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FURTHER ANALYSIS OF PROBLEM BEHAVIOR IN RESPONSE CLASS HIERARCHIES

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A functional analysis identified the reinforcers for 3 participants' problem behavior, but only relatively mild problem behaviors (e.g., screaming, disruption) were observed when all topographies produced tested consequences. We then conducted an extinction analysis in which specific topographies produced a reinforcer while all other topographies were on extinction. The extinction analysis confirmed that the same reinforcer identified in the initial functional analysis maintained more severe topographies of problem behavior (e.g., aggression). In addition, results of the extinction analysis indicated that 2 of the participants displayed patterns of responding consistent with a response class hierarchy hypothesis, in which less severe problem behavior frequently occurred prior to more severe topographies. The 3rd participant displayed a response pattern indicative of differential reinforcement effects.

DESCRIPTORS: functional analysis, response class, response class hierarchies, covariation, aberrant behavior, extinction

The development of functional analysis methodology has allowed practitioners and researchers to better understand and categorize environmental reinforcement contingencies that maintain aberrant behavior. A primary advantage of a functional analysis is that the function of aberrant behavior can be matched to specific treatment recommendations that focus on disrupting the response–reinforcer relationship associated with aberrant behavior.

Although epidemiological studies have suggested that the function of aberrant behavior can be identified via a functional analysis in the majority of cases (Derby et al., 1992; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994), some outcomes are inconclusive or "undifferentiated." There are several possible explanations for undifferentiated functional analyses. Derby et al. (1994) indicated that functional analyses may be undifferentiated when multiple topographies of aberrant behavior are maintained by different reinforcers, but the data are evaluated with all target behaviors aggregated. Derby et al. examined four functional analyses with all topographies aggregated on a single graph and with each topography graphed individually. For all 4 participants, at least one behavioral function was masked by the aggregate analysis. These results suggest that, when clients exhibit multiple target behaviors, aggregate analyses should be interpreted with caution, particularly when the results of the functional analyses are undifferentiated.

A second reason for undifferentiated functional analyses is that one or more of the target behaviors may be maintained by automatic reinforcement (Vollmer, Marcus, & LeBlanc, 1994). In this case, the functional analysis pattern may reveal high levels of responding across all conditions because the reinforcer responsible for maintenance of at least one of the target behaviors is available in all conditions. In addition, automatically reinforced behavior may occur during functional analysis conditions that provide lower

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levels of environmental stimulation (e.g., attention, alone), which can result in undifferentiated patterns of responding even if some of the participant's target behaviors are socially reinforced.

Thompson, Fisher, Piazza, and Kuhn (1998) described a similar problem with combining multiple target behaviors during a functional analysis. Thompson et al. documented a case of aggression in which one topography of aggression was maintained by automatic reinforcement while other topographies of aggression were maintained by social attention. The initial functional analysis resulted in undifferentiated patterns of aggression when all topographies (i.e., chin grinding, hitting, kicking) produced the tested contingencies. A second functional analysis was then conducted to test the hypothesis that chin grinding was maintained by automatic reinforcement and the other topographies of aggression (e.g., hitting, kicking) were maintained by adult attention. During the second functional analysis, the experimenters compared noncontingent attention and contingent attention for both chin grinding and other aggression or only for other aggression. Results indicated that when attention was provided for all topographies of aggression, occurrence of chin grinding was variable, and near-zero rates of other forms of aggression occurred. Other topographies of aggression increased only when attention was provided contingently for those behaviors.

A third reason for undifferentiated functional analyses is when the primary problem behavior does not occur during the functional analysis, but other topographies of problem behavior result in reinforcement. If all topographies are maintained by the same reinforcer (i.e., are members of the same response class) and functional analysis contingencies are provided for all topographies, the client may not display one or more of the target behaviors for which he or she was referred for treatment. That is, the target behaviors may represent a response class hierarchy as described by Lalli, Mace, Wohn, and Livezey (1995). If a response class hierarchy exists, more severe forms of problem behavior may not occur because less severe forms of behavior in the response class hierarchy are reinforced, reducing the probability of escalation to more severe problem behavior.

