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Within-Session Patterns of Responding during Functional Analyses: The Role of Establishing Operations in Clarifying Behavioral Function

Henry S. Roane, Dorothea C. Lerman, Michael E. Kelley, and Carole M. Van Camp

Louisiana State University

Functional analysis procedures have been demonstrated to be effective for identifying the operant mechanisms underlying problem behavior. However, functional analyses sometimes yield results that are undifferentiated (i.e., show similar levels of responding across test conditions). Within-session (i.e., minute-by-minute) analyses of response patterns during undifferentiated functional analyses have proven useful in clarifying behavioral function. This study extends previous research by examining within-session changes in responding associated with variations in relevant establishing operations. Levels of problem behavior during the presentation and removal of reinforcement were compared when responding occurred in test conditions associated with sources of social reinforcement (i.e., access to attention, materials, escape). Results showed that changes in responding associated with changes in relevant establishing operations could be examined to clarify behavioral function. © 1999 Elsevier Science Ltd

Numerous research findings indicate that functional analysis methodologies are effective for identifying the reinforcing consequences that maintain problem behavior (e.g., self-injury, aggression, disruption). Based on the procedure described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), func-

Address correspondence to: Dorothea C. Lerman, 236 Audubon Hall, Department of Psychology, Louisiana State University, Baton Rouge, LA 70803. E-mail: dlerman@unix1.sncc.lsu.edu

tional analyses consist of several experimental conditions, each designed to test a potential source of reinforcement for problem behavior. Three or four test conditions and a control condition typically are alternated in a multi-element design. Relatively high levels of responding under one or more conditions indicate which variable(s) likely maintain the target behavior. Interventions based on the results of functional analyses generally are effective in treating problem behavior because the identified maintaining consequence(s) can be withheld following occurrences of the behavior and provided contingent on appropriate behavior (differential reinforcement; Iwata, Vollmer, & Zarcone, 1990).

Nevertheless, functional analyses sometimes yield unclear results (i.e., show similar levels of responding across two or more conditions), even after extended exposure to experimental conditions (Iwata, Pace et al., 1994). Such undifferentiated results may be due to interaction effects across conditions or lack of discrimination among conditions, particularly when a multi-element design is used. Alternatively, ambiguous outcomes may occur if behavior is maintained by automatic consequences or by multiple sources of reinforcement (Vollmer, Marcus, Ringdahl, & Roane, 1995). When functional analysis results are unclear, identification of behavioral function and corresponding treatment development may prove difficult.

Several methods have been developed to clarify undifferentiated functional analysis results. Vollmer, Iwata, Zarcone, Smith, and Mazaleski (1993a) examined within-session patterns of responding across functional analysis conditions. The tenet of this approach was that overall response rates may be similar during two or more conditions of a multi-element functional analysis even though patterns of responding may vary within and across conditions. For example, response bursts may occur during the initial part of a session due to carryover effects from a previous session, resulting in similar overall response rates in both sessions. In this case, examination of within-session response patterns might help clarify behavioral function (e.g., reveal an initial burst in responding). Vollmer et al. examined responding on a minute-by-minute basis during the first two sessions of each test condition and found that response patterns were consistent with the outcomes of more extended functional analyses. Furthermore, the within-session analysis clarified the results of one undifferentiated functional analysis and permitted rapid identification of behavioral function for all participants. However, results of subsequent studies indicated that minute-by-minute analyses do not always yield differentiated results across test conditions (Kahng & Iwata, 1998; Vollmer et al., 1995).

Other methodologies have been developed to clarify functional analysis outcomes over more extended periods of time. Vollmer, Iwata, Duncan, and Lerman (1993) conducted reversal-type assessments to control for possible interaction effects that may have occurred during initial multi-element analyses. In the reversal assessment, participants were exposed to one condition at a time, presented in sequential but random order. Results showed that the reversal-type

functional analysis clarified assessment outcomes for three of four participants. However, reversals to a control condition did not precede each phase of a test condition to minimize the possibility of carryover or sequence effects between conditions. Thus, in a subsequent study, Iwata, Duncan, Zarcone, Lerman, and Shore (1994) alternated two conditions (test and control) during each reversal phase and compared the outcomes to those of a traditional, multi-element functional analysis. Results showed that this "pairwise" comparison either clarified or replicated results of initial assessment outcomes for the five participants.

Finally, Vollmer et al. (1995) developed a four-tiered method for identifying the variables that maintain aberrant behavior. First, responding was analyzed on a minute-by-minute basis during the first 10 sessions of the multi-element functional analysis. Clear patterns of responding led to treatment development, whereas inconclusive results led to an extended multi-element analysis. If responding remained undifferentiated, a series of no interaction sessions was conducted to determine if the behavior would persist in the absence of social consequences. Continued responding during the no-interaction condition indicated that the behavior was maintained by automatic reinforcement. If responding ceased, the remaining test conditions were re-presented in a reversal design to minimize potential interaction effects. Results showed that 17 of 20 participants exhibited differentiated responding during at least one phase of this assessment.

