

Functional Behavior Assessment in Context

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A universally challenging feature of child development is when problem behavior interferes with health and well-being. Some problem behavior is expected as part of typical development, but the persistence or escalating severity of behaviors like aggression, destruction, or self-injury serve as barriers to success for both children and their caregivers. Intensive, extended treatment for chronic problem behavior also occurs at a significant cost to society (National Research Council & Institute of Medicine, 2009).

Functional behavior assessment (FBA) is a term used by behavior analysts to characterize a problem-solving process that identifies the proximal causes of behavior. The word *function* is equivalent to *cause* or *purpose* and can be used to classify both desirable (e.g., speech) and problematic (e.g., aggression) behavior. When applied to problem behavior, FBA is used to inform individualized intervention by tailoring intervention to the cause of behavior in a similar manner as that accomplished by personalized medicine. This functional approach is grounded in several decades of behavior-analytic research and integrates well with existing frameworks of developmental psychopathology. This entry delineates the unique contributions of a behavior-analytic approach to the assessment of problem behavior, identifies core features of the functional assessment process, and reviews long-standing as well as emerging areas of application.

1 Functional Behavior Assessment in Context

Historical Context

The historical context of FBA is framed by early observational and experimental studies of individuals with significant intellectual impairments and clinical disorders (e.g., schizophrenia). These studies provided the first clues that severe problem behavior was influenced by the immediate context in which it occurred (e.g., Lovaas, Freitag, Gold, & Kassorla, 1965; Patterson, 1976). For example, an individual who resided in a psychiatric ward with limited daily interactions could gain access to adult attention (e.g., comfort, physical restraint, reprimands, medical attention, among other forms) by engaging in head banging, a form of self-injury. From these studies emerged a hypothesis that

common situations and natural reactions to problem behavior were influential in its development and chronicity in some cases (Carr, 1977).

By the 1980s, behavioral researchers had amassed experimental evidence confirming that two general processes were responsible for the persistence of problem behavior: *positive reinforcement* (access to appetitive events or items following behavior) and *negative reinforcement* (avoidance of and escape from aversive events or items following behavior). In seminal studies, access to adult attention, access to preferred items (e.g., toys), and escape from demands (e.g., self-care, academic tasks) were carefully arranged as consequences to test their causal relation to problem behavior (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). The orderly relations that emerged between problem behavior and changes in one or more of these consequences revolutionized the behavior-analytic approach to both assessment of and intervention with problem behavior.

Next, FBA procedures were extended to various diagnoses, ages, degree of disability, and residence (e.g., Iwata et al., 1994) as well as across numerous forms of problem behavior (e.g., Beavers, Iwata, & Lerman, 2013; Hanley, Iwata, & McCord, 2003). Along with these demonstrations supporting the reliability of functional analysis came evidence of its validity, as researchers and practitioners achieved more tailored, safe, effective, and efficient outcomes when interventions were based on behavioral function. In addition, unexplained and contraindicated effects of interventions were clarified by the understanding of person-specific functions of problem behavior. The generality of FBA continues to be explored in a range of clinical disorders across the lifespan, including pediatric feeding disorders, sleep disorders, attention deficits, eating disorders, substance use disorders, anxiety, and depression, among others (e.g., Sturmey, 2007).

Theoretical Context

The theoretical context of FBA highlights the dynamic interplay between behavior and its consequences (i.e., *operant learning theory*) and exists in synchrony with prevailing biological and sociocultural theories of abnormality. An exhaustive account of a child's problem behavior, for instance, requires assessing variables across a range of proximities to problem behavior. Heritable variables related to impulsivity, biological variables related to the child's health, cultural variables related to childrearing practices, and historical variables related to the caregiver's upbringing are just a few of the more distal factors influencing the development of problem behavior. More proximal variables such as the teacher's curricular decisions and the caregiver's well-being exert additional influence. Among this multitude of variables, the FBA process focuses on the proximal, discrete events closely surrounding problem behavior. Those events are typically classified by their presence before (called *antecedents*) or after (called *consequences*) a single occurrence or cluster of behaviors. FBA also has the capacity to rule out causal influence of social variables, elucidating other pathways (e.g., underlying organic causes) for the development of problem behavior.

