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EMERGING THEMES IN THE FUNCTIONAL ANALYSIS OF PROBLEM BEHAVIOR

EDWARD G. CARR

STATE UNIVERSITY OF NEW YORK AT STONY BROOK AND
DEVELOPMENTAL DISABILITIES INSTITUTE

The functional control of problem behavior is generally conceptualized as involving attention, escape, sensory reinforcement, and tangible factors. Our analytic tools have now reached a level of sophistication that makes possible consideration of several new, emerging themes in the area of functional analysis. First, we need to examine other functional properties of problem behavior involving social avoidance, biological reinforcement, and respondent conditioning factors. Second, we need to explore the role of context, including social factors such as group interactions, sequencing of tasks and activities, presence or absence of specific individuals, and crowding; as well as biological factors, such as physical illness, exercise, and drugs. Finally, we must consider the multidimensional character of assessment in naturalistic settings and the practical need for developing descriptive analytic procedures that complement and produce results that are congruent with those obtained from traditional functional analyses.

DESCRIPTORS: functional analysis, problem behavior, context, developmental disabilities

Research Background

The field of applied behavior analysis began with several powerful demonstrations of how functional analysis could be used to discover the conditions under which problem behavior occurred (e.g., Hawkins, Peterson, Schweid, & Bijou, 1966; Lovaas, Freitag, Gold, & Kassorla, 1965; Patterson, Littman, & Bricker, 1967; Wahler, 1969). However, the exigencies of having to deal with dangerous aggression and self-injury soon made functional analysis a lesser priority. Technology took precedence over understanding (Carr, Robinson, & Palumbo, 1990; Deitz, 1978). Although a purely technological approach (i.e., an approach divorced from functional analysis) proved to be successful in many cases, there were treatment failures as well (Carr, Robinson, Taylor, & Carlson, 1990; Scotti, Evans, Meyer, & Walker, 1991). These failures prompted investigators to return to what is arguably the central idea of applied behavior analysis, namely, that intervention efforts should begin with a thorough functional analysis and that hypotheses derived from such an analysis should form the basis for choosing and designing treatments (Carr, 1991; Durand, 1987).

A conception of severe problem behavior emerged that highlighted the multiple functions served by such behavior (Carr, 1977). Functional analysis has identified four categories of controlling variables: attention seeking (Carr & McDowell, 1980; Lovaas et al., 1965; Martin & Foxx, 1973), escape from tasks (Carr & Newsom, 1985; Carr, Newsom, & Binkoff, 1976, 1980), the generation of sensory reinforcement (Favell, McGimsey, & Schell, 1982; Rincover & Devaney, 1982), and access to tangible items or events (Derby et al., 1992; Durand & Crimmins, 1988). The seminal paper by Iwata, Dorsey, Slifer, Bauman, and Richman (1982) was a major breakthrough in assessment research because it translated a substantial body of empirical findings into a practical and now widely used procedure for identifying the functional properties of problem behavior, thereby facilitating treatment planning.

Now that we have a firm basis for approaching assessment issues, we are in a position to ask sys-

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Reprints may be obtained from Edward Carr, Department of Psychology, State University of New York, Stony Brook, New York 11794-2500.

tematic questions concerning the extension of our current analytic tools to encompass new aspects of the field of problem behavior. I see three emerging areas of inquiry: (a) the examination of other functional properties of problem behavior, (b) the influence of context, and (c) the multidimensional character of naturalistic assessment.

Examining Other Functional Properties

Attention seeking, escape, sensory reinforcement, and tangible events are key variables in any analysis of problem behavior, but they are not the only variables. For example, analyses of escape factors have thus far focused almost exclusively on putatively aversive tasks, such as those involving academic demands (Carr & Durand, 1985; Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990). However, recent data suggest that the escape variable needs to be analyzed further. Specifically, some individuals with disabilities exhibit high levels of problem behavior when they receive attention from others but are well behaved when they are asked to perform tasks (J. Taylor & Carr, 1992a). The behavior of these individuals is appropriate until they receive attention from others, at which point it deteriorates. Thus, there appear to be two types of escape—a well-researched type involving task avoidance and a newly researched type involving social avoidance. A common treatment strategy for reducing problem behavior in individuals who avoid tasks is to teach them to request assistance in completing the task or ask for a break during the task (Carr & Durand, 1985; Wacker et al., 1990). This strategy is not likely to work for individuals whose problem behavior functions to avoid social contact with others. Thus, from the standpoint of designing treatments, it is necessary to modify assessment strategies so that a discrimination can be made between individuals who engage in task avoidance and those who engage in social avoidance.