The minute-by-minute, reversal, and pairwise analyses examined overall response rates during each session or trends in overall response patterns across sessions. However, it is possible that transient changes in responding may occur within each session due to momentary changes in certain motivational variables (i.e., establishing operations (EOs)). An EO is an event that alters the effectiveness of certain consequences as reinforcers and that changes the momentary frequency of behaviors that have previously produced those consequences (Michael, 1993). Due to the presence or absence of an EO, the motivation to engage in certain behaviors is altered. Reinforcer deprivation is an example of an EO. Deprivation establishes certain stimuli (e.g., food, attention) as reinforcers for a given behavior (e.g., self-injury) and increases the likelihood that an individual will engage in behaviors that were previously followed by presentation of these stimuli. Within each session of the functional analysis, levels of responding may be influenced momentarily by the presence or absence of relevant reinforcers, which are withheld in the absence of problem behavior and provided for a brief period contingent on occurrences of behavior. Thus, the motivation to respond may fluctuate across a session if a change in the presence or absence of a relevant reinforcer functions as an EO for problem behavior. For example, if a behavior is maintained by socially mediated positive reinforcement, the absence of attention or tangible items (i.e., deprivation of these items) may increase the motivation to engage in the behavior, whereas the presence of these items (i.e., satiation) may decrease the motivation to engage in the

behavior (Iwata et al., 1990; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993b). As a result, levels of responding should be higher in the absence of attention or tangible items than in the presence of these items. If attention or materials are irrelevant to behavioral function, differential responding should not occur in the presence versus absence of these stimuli. For problem behavior maintained by socially mediated negative reinforcement, the presence of aversive stimuli (e.g., academic tasks) should increase the motivation to engage in problem behavior, whereas cessation of aversive stimuli (i.e., the time-out interval of the escape condition) should decrease the motivation to engage in the aberrant response. If escape is irrelevant to behavioral maintenance, the presence or absence of putative aversive stimuli should not differentially influence response frequency. Finally, when behavior is maintained by automatic reinforcement, the absence of alternative sources of stimulation (e.g., toys, instructions) should increase the likelihood of problem behavior, and the presence of alternative stimuli should decrease the likelihood of behavior (provided that the alternative stimuli compete with the reinforcement for aberrant behavior). To summarize, problem behavior should be more likely to occur when a maintaining reinforcer is withheld relative to when that reinforcer is being delivered (Iwata et al., 1990); thus, a comparison of response levels when the putative reinforcer is present versus absent may help clarify initially ambiguous functional analysis outcomes.

The purpose of this study was to examine the extent to which momentary changes in establishing operations influence responding during the course of a functional analysis by comparing response levels associated with the presence or absence of putative reinforcers. Within-session patterns were examined in conjunction with extended multi-element functional analyses to help clarify functional-analysis results.

METHOD

Participants and Settings

The first five individuals referred to our research program for assessment and treatment of problem behavior were included in this study (with the exception of one individual who did not exhibit the target behavior during the initial functional analysis). Functional analysis outcomes for three participants revealed high levels of responding in one condition relative to the other conditions within approximately 20 sessions. These unambiguous data were used to examine the validity of the within-session analysis (i.e., the degree to which the results of the within-session analysis matched those of the multi-element functional analysis). Functional analysis outcomes for the other two participants remained unclear after about 20 sessions, and a minute-by-minute analysis of the data (Vollmer et al., 1993a) did not yield information about behavioral function. These two cases provided the opportunity to assess the utility of the

within-session analysis as a method of clarifying ambiguous functional analysis results.

Ralph was a 9-year-old boy diagnosed with severe mental retardation and autism, who was referred for assessment and treatment of aggression. He attended a self-contained classroom for children with developmental disabilities. Tacita, a 21-year-old woman diagnosed with severe mental retardation, attended a preparatory school for individuals with developmental disabilities. Tacita was referred for assessment and treatment of inappropriate vocalizations (i.e., screaming), which were severely disruptive in her classroom. Bucky, an 18-year-old man diagnosed with moderate mental retardation, attended the same preparatory school as Tacita. Bucky was referred for treatment of self-injurious behavior (SIB) in the form of scratching, which frequently produced severe tissue damage. Molly was a 5-year-old girl diagnosed with Trisomy 6 Q, who appeared to function in the moderate range of mental retardation but had no formal diagnosis. She attended a non-categorical preschool for children with multiple disabilities. Molly was referred for assessment and treatment of chronic SIB in the form of scratching. Throughout the assessment, she wore protective gloves to prevent tissue damage caused by her SIB. Galen, an 11-year-old boy diagnosed with autism and moderate mental retardation, was referred for assessment and treatment of disruptive behavior that required continuous monitoring in the classroom to prevent serious injury (e.g., pulling objects onto himself). He attended the same school as Ralph but was placed in a different classroom. All participants were ambulatory and exhibited some self-help (e.g., feeding, grooming) and receptive language skills. Bucky, Molly, and Galen exhibited some expressive language skills, although their utterances often were echolalic or difficult to interpret. Ralph and Tacita exhibited no expressive language. All participants responded to social interaction by smiling, laughing, and making eye contact.

Sessions were conducted in empty classrooms at the participants' schools. The rooms typically contained at least one table, several chairs, and desks. The classroom for Galen always contained a variety of items (e.g., books, cabinets, toys) that were necessary for the emission of his target behaviors.