An example is displayed in Figure 1. Assume that an FBA identified that a child's destructive behavior was proximally influenced (via negative reinforcement) by escape from homework. Caregiver prompts to complete the homework (the antecedent) contribute to the aversiveness of the situation. This in turn establishes the value of escaping homework (the consequence) for the child. A chronic pattern of destructive behavior in

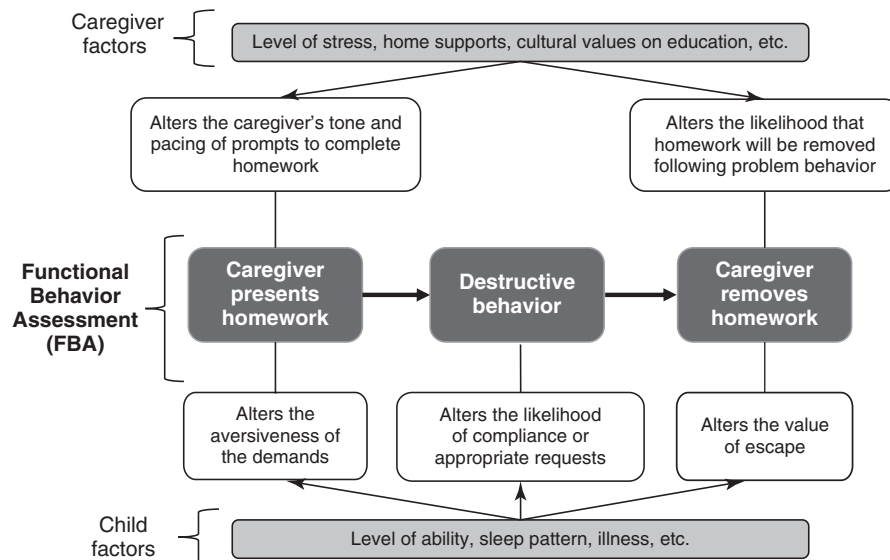


Figure 1 A hypothetical example of an integrated theoretical framework for the study of a child's destructive behavior. Discrete, proximal variables displayed in black boxes are the focus of the FBA process. More distal variables, displayed in gray boxes, influence the availability, probability, and strength of events surrounding the problem behavior.

this context is the interaction between these immediate antecedents and consequences and more distal factors. For instance, the caregiver's tone and pacing of initial prompts and discontinuation of homework after experiencing problem behavior are likely to be affected by their current level of stress, the availability of support for them, and the overall value they place on homework activities. In addition, the child's difficulties with the homework and likelihood of exhibiting appropriate behaviors in this context (e.g., asking for help or a break) may be influenced by the child's level of disability, communication skills, sleep patterns, and health. Thus, an integrated theoretical framework reveals the impact of distal variables on the availability, probability, and strength of the more proximal antecedents and consequences for problem behavior that constitute the FBA process.

2 Functional Behavior Assessment in Practice

In some texts, FBA is mischaracterized as a set of standardized procedures, predictably ordered, and intractably prescribed. In both research and practice, FBA is a broad and iterative *process*. The process may include interviews, observations, tests, and combinations of these. As an analogy, an individual may consider seeking the advice of a doctor for a severe allergic reaction to an unknown toxin. The doctor begins by asking them to describe their symptoms and to report common exposures; the individual's input directly influences the doctor's next steps, which may include observations and medical tests to obtain additional, confirmatory information prior to recommending an

intervention. The visit is considered a success if the doctor's process results in a clear prescription that effectively eliminates future allergic reactions. Furthermore, the individual's satisfaction with the recommended intervention is reflected in their unwavering adherence to it. In a similar way, the FBA process involves an exchange of information between caregivers and professional behavior analysts. The process varies based on the presenting problem behavior and the context of its occurrence in the child's life. Caregivers will consider the FBA process a success if it results in a safe, effective intervention. Outcomes like these require a process that is flexible in nature and responsive to new information obtained throughout.