In addition, some forms of self-injury are now believed to be maintained by biological reinforcers. For example, the opiate hypothesis of self-injury holds that self-injurious behavior results in the release of endogenous opiates, producing a natural "high" for the individual who displays the behavior (Cataldo & Harris, 1982; Sandman, 1991). In this sense, individuals may become addicted to their own problem behavior. Opiate blockers such as naltrexone have been used to prevent the "high," with the result that there is a decrease in self-injury (Barrett, Feinstein, & Hole, 1989; Sandman, Barron, & Colman, 1990). Alternatively, opiate blockers may function to decrease the pain threshold, thereby making the emission of self-injurious behavior punishing. Irrespective of the mechanism involved, current assessment strategies are inadequate for identifying the subgroup of individuals for whom biological reinforcement is a critical variable.

At a categorical level, both task avoidance and social avoidance are examples of negative reinforcement. Seeking attention or tangible items and endogenous opiate production are examples of positive reinforcement. A question arises as to when it is useful to make distinctions among the structural variants or subcategories (e.g., attention vs. tangible items vs. endogenous opiates) that comprise a given functional category. Ultimately, distinctions are most important from the standpoint of treatment planning. For example, functional communication training may be useful in addressing problem behavior related to the subcategory of attention seeking and yet be irrelevant for dealing with behavior maintained by the subcategory of endogenous opi ates. Even within a subcategory, it may be useful to extend functional analysis so that, for example, distinctions are made among different forms of attention. Thus, if a child's head banging increases following attention from one adult but not another, then it is certainly important to identify this pattern of differential responding because the attention-seeking function pertains only to one adult. From the standpoint of intervention, then, the value of a functional analysis does not rest solely in identifying generic categories of functional control (e.g., positive vs. negative reinforcement). Instead, it is frequently helpful to extend the analysis to identify the various subcategories of a given function as well as important variants within each subcategory. One can therefore envision an important research task for the field, namely, providing guidelines as to

how best to conduct sequentially refined series of functional analyses that progressively identify factors critical for treatment planning. Thus, analysis might begin by focusing on the identification of functional categories and end with an analysis that focuses on a given subcategory (e.g., avoidance of short vs. long tasks, as illustrated in a study by Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991).

Occasionally, even a thorough functional analysis fails to identify a pattern of responding that is systematically differentiated across environmental conditions. Such a pattern may indicate that biological reinforcement is salient. Alternatively, the pattern might indicate that the behavior may still be under environmental control but that the mechanism is not operant. For example, in the animal learning literature, there have been demonstrations that both aggression (Azrin, Hutchinson, & Sallery, 1964) and self-injury (Gluck, Otto, & Beauchamp, 1985) can be elicited by painful stimuli. That is, respondent conditioning may play a role in the control of problem behavior. Although respondent factors have been incorporated into theoretical accounts of problem behavior in humans (Romanczyk, 1986), they have not yet been incorporated into the structure of functional-analytic procedures. In sum, undifferentiated patterns of responding obtained from traditional functional analysis should prompt investigators to examine other properties of behavior including, but not limited to, those influenced by respondent conditioning, biological reinforcement, and social avoidance.