Response Measurement and Reliability

Problem behavior for each participant was defined as follows: aggression (Ralph)—hitting, pinching, or pushing the therapist; screaming (Tacita)—vocalizations above conversation level, not including laughing; scratching (Bucky)—contact of the fingernail to the skin of the hand, arm, or neck, or rubbing the hand against objects (i.e., clothing, desk); scratching (Molly)—moving the gloves in an upward or downward motion against the face, arms, or legs; disruption (Galen)—climbing on tables, pulling objects off shelves, throwing toys, banging toys against hard objects, and knocking over furniture.

Data were collected on lap-top computers by observers seated in unobtrusive

positions in the classrooms. All observers were previously trained in behavioral observation. Observers did not interact with the participants during sessions. For Ralph, Bucky, Molly, and Galen, data on problem behavior were collected using frequency recording and expressed as responses per minute. For Tacita, data on screaming were collected using duration recording and expressed as percentage of session time consumed by the behavior. In addition, data on therapist delivery of reinforcement were collected using duration recording during each test condition of the functional analysis (with the exception of no interaction). A second observer independently collected data during 62% of all sessions. Interobserver agreement for each target behavior was calculated by dividing each session into 60 10-s intervals. During each interval, observers could agree on the exact number of responses (or seconds of the response), agree that no responses occurred, or disagree on the amount of responding that occurred. The agreement coefficient was computed by dividing the number of exact agreements by the number of agreements plus disagreements, and multiplying by 100%. Exact interobserver agreement coefficients for each participant's aberrant behavior were as follows: Ralph—M = 100%; Tacita—M = 95% (range: 77% to 100%); Bucky—M = 98% (range: 82% to 100%); Molly—M = 90% (range: 80% to 97%); Galen—M = 88% (range: 66% to 100%). Exact interobserver agreement coefficients for reinforcer delivery were as follows: Ralph—M = 99% (range: 98% to 100%); Tacita—M = 97% (range: 92% to 100%); Bucky—M = 99% (range: 98% to 100%); Molly—M = 92% (range: 82% to 96%); Galen—M = 92% (range: 89% to 100%).

Procedure

Four to six sessions were conducted daily with each participant, 4 to 5 days per week. All sessions lasted 10 min.

Functional Analysis

The conditions of the functional analyses were similar to those described by Iwata et al. (1982/1994). However, access to the putative reinforcer contingent on occurrences of problem behavior lasted 20 s during all test conditions (except no interaction) to control for the effect of reinforcer access time on levels of aberrant behavior (Fisher, Piazza, & Chiang, 1996). In the attention condition, participants had continuous access to preferred stimuli while the therapist's attention was diverted toward another activity. When aberrant behavior occurred, the therapist provided attention for 20 s. Attention consisted of statements of social concern or reprimands and physical interaction. The attention condition tested for behavior maintained by social positive reinforcement. In the escape condition, academic tasks were presented continuously to the participant using a graduated prompting sequence. Contingent on the occurrence of aberrant behavior, instructional items were removed, and the participant was given a 20-s

break. This condition was designed to examine the effects of negative reinforcement on levels of aberrant behavior. During the no-interaction condition, no leisure or work materials were available, and the therapist did not interact with the participant. No programmed consequences were provided for aberrant behavior. This condition was conducted to determine if aberrant behavior would occur in the absence of social consequences and alternative sources of reinforcement (e.g., toys, attention). In the materials condition, preferred stimuli were removed from the participant at the beginning of the session and access to the items was provided for 20 s contingent on occurrences of problem behavior. The materials condition examined the effects of positive reinforcement (access to preferred stimuli) on levels of aberrant behavior. In the play condition, participants had continuous access to preferred stimuli and social attention, and no instructions were presented. This condition served as a control.

Ralph, Tacita, and Galen were exposed to four test conditions (attention, escape, no interaction, materials) and the control (play) condition; Bucky and Molly were exposed to all but the materials condition. The materials condition was conducted for Ralph, Tacita, and Galen based on pre-assessment interviews and observations suggesting that restricted access to or removal of preferred stimuli was associated with occurrences of problem behavior. Conditions were alternated randomly within a multi-element design. If initial results were undifferentiated, a series of no interaction sessions was conducted to determine if the behavior would maintain in the absence of social consequences (Vollmer et al., 1995). For Galen, these consecutive no interaction sessions were slightly modified. He had continuous access to stimuli (i.e., toys), but no attention was delivered, and no social consequences were provided for problem behavior. Toys were available in this condition because Galen's disruption often involved throwing or breaking toys. The same set of toys was present in each session. Therapists were present in this condition to prevent Galen from injuring himself but did not interact with him otherwise.