Building Rapport

The FBA process relies heavily on caregivers serving in an active role as stakeholders. Rapport building with stakeholders starts when the behavior analyst initially describes the need and rationale for the FBA, details its procedures, and gains consent for its use. It is helpful to the FBA process if the stakeholder possesses a basic understanding of the function of behavior in its everyday context and can accept their potential role in its emergence, maintenance, and future reduction; this can be accomplished by a skilled analyst who invites the stakeholder into the process using everyday explanations, a nonjudgmental tone, transparency, and empathy. Rapport is further built throughout the FBA process by considering the stakeholder's schedule, priorities, preferences, and capabilities. For example, scheduling an interview with a teacher on their only break for lunch is usually less preferred than securing a substitute for a brief period of their classroom time. Ways to achieve rapport are seldom described in FBA research, but the experienced analyst will understand that establishing rapport early in the process is essential to success in practice.

Gathering Information and Developing Hypotheses

The focus of much FBA research is on how information is gathered on the child's behavior and context. Several indirect (e.g., structured interviews), descriptive (e.g., naturalistic observations), and experimental (e.g., testing attention as a potential cause) formats exist by which information is gathered by the behavior analyst during an FBA. Many textbook chapters have already been devoted to detailing these existing formats (e.g., Neef & Peterson, 2006); thus, they will not be reviewed extensively here. Rather, the necessary outcomes of the information-gathering process, regardless of format, will be discussed.

First, the behavior analyst must collect enough preliminary information to define the behavior, identify contexts the child regularly experiences, build hypotheses about the relations between behavior and its context, and design a measurement system. Often, this preliminary information is gathered during an initial interview with stakeholders and is confirmed or refined by observations. One distinguishing feature of behavior-analytic approaches to problem behavior is the insistence on observable and measurable dimensions of behavior and context. For example, a referral of child meltdowns during dental visits would require the analyst to precisely define types of problem behavior that constitute the meltdown and the relevant events during the dental visit. Events deemed relevant are those that are ongoing, typically in close proximity to the behavior, and that

can be directly observed and measured in a manner that produces high interobserver reliability. The rationale for this level of precision and objectivity is the analyst's interest in eventually confirming causal (functional) relations. However, the analyst also gathers background information on things that cannot be directly observed but that may still inform the FBA or intervention, such as medical and educational histories.

Confirming Functions

After preliminary information is gathered via interviews and observations, hypotheses about potential influential events can be made. With that said, behavior analysts are rightfully cautious to refrain from generating a conclusion and designing an intervention at this point of the process. The subjective information gathered in an interview is unlikely to align precisely with what has been and is occurring in the context of interest. Thus, interviews are used to gather rich details and preliminary ideas but not to prescribe intervention alone. Direct observations of behavior have the benefit of objectivity, but can easily deplete resources (e.g., time) and are shown to be invalid indicators of behavioral function when used alone. Direct observations are instead used to confirm potentially relevant contexts (via correlational analyses), to refine behavioral definitions, and to gather data on the frequency and intensity of problem behavior to inform intervention goals.

To confirm a functional relation between the problem behavior and relevant contextual events, an analyst must directly test the effects of those events in what is called a *functional analysis*. At a basic level, a functional analysis involves thoughtfully designing brief periods (e.g., several minutes) in which events hypothesized to cause problem behavior are presented and removed. During these periods, the analyst directly measures the level of problem behavior exhibited by the child. The absence of hypothesized events serve as control periods in which problem behavior should be absent; the presence of events serves as test periods, during which problem behavior should increase. For example, a child whose furniture climbing in the classroom is maintained by teacher attention may experience several 5-minute sessions in which attention is and is not present before and after problem behavior. In the functional analysis, the child's responding will show the following orderly patterns. First, climbing will momentarily increase when attention is absent and its delivery is contingent on the occurrence of climbing. Second, climbing will be minimal or absent when attention is freely available, even if other social variables (e.g., being presented with work) are introduced in those other conditions. Knowledge of contexts that are both influential and incidental to problem behavior helps the analyst achieve the most tailored intervention program. Furthermore, the functional analysis minimizes the influence of potential bias or erroneous assumption by directly testing the influence of a range of variables on problem behavior.

