs, all three approaches have value. Indirect assessments should never be the sole source of functional assessment information, but they can inform the planning and increase the efficiency of direct assessments and FAs. When results of indirect assessments correspond to the results of direct assessments or FAs, behavior analysts can develop and implement interventions based on the results. Treatment outcome then validates the outcomes of the assessments. Based on recent research, we recommend behavior analysts rather than caregivers carry out functional assessment procedures for the best outcomes; behavior analysts use the results of indirect assessments to design direct assessments or FA procedures to increase efficiency; and

researchers continue to evaluate the most efficient yet rigorous forms of functional assessment, such as the IISCA.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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