Within-Session Analysis

The within-session analysis was conducted simultaneously with the functional analysis and continued until the functional analysis was completed. Test conditions associated with occurrences of problem behavior (other than no interaction) were included in the analysis. First, the total amount of time (in seconds) in which the putative reinforcer was absent and the total amount of time in which the putative reinforcer was present were calculated for each session. The length of time associated with either the presence or absence of reinforcers depended on the level of problem behavior during the session (i.e., a higher response rate resulted in a longer total duration of reinforcer access time). If data on problem behavior were collected using frequency recording, the total number of seconds in which the reinforcer was present or absent was converted to total number of minutes. Next, the total number of responses that

occurred in the presence and absence of the reinforcer was calculated for each session. The rate of problem behavior in the presence versus absence of the putative reinforcer then was calculated by dividing the number of responses that occurred during either time period (reinforcer present or absent) by the total minutes of either time period. For Tacita, the duration of screaming in the presence and absence of the reinforcer was divided by the total number of seconds in either condition. These numbers were then multiplied by 100% to yield the percentage of time (during reinforcer presence or absence) in which screaming occurred. Thus, the within-session analysis during each session permitted a comparison of levels of problem behavior during two possible motivational conditions for all participants.

RESULTS

Ralph's functional analysis results are shown in the upper panel of Figure 1. Rates of aggression initially were high in three test conditions but then decreased in all but the materials condition. These results indicated that Ralph's aggression was maintained by positive reinforcement in the form of access to preferred materials. The middle panel of Figure 1 shows the within-session analysis for the materials condition. Across all six sessions, aggression was more likely to occur when access to preferred stimuli was withheld (reinforcer-absent interval) than when access was available (reinforcer-present interval). These results suggested a social positive reinforcement function for Ralph's aggression, thus matching the results of the functional analysis. The lower panel of Figure 1 shows the within-session analysis for the escape condition. Aggression was observed only during the first session, and results showed that responding in this session occurred less often when instructions were presented (reinforcer-absent interval) than when a break from instructions was provided (reinforcer-present interval). This finding, which suggested that negative reinforcement did not maintain Ralph's aberrant behavior, also was congruent with that of the extended functional analysis.

The upper panel of Figure 2 shows the results of Tacita's functional analysis. High levels of responding were initially observed in both the escape and materials conditions. Screaming subsequently dropped to low levels during the escape condition while maintaining in the materials condition. These results suggested that Tacita's screaming was maintained by positive reinforcement in the form of access to preferred stimuli. The middle panel of Figure 2 shows the outcome of Tacita's within-session analysis for the eight materials sessions. With the exception of one session, more screaming was observed when preferred stimuli were unavailable (reinforcer-absent interval) than when materials were available (reinforcer-present interval). These results are consistent with a positive reinforcement hypothesis. The lower panel of Figure 2 shows the results of the within-session analysis for the six escape sessions. Higher levels of screaming occurred when the putative reinforcer (escape from demands) was

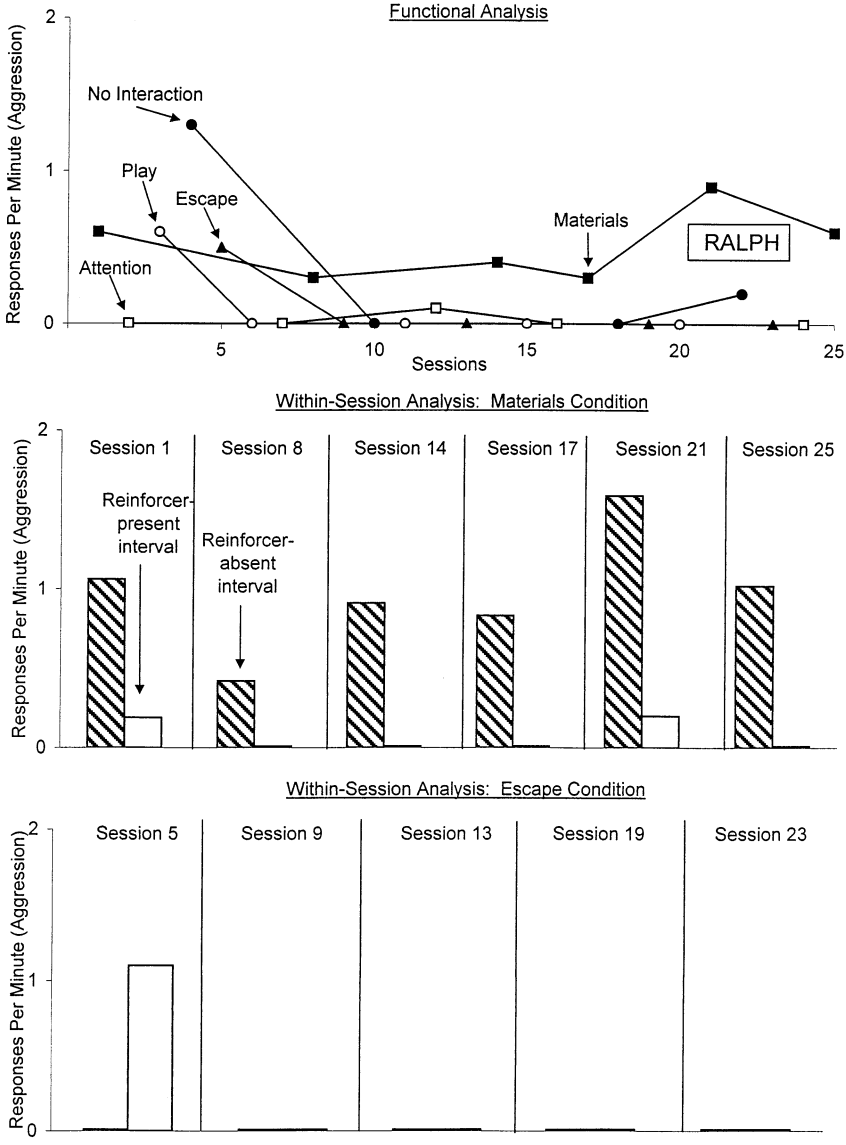

FIGURE 1. Responses per minute of aggression for Ralph during the functional analysis (upper panel), the within-session analysis for the materials condition (middle panel), and the within-session analysis for the escape condition (lower panel).