The functional analysis is similar, in theory, to why the doctor from the previous scenario may recommend and conduct an allergy test. Based on the patient's descriptions of the presenting symptoms, the doctor generates hypotheses about potential contributing events. Before recommending medical intervention, however, the doctor attempts to confirm allergens via a test. Prior to the test the patient's skin shows no reaction, but soon after the potential allergens are applied to the skin acute inflammation is observed. Minimal and highly controlled exposure to the allergens ensure the patient's safety. In

this analogy, the allergens tested are akin to the events tested in the functional analysis, and the acute inflammation is akin to the momentary increase in problem behavior. Both an allergy test and a functional analysis provide precise and valid information on the cause of the problem insofar as the test included the correct causal factors. If either test produces unclear results, additional information may be gathered and follow-up tests conducted until a conclusion is reached. This latter point emphasizes the iterative nature of the FBA process.

Predicting and Guiding Intervention

An important outcome of the FBA process is to predict and guide the development of a function-based intervention. When an analyst has identified proximal, discrete events that influence problem behavior, the modification of those events becomes the focus of intervention. To expand on the earlier example, the child with problematic climbing behavior will receive a program that modifies the social context (i.e., antecedent), the timing of attention deliveries (i.e., consequences), or both. The social context can be modified by enriching the classroom with more socially stimulating activities. The timing of attention deliveries can be modified by setting a timer to deliver attention at frequent intervals that are shorter than those typically produced by problem behavior. The attention delivered following climbing may be minimized (used only to ensure safety), with more rich interactions scheduled to occur in the absence of climbing. Beyond modifying antecedents and consequences identified by an FBA, the analyst may design a skill-building program that directly addresses the function of problem behavior. For instance, the child may be taught to appropriately request attention and to identify periods of time when attention is and is not available. A standard of practice in applied behavior analysis is to evaluate the effect of function-based interventions on both problem and appropriate behavior. Thus, another important benefit of the FBA process is to generate data that serve as a baseline upon which intervention effects can be evaluated.

Standardized Protocols

Iterative processes like the FBA are difficult to standardize. Nevertheless, practitioners may be attracted to the systemization of therapeutic procedures because it expedites the training process, enables an evaluation and comparison of reliability and validity, and promotes high procedural integrity. Certain features of the FBA process are so often used that they are considered a standard, or even a gold standard, of the field. For example, a study by Sturmey (1994) compared the psychometric properties of several standardized FBA interviews. Likewise, a chapter by Thompson and Borrero (2011) detailed common formats for descriptive assessments in the FBA process. For functional analyses, a variety of commonly used protocols exist (e.g., Iwata & Dozier, 2008), with each containing the necessary components of a single-subject experimental design (at least one test and one control condition, presented in a manner to rule out confounds).

Skilled behavior analysts, however, recognize that optimal outcomes are achieved with a flexible approach that allows for variation to standards as indicated throughout the FBA process. For instance, when standard protocols have failed to produce clear outcomes, a host of modifications have been made with success (e.g., Schlichenmeyer, Roscoe, Rooker, Wheeler, & Dube, 2013). Such flexibility comes with a deep

understanding of the benefits and limitations of various approaches to assessment, along with a solid foundation in the principles of behavior analysis and single-subject design.

3 Current and Future Applications of Functional Behavior Assessment

Function-Based Interventions

As briefly described earlier, the FBA process is a first step in the design of personalized interventions aimed at reducing problem behavior. That is, knowing the cause of problem behavior is essential to identifying precisely what features of the child's environment to change or reengineer, and how and when to do that. The FBA process also indicates which features of the child's environment are irrelevant to the problem behavior, so that unnecessary resources are not expended in intervention design. Interventions tailored to the outcomes of an FBA are often called *function-based interventions*. Function-based interventions are sometimes contrasted with *arbitrary interventions*, in which intervention components are not linked to the functional characteristics of behavior. For example, consider a child who is referred for aggression toward peers. Without knowledge of the function of the behavior, an intervention that provides the child with access to a preferred piece of candy each hour in which they do not engage in aggression may reduce aggression. However, if the FBA process confirms that the cause of the child's aggression is the attention they receive from peers following aggression, the candy-based intervention is arbitrary to that function. Instead, a function-based intervention may involve teaching the child how to acquire attention from peers using more socially acceptable behavior that leads to meaningful peer interactions.