The Influence of Context

All behavior has a context, including those behaviors that are studied in functional analysis research. However, the nature of the context in which functional analyses are carried out is seldom a topic for systematic study. Typically, a single individual (the subject) is assessed by a single experimenter (the assessor) using somewhat restricted forms of attention, tasks, and play materials. In using the term *context,* I am referring to the countless stimulus parameters, both environmental and biological, that operate both within and outside of assessment sessions that can interact with one another to alter the results of the analyses, contribute to data instability, and make comparisons across studies difficult. For example, Carr et al. (1980) used an analogue situation to study aggressive behavior maintained by negative reinforcement in 2 children diagnosed as retarded. Each day, a child was presented with the same academic demands. Yet, notwithstanding the consistency of the demand condition (i.e., same child, adult assessor, and task), the level of problem behavior changed as much as 10-fold within the condition, rarely occurring on some days, and occurring at very high levels on other days. Teachers attributed this variability to changes in context involving biological events (such as respiratory infection) and social events (such as the child's recent participation in a classroom party). An emerging literature now suggests that these observations were not isolated occurrences but that the influence of context is both pervasive and worthy of examination.

The study of social systems illustrates well how functional analysis procedures can be extended to examine contextual variables. As noted, traditional functional analysis is dyadic in nature, involving a single individual (the subject) and a single experimenter (the assessor). Yet, many social situations are nondyadic. Consider a study by J. Taylor, Sisson, McKelvey, and Trefelner (1993) involving the attention-seeking problem behavior of a young girl diagnosed as retarded. As has been reported many times (e.g., Carr & Durand, 1985), low levels of adult attention sometimes occasioned problem behavior. What makes the Taylor et al. study unique, however, is that social context was manipulated. Specifically, in one context, the adult limited attention to the child by speaking to another child. In a second context, the adult limited attention by speaking to another adult. Problem behavior did not occur in the former context but was frequent in the latter. By broadening the social context beyond the dyadic situation characteristic of most functional analyses, Taylor et al. identified new forms of control for problem behavior hitherto unreported in the literature. Further affirming the important role of social context, recent studies of triadic interaction (2 child subjects in combination

with 1 adult subject) demonstrate the impact of child misbehavior on adult teaching practices as well as the manner in which adults distribute their attention among different children (Carr, Taylor, & Robinson, 1991; J. Taylor & Carr, 1992b). Other systems variables that affect the probability of problem behavior include the nature and sequence of activities (Brown, 1991; Horner, Day, Sprague, O'Brien, & Heathfield, 1991; Kennedy & Itkonen, 1993; Krantz & Risley, 1977; Mace et al., 1988; Winterling, Dunlap, & O'Neill, 1987), the presence or absence of specific people in an individual's social setting (Touchette, MacDonald, & Langer, 1985), and crowding or population density (Boe, 1977; McAfee, 1987).

Context can also be biological in nature and can involve factors such as physical illness, exercise, and drugs. For example, drugs such as caffeine can influence aggressive behavior. Podboy and Mallory (1977) studied the effects of caffeine on the aggressive behavior of a group of adults diagnosed as retarded. They served caffeinated and noncaffeinated coffee in a double-blind study. Aggressive behavior decreased during the condition with noncaffeinated coffee. These data suggest that changes in caffeine level superimposed on an ongoing functional analysis could alter the results of the analysis. Again, it is clear that context needs to be studied so that its effects can be measured, thereby permitting meaningful interpretation of assessment results.

Strenuous exercise also has physiological effects that can influence the level of problem behavior. Baumeister and MacLean (1984), for example, introduced a jogging program for 2 adults diagnosed as severely retarded. Stereotypy and self-injury both decreased from baseline levels as the exercise requirement increased. Other studies have reported similar findings (Kern, Koegel, Dyer, Blew, & Fenton, 1982; McGimsey & Favell, 1988). It is plausible that unless attempts are made to standardize the level of physical activity prior to conducting a functional analysis, the level of problem behavior observed during the analysis could fluctuate across days, more as a function of prior activity level than as a function of the variables manipulated during the functional analysis per se.

Physical illness and discomfort may also constitute a biological context that exacerbates problem behavior. Some literature suggests that self-injury and aggression become more frequent and severe in individuals who suffer from urinary tract infections and constipation (Gunsett, Mulick, Fernald, & Martin, 1989), allergies (Gardner, 1985), middle ear infections (deLissovoy, 1963), and menstrual discomfort (D. Taylor, Rush, Hetrick, & Sandman, 1993). The impact of these biological variables on problem behavior needs to be examined systematically so that their functional relationship to aggression and self-injury can be determined and so that the assessment situation itself can be better standardized.