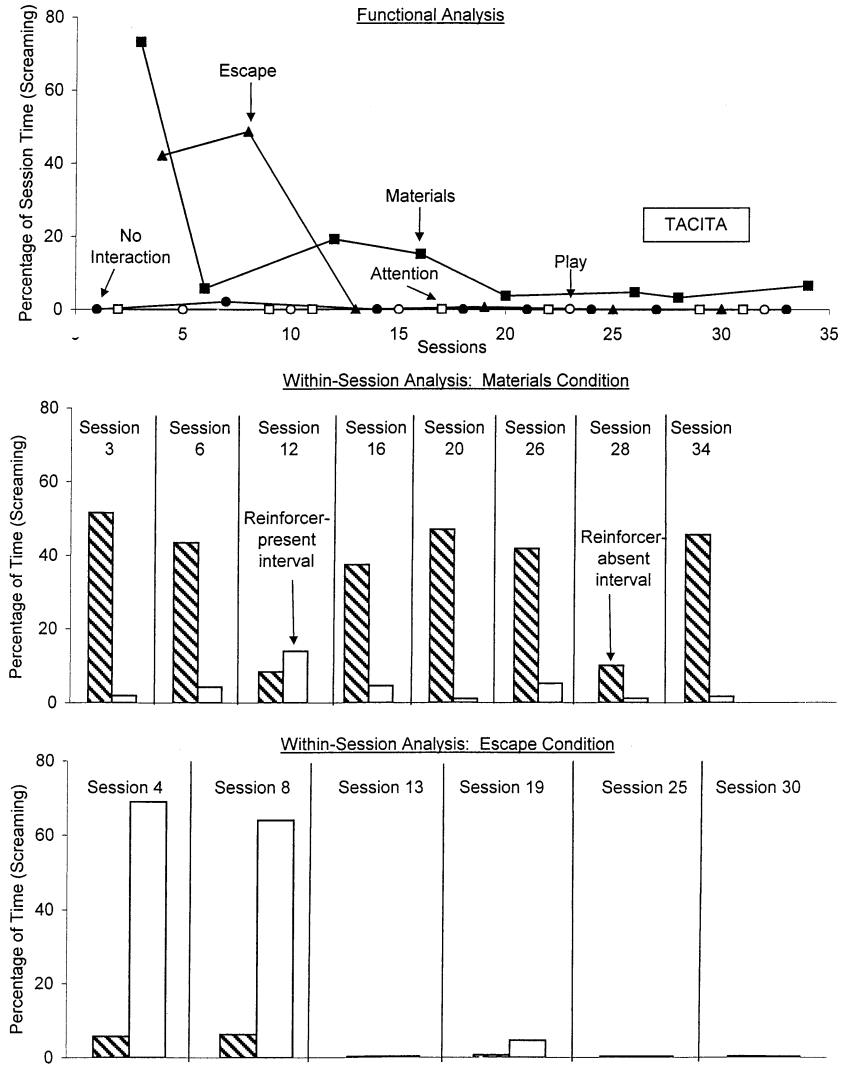

FIGURE 2. Percentage of session time of screaming for Tacita during the functional analysis (upper panel), the within-session analysis for the materials condition (middle panel), and the within-sessions analysis for the escape condition (lower panel).

present than when it was absent, which is inconsistent with a negative reinforcement hypothesis. Thus, results of the within-session analysis matched those of the overall functional analysis.