Function-based interventions are rooted in basic behavioral research and have garnered strong empirical support across a range of human applications. There are at least six critical features of a function-based intervention. These include (1) conducting an initial FBA to identify the function of the problem behavior; (2) designing manipulations to antecedent events and consequences that are relevant to the function of the problem behavior; (3) teaching skills that influence the manner in which the child accesses the reinforcers relevant to the function of their problem behavior; (4) collecting baseline data; (5) demonstrating socially significant effects of intervention using an experimental design; and (6) evaluating the persistence and generalization of the improvements in behavior. Because the FBA process identifies active reinforcers for problem behavior, function-based interventions are *reinforcement based*. By contrast, punishment procedures are predominantly arbitrary in relation to the function of problem behavior or, worse, may be countertherapeutic if the reinforcer for problem behavior remains unknown. A common example is the use of time-out, which may increase problem behavior that is influenced by an undetected escape function.

It is considered best practice to teach children new skills that "replace" problem behavior following an FBA. Teaching new skills constitutes *differential reinforcement of alternative behavior* (DRA), in which the functional reinforcer for problem behavior is delivered following an adaptive, alternative response. A dominant application of DRA involves teaching a *functional communication response* that requires the

child to request the reinforcer for problem behavior using voice, sign, or augmented communication devices (e.g., Tiger, Hanley, & Bruzek, 2008). Recent research in FBA and function-based interventions highlights the importance of extending intervention beyond teaching communication responses to the training of tolerance for the unavoidable delays to, and denials of, functional reinforcers. For example, a child may appropriately communicate their desire for access to a toy that is not available and the caregiver may respond “Not now.” It is during these periods of “no access” that problem behavior has a higher probability of reemerging. Future applications of function-based interventions are likely to extend both the repertoire of adaptive alternative responses and the conditions under which alternative responses persist under less than ideal circumstances. Making these strides in research will help the field achieve durable outcomes that follow a child as they grow and encounter new contexts.

Other common function-based interventions that modify the context of problem behavior, but do not teach new skills, include providing the reinforcer independent of problem behavior (*noncontingent reinforcement*), withholding the reinforcer following problem behavior (*extinction*), and providing the reinforcer following periods of time without problem behavior (*differential reinforcement of other behavior*). Each of these intervention components has unique strengths and weaknesses and, because of their weaknesses, are often used in combination with DRA. Decisions about what combination of components to include in a function-based intervention are based on the initial FBA outcomes and situational factors surrounding the implementation of intervention.

Emerging research suggests that functional analysis outcomes can predict intervention efficacy in some cases. For example, researchers have detected two distinct patterns (i.e., *subtypes*) of self-injurious responding during functional analyses that predict treatment responsiveness (e.g., Hagopian, Rooker, & Yenokyan, 2018). Subtype 1 occurred most often during functional analysis conditions without another person present (alone condition) or when the person present did not respond to any behavior (ignore condition) and occurred rarely when toys and caregiver attention were freely delivered in the absence of demands (free-play condition). This subtype was highly responsive to interventions based on reinforcement alone. By contrast, subtype 2 occurred during all functional analysis conditions and was highly resistant to reinforcement-based interventions, often warranting intensive intervention components such as response-contingent restraint and protective equipment. Hagopian et al. (2018) applied the quantitative approach taken in identifying predictive *biomarkers* of diseases to determine whether the subtypes could serve as predictive *behavioral markers*. Response patterns in the functional analysis—in particular the degree of differentiation in self-injury between conditions—served as *good to excellent* behavioral markers for responsiveness to treatments comprised of reinforcement alone. The generality of these subtypes was established in a replication study that included published cases from other treatment centers.