Social and biological contexts may constitute setting events; that is, they are classes of stimuli that change ongoing stimulus–response relationships (Bijou & Baer, 1961). Alternatively, these contexts may represent establishing operations that change the reinforcing or aversive properties of response consequences, thereby influencing the likelihood of problem behavior (Michael, 1982). The study of setting events and establishing operations may offer an important opportunity to understand the impact of context on functional-analytic outcomes, thereby helping to generalize assessment results to naturalistic situations in which contextual variability is the rule rather than the exception.

Multidimensional Character of Naturalistic Assessment

Functional analysis analogues are powerful because they control sources of variance experimentally, thereby permitting strong statements about which factors evoke and maintain problem behavior. Such power, however, is sometimes bought at the expense of being able to sample the full range of antecedent, consequent, and setting-event variables that are generally present outside the analogue situation (i.e., in the natural environment of home, school, and community). Sampling the full range of controlling variables for a given individual is potentially quite costly in terms of personnel and time. For example, we recently completed a 5-year study of severe problem behavior in 3 individuals with developmental disabilities (Carr et al., 1994).

Over time, we observed problem behavior across work, school, home, and neighborhood settings and found that there were more than 100 situations per individual that set off aggression and self-injury. Even though most of these situations represented variations of two generic functional categories (i.e., positive and negative reinforcement), it was critical from the standpoint of treatment planning to identify important variations even at the subcategory level. For example, within the attention subcategory for 1 individual, four major types of situations were identified in which problem behavior escalated: (a) during independent work assignments; (b) when the teacher spoke to another adult; (c) during group activities; and (d) when making transitions from one activity to another. Being able to specify controlling variables at this refined level was very helpful in designing a series of different interventions that were uniquely tailored to the stimulus parameters of each situation.

Nothing can replace functional analysis as a research tool to uncover new functional properties of problem behavior and to verify definitively that a given factor does indeed control problem behavior. Nonetheless, we are rapidly reaching the point, in clinical work involving complex community settings, at which we must consider developing supplementary strategies that address the multidimensional character of naturalistic assessment. One approach that merits attention is the hypothesis-driven model developed by Repp, Felce, and Barton (1988). In this approach, direct observations are made in naturalistic situations, and correlations between problem behavior and its antecedents and consequences are noted. Based on these observations, hypotheses concerning the control of problem behavior are formulated, and treatments derived from these hypotheses are designed. Positive treatment outcomes support the validity of the hypothesis even though they cannot do so definitively, as they do in the traditional functional analysis. Carr and Carlson (1993) found this model to be practical in treating problem behavior that had been observed in 18 different community situations in 3 adolescents. In terms of treatment planning, the cost of identifying the stimulus parameters associated with the control of problem behavior in the various situations would have been prohibitive had a traditional functional analysis been used.

A major research question underlying the hypothesis-driven model concerns whether the descriptive analyses that characterize this model are generally corroborated by subsequent functional analyses. Research to date has produced mixed results. Some investigators report a convergence of findings from the two approaches (Dunlap et al., 1991; Lalli, Browder, Mace, & Brown, 1993; Sasso et al., 1992), whereas others report divergence (Lerman & Iwata, 1993; Mace & Lalli, 1991). Apparently, there are conditions, not yet systematically identified, under which descriptive and experimental analyses yield similar results. Two studies suggest that one such condition may be the degree to which the descriptive and experimental settings share similar stimulus features (Dunlap et al., 1991; Sasso et al., 1992). This observation may provide a useful heuristic for pursuing research on the question of convergence. Ultimately, the question of congruence between experimental and descriptive analysis is not simply academic. Unless we can develop plausible alternatives to formal functional analysis analogues, we will always be confronted with the issue of what to do, practically, when trying to assess problem behavior in naturalistic settings in which the control of such behavior for a given individual is frequently influenced by multiple antecedent, consequent, and setting-event variables.

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