The upper panel of Figure 3 shows the outcome of Bucky's functional

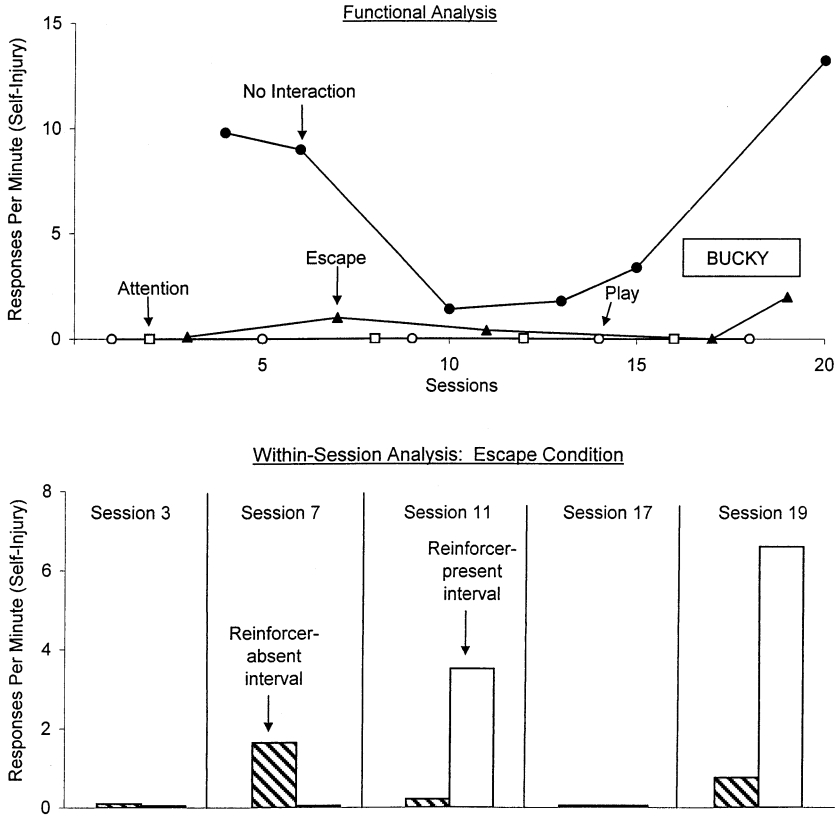

FIGURE 3. Responses per minute of scratching for Bucky during the functional analysis (upper panel) and the within-session analysis for the escape condition (lower panel).

analysis. The highest levels of SIB were observed during the no-interaction condition, suggesting that Bucky's SIB was maintained by nonsocial (automatic) sources of reinforcement. Low levels of SIB also were observed in the escape condition, and the lower panel of Figure 3 shows the outcome of Bucky's within-session analysis for the five escape sessions. Although responding occurred exclusively in the reinforcer-absent interval during the second session, levels of SIB shifted toward the reinforcer-present interval (i.e., during escape from instructions) across the remaining sessions. This finding was inconsistent with an escape function and supported the results of the overall functional analysis. That is, SIB observed in the escape condition primarily occurred when alternative stimuli (i.e., instructional material) that could compete with SIB were removed during the escape interval.

Results of Molly's functional analysis are shown in the upper left panel of

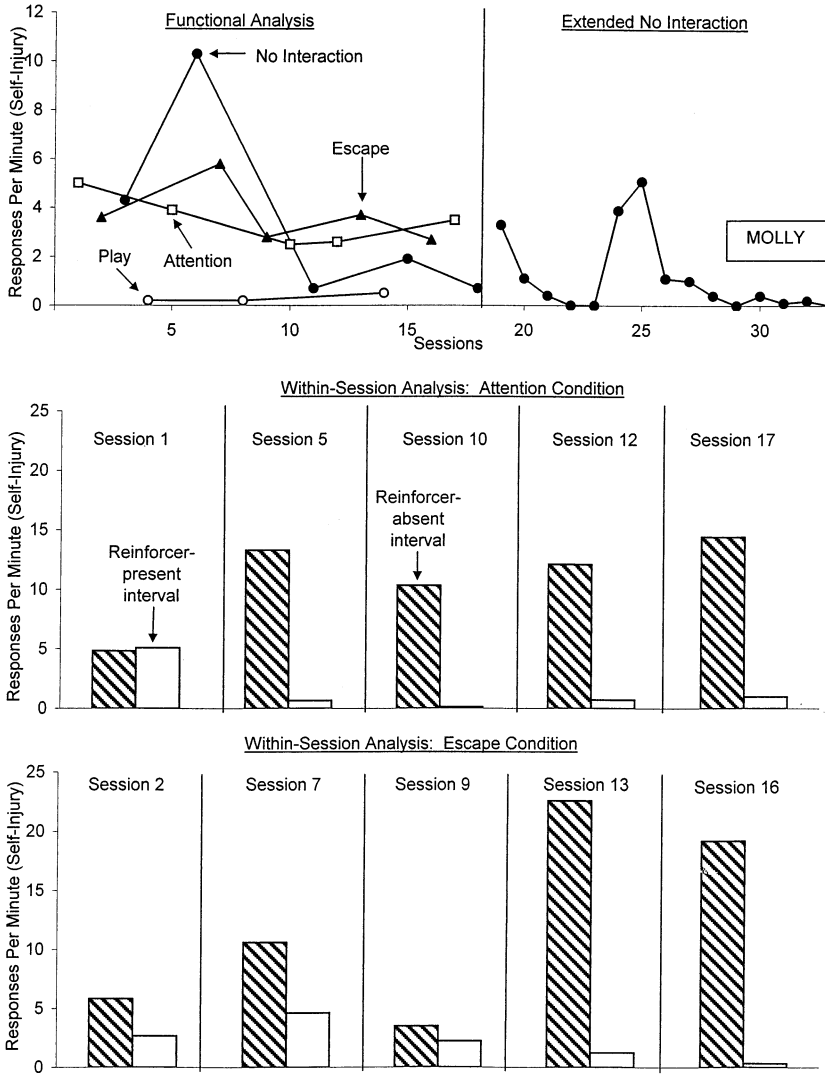

FIGURE 4. Responses per minute of scratching for Molly during the functional analysis and extended no-interaction condition (upper panel), the within-session analysis for the attention condition (middle panel), and the within-session analysis for the escape condition (lower panel).