Etiology of Behavior Disorders

The applications described above are a part of clinical case management, in that client referrals initiate personalized FBAs, which in turn inform individualized function-based interventions. This process is reactive because client referrals are made only when

problem behavior is harmful enough to warrant intervention. FBA applications, however, extend well beyond clinical case management and can also enhance our understanding of the etiology of problem behavior. For example, the research on predictive behavioral markers described earlier may not only allow behavior analysts to design effective interventions more quickly but may also guide neuroscience research toward identifying specific, biological mechanisms for self-injury. That is, the distinct subtypes of self-injury identified by the researchers suggest different reinforcement mechanisms for self-injury at the biological level (i.e., the sources of private stimulation or attenuation produced by the self-injury are distinct). Other studies (e.g., Richman & Lindauer, 2005) that have applied functional analysis longitudinally have determined the trajectory of some of the earliest forms of problem behavior and subsequent changes in its intensity, form, and function across a child's early development.

Recent research in FBA also shows an increasing focus on the refinement of risk and protective markers as well as interventions that prevent problem behavior. This research relies on the assumption that variables causally related to the maintenance of problem behavior are also influential during its initial emergence. Using this line of reasoning, the FBA process has been applied to a range of problem behaviors that are not yet destructive but that may become destructive over time. A study by Fahmie, Iwata, and Mead (2016) documented the increasing severity of problem behavior through measurement of a range of both problem and appropriate responses to common contexts for severe behavior. The authors used the FBA process to track trajectories of problem behavior over time and to assess the effects of an intervention developed to prevent more severe forms of behavior from emerging. This study relates to a collection of other research showing that, when our best function-based interventions are applied early in development, they can prevent problem behavior from emerging in young children.

An example is a line of research on the Preschool Life Skills program (Luczynski & Fahmie, 2017). As indicated earlier, the most common effective intervention to decrease socially mediated problem behavior is to teach communication responses that produce access to the same reinforcers influencing problem behavior. The Preschool Life Skills program uses an active teaching approach to establish 13 skills across four units—compliance, functional communication, delay and denial tolerance, and friendship—by providing a rationale and description of each skill, modeling of the skill, arranging authentic learning opportunities, and delivering differential consequences. The program's successful outcomes support routinely arranging situations similar to that of a functional analysis as a context to teach functionally relevant skills proactively.

Classification of Behavior Disorders

An additional frontier in FBA is its contribution to the classification and diagnosis of clinical disorders. Prevailing classification systems (e.g., *Diagnostic and Statistical Manual of Mental Disorders*) rely more heavily on behavioral form than function. However, a growing acknowledgment of the multifinality (i.e., similar processes can beget different pathologies) and equifinality (i.e., different processes can beget similar pathologies) of clinical disorders presents an opportune area for application of the functional perspective on problem behavior. For example, a traumatic experience may increase the aversiveness of going to school, making frequent escape from school highly valuable. This

process of negative reinforcement can maintain a variety of distinct problem behavior forms, such as substance use, truancy, excessive sleep, and violent acts, to name a few. The classification and treatment of those problems may be well informed by knowledge of their unifying escape function (multifinality). Likewise, a group of children can present with exactly the same form of problem behavior but with different functions. Self-injurious behavior, for example, tends to produce quick and strong reactions from onlookers. However, some children's self-injury is maintained by distinct social reinforcers (e.g., attention, escape, access to items), whereas other children's self-injury is maintained by automatic reinforcement (e.g., sensory stimulation, escape from internal pain). The unique pathways leading to the development of self-injury (equifinality) can be illuminated by the FBA process.

One final example of how the FBA process can enhance classification is in behavioral research on attention-deficit/hyperactivity disorder (ADHD). Neef et al. (2005) evaluated how appropriate behavior (academic engagement) was influenced by changes to the events surrounding its occurrence. These events included the difficulty of the academic problem (*antecedent*) as well as the rate, immediacy, and quality of the reinforcer (*consequence*). Using a single-subject experimental design adapted from research in functional analysis, the authors showed that the immediacy of reinforcement was more influential to those with ADHD than those without. These outcomes show how a pattern of "impulsivity" (often classified by behavioral topography) may be operationalized in the diagnosis of ADHD. Thus, applications of FBA procedures to clinical diagnoses have the potential to enhance the objectivity and reliability of classification, ultimately leading to improvement in client care.

SEE ALSO: A Behavior-Analytic Theory of Child Development; Antecedent Interventions; Consequent Interventions; Motivation in Childhood; Self-Injurious Behavior; Tantrums; Verbal Behavior

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