Figure 4. High rates of SIB occurred in the no interaction, attention, and escape conditions. These results suggested that SIB was maintained by one or both sources of social reinforcement (escape and/or attention), by automatic reinforcement only, or by multiple sources of reinforcement. Within-session data

were analyzed for the attention and escape conditions. The middle panel of Figure 4 shows the within-session analysis for the five attention sessions. With the exception of the first session, higher rates of SIB occurred during the reinforcer-absent intervals than during the reinforcer-present intervals. That is, Molly was more likely to engage in SIB when attention was absent than when attention was delivered, suggesting that attention was functionally related to SIB. The lower panel of Figure 4 shows the results of the within-session analysis for the five escape sessions. Across the sessions, Molly engaged in higher rates of SIB during the reinforcer-absent interval (i.e., when instructions were presented) than during the reinforcer-present interval (i.e., when escape was provided). These results suggested that SIB was sensitive to negative reinforcement. Together, the findings of the within-session analysis suggested that Molly's SIB was maintained by multiple sources of social reinforcement rather than by automatic reinforcement (notice that less SIB occurred when instructions were absent rather than present). To further test the hypothesis that Molly's SIB was not maintained by automatic reinforcement, a series of no interaction sessions was conducted following the initial multi-element functional analysis. As shown in the upper right panel of Figure 4, rates of SIB initially were high and then decreased to low levels across this condition, indicating that Molly's behavior did not maintain in the absence of social consequences.

Galen's functional analysis data are presented in the upper left panel of Figure 5. Disruption occurred at high levels across all conditions, suggesting that his behavior was maintained by one type of social reinforcement, by automatic reinforcement, or by multiple sources of reinforcement. Within-session analyses were conducted for the attention, materials, and escape conditions. The second panel of Figure 5 shows the within-session analysis for the five attention sessions. Rates of disruption were not consistently different when the putative reinforcer was absent versus present, suggesting that the behavior was not sensitive to positive reinforcement in the form of attention. The third panel of Figure 5 shows the results of the within-session analysis for the six materials sessions. With the exception of the first session, rates of disruption also were similar during the reinforcer-absent and reinforcer-present intervals, suggesting that access to materials was not functionally related to his behavior. Finally, the third panel of Figure 5 shows the within-session analysis for the five escape sessions. Disruption occurred less frequently when instructions were delivered (reinforcer-absent interval) than when escape was provided (the reinforcer-present interval). This response pattern is inconsistent with a negative reinforcement hypothesis. Together, results of Galen's within-session analysis were inconsistent with a social function for disruption, suggesting that his behavior was maintained by automatic reinforcement. To further test this hypothesis, a series of no-interaction sessions was conducted. As shown in the upper right panel of Figure 5, high levels of disruption persisted in this

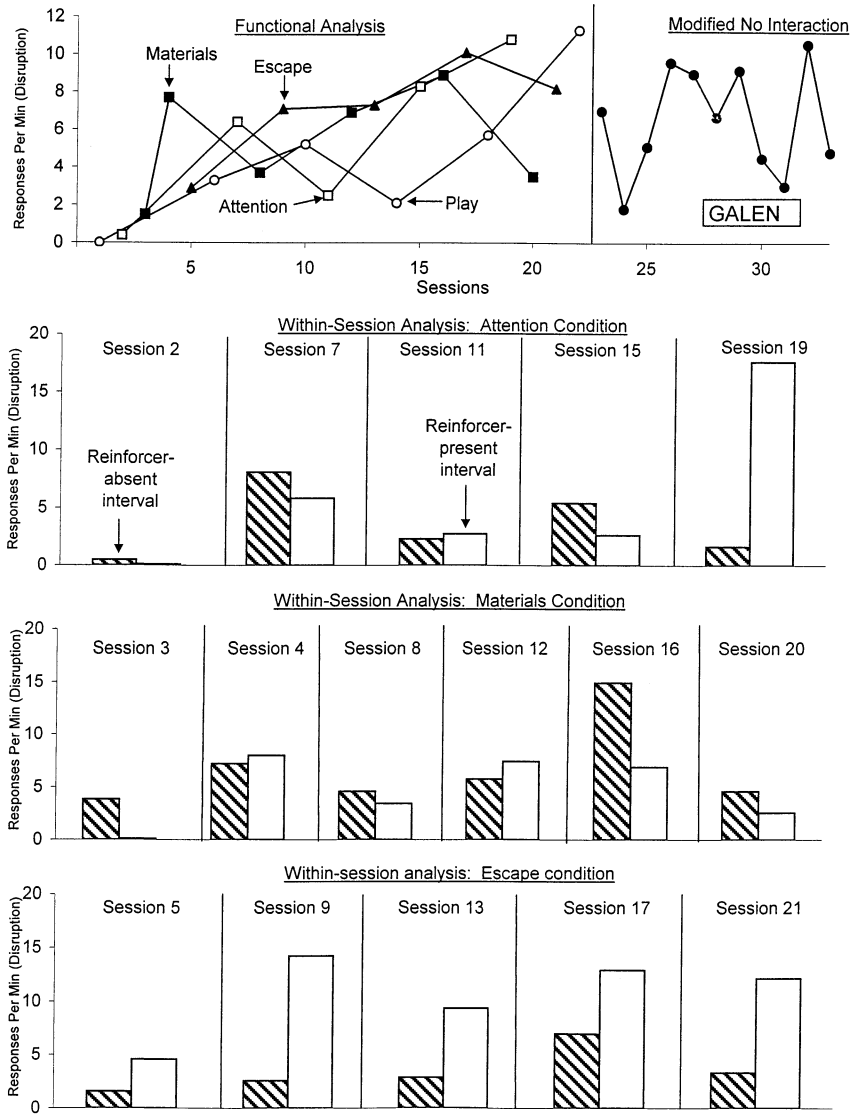

FIGURE 5. Responses per minute of disruption for Galen during the functional analysis and extended no-interaction condition (upper panel), the within-session analysis for the attention condition (second panel), the within-session analysis for the materials condition (third panel), and the within-session analysis for the escape condition (lower panel).

condition, indicating that Galen's problem behavior was maintained by automatic reinforcement. This finding was congruent with the within-session analysis.

DISCUSSION

Results of the within-session analysis for Ralph, Tacita, and Bucky corroborated those of the extended functional analyses by showing that more problem behavior occurred when the maintaining reinforcer (or, for Bucky, an alternative source of stimuli) was absent rather than present. This finding suggests that momentary changes in establishing operations can influence responding during the course of a functional analysis and that comparisons of response levels associated with the presence or absence of putative reinforcers can provide valid information about behavioral function. More important, results for Molly and Galen demonstrated the utility of using the within-session analysis to help clarify ambiguous functional analysis results.

Higher rates of SIB were observed for Molly when two putative reinforcers (attention, escape) were absent rather than present, suggesting that specific establishing operations (deprivation of attention, presence of instructional activities) increased Molly's motivation to engage in SIB (Iwata et al., 1990). In turn, SIB resulted in access to the putative reinforcers (attention delivery, escape), which presumably decreased the motivation to engage in SIB. The relevance of social reinforcement to the maintenance of SIB was further substantiated by the outcome of the extended no-interaction condition, during which SIB extinguished. These results indicated that carryover effects from the attention and escape conditions were responsible for occurrences of SIB during the no-interaction condition of the multi-element functional analysis. A limitation of Molly's analysis was that the remaining conditions were not re-presented in a reversal format following the extended no-interaction condition. A complete reversal-type assessment might have indicated whether both attention and escape maintained her SIB (as suggested by the within-session analysis) or whether just one source of reinforcement was relevant to behavioral maintenance. Thus, although it was clear that some type of social reinforcement maintained her SIB, additional analyses should have been conducted to corroborate results of the within-session analysis more precisely.

Both the multi-element functional analysis and within-session analysis produced undifferentiated outcomes for Galen, which suggested that his disruption was maintained by automatic reinforcement. A subsequent extended no-interaction condition supported this hypothesis by showing that disruptive behavior persisted in the absence of social consequences. Thus, the within-session analysis was helpful in clarifying the results of the initial functional analysis prior to the use of more extended analyses.

Results for all subjects indicated that the within-session analysis can be a useful supplement to multi-element functional analyses. Most notably, the within-session analysis can be used prior to more extended functional analyses (e.g., reversal, pairwise) to clarify results that are ambiguous due to carryover or interaction effects across conditions (Molly) or due to control by automatic reinforcement (Galen). Furthermore, the analysis may facilitate the use of

relatively brief functional analyses. For example, results of the within-session analysis accurately identified a specific socially mediated function for Tacita and Ralph before the overall functional analysis data were differentiated. Methods that permit rapid determination of behavioral function are particularly useful when limited time is available for assessment (Lennox & Miltenberger, 1989).

Despite these potential advantages, the within-session analysis has several limitations. First, some individuals may show similar levels of responding across reinforcer-present and reinforcer-absent intervals. For example, the presence of reinforcement in the form of attention or materials could function as a discriminative stimulus for further occurrences of the behavior if responding in this manner previously led to additional reinforcement (see Vollmer et al., 1993b). Similarly, negatively reinforced behavior may continue to occur during escape intervals if such responding historically enabled the individual to avoid further contact with the aversive stimulus. Second, nonsocial functions must be identified indirectly by examining within-session response patterns in other test conditions because automatic reinforcement typically is not controlled (i.e., presented and removed) during the functional analysis. This is especially problematic because the within-session response patterns of automatically reinforced behavior could resemble those of behavior maintained by social positive reinforcement. That is, levels of responding could be substantially higher when the putative reinforcer is absent rather than present if the availability of competing sources of stimulation (attention, materials) decreases the motivation to engage in automatically reinforced problem behavior, and the absence of stimulation increases the motivation to engage in the behavior. Finally, some individuals may require repeated exposure to test conditions before clear within-session patterns emerge (see results for Bucky and Molly). Thus, an initial examination of within-session response patterns should rarely replace a more extended functional analysis. The within-session analysis probably is most useful for elucidating undifferentiated functional analysis outcomes.

Additional studies are needed to determine the general utility of the within-session analysis for clarifying ambiguous functional analysis results. Furthermore, the extent to which effective treatments for problem behavior can be developed by examining within-session response patterns early in the assessment should be investigated. Finally, future research on the relationship between certain EO's and levels of problem behavior in the natural environment might indicate whether this type of analysis could be used to enhance the interpretation of descriptive analysis outcomes.

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