Lalli et al. (1995) demonstrated this effect by analyzing the temporal relationships between members of a response class for 1 client. The participant seemed to display a response class hierarchy that consisted of screams, aggression, and self-injury maintained by negative reinforcement in the form of escape from instructional tasks. A response class hierarchy was tested by sequentially applying a negative reinforcement contingency to each topography of problem behavior while simultaneously placing the other topographies on extinction. When negative reinforcement was provided for the first topography of problem behavior, the participant rarely displayed subsequent topographies. Applying the contingency to the last response in the hierarchical sequence typically resulted in all three topographies being displayed in a hierarchical order. Several other investigators have shown that separate topographies maintained by the same class of reinforcement will covary depending on which response is reinforced initially (Shulka & Albin, 1996; Sprague & Horner, 1992). Collectively, these studies suggest that increased consideration should be given to selecting the topography to be reinforced during a functional analysis.

The main purpose of the present study was to evaluate methods for clarifying undifferentiated functional analysis outcomes when the primary target behavior does not occur (i.e., when the most severe behavioral topography is not observed in the assessment). A second purpose of the study was

to examine the relative latencies between the onset of a relevant establishing operation and the first occurrence of each target behavior to provide support for a response class hierarchy hypothesis. In the current investigation, all topographies of problem behavior were reinforced initially during a functional analysis. During the initial functional analysis, clear reinforcement effects were identified for less severe forms of problem behavior (e.g., screaming and disruption), but the results were inconclusive for more severe topographies (e.g., aggression). In order to complete the assessment, we then placed less severe forms of behavior on extinction and tested reinforcement contingencies on more severe forms of behavior.

METHOD

Participants and Setting

Three children with developmental disabilities participated. Each had been referred to an inpatient service for evaluation and treatment of severely disruptive and aggressive behavior. All sessions were conducted in a classroom on the inpatient unit, and all observations were conducted via video monitoring. The room was equipped with a sink, sofa, table, several chairs, and numerous play and instructional materials.

Sean was an 8-year-old boy with diagnoses of moderate mental retardation, attention deficit hyperactivity disorder (ADHD), and pervasive developmental disorder. He had been admitted to the inpatient unit for treatment of stereotypic movements (i.e., hand and face rubbing), facial tics, and severely disruptive and aggressive behavior. When Sean was admitted to the inpatient unit, he was taking Disipramine and Ritalin for medical management of ADHD. Throughout the course of his 2-week admission, Sean was tapered off of both drugs, but no changes in his problem behavior or facial tics were associated with the reduction in medications. Sean was verbal (two- to three-word sentences), ambulatory, and had adequate fine-motor skills to manipulate leisure and academic materials. He received special education services in a self-contained special education classroom at an elementary school in his local community. Disruptive and aggressive behaviors were reported to occur when care providers told him to discontinue interacting with a preferred activity (e.g., video games). Stereotypic behavior was reported to occur throughout the day but occurred most frequently during periods of low social interaction.

Chris was a 4-year-old boy with diagnoses of developmental delays and autism. He had been admitted to the inpatient unit for treatment of aggression. Chris used four to five signs and an augmentative communication board, he was ambulatory, and he had adequate fine-motor skills to manipulate leisure and academic materials. Chris received special education services through a preschool developmental classroom in his community. He displayed disruptive and aggressive behavior during activities of daily living (e.g., toy pick-up, hygiene tasks) and academic activities (e.g., putting puzzles together, color identification).

Kim was a 6-year-old girl with diagnoses of mild mental retardation and ADHD. Kim was taking Clonidine for management of ADHD. She had been admitted to the inpatient unit for treatment of disruptive behavior that was reported to frequently escalate to aggression. Kim was verbal (three- to four-word sentences), ambulatory, and had adequate fine-motor skills to effectively manipulate leisure and academic materials. Kim received special education services in a self-contained special education classroom at an elementary school in her local community. She reportedly engaged in disruptive and aggressive behavior during demand situations (e.g., cleaning, self-care, preacademic situations).

Dependent Variables, Data Collection, and Interrater Agreement

Behavioral definitions were derived from parental interviews and direct observations of the children interacting with their parents. For Sean, we hypothesized that the same social reinforcer maintained all three separate target behaviors, and all three topographies frequently occurred in a predictable order. However, for Chris and Kim, several less severe problem behaviors were observed to occur before aggression, but they did not occur in a consistent order. Therefore, for the purposes of the extinction analysis for Chris and Kim, we grouped several less severe forms of problem behaviors together into one category described as disruptive behavior.

Sean's target behaviors were (a) screams, defined as vocalizations above normal conversational levels; (b) grabbing, defined as grasping an item or person with his hands and pulling towards him; (c) aggression, defined as slapping or hitting others; and (d) appropriate vocalization, defined as saying "please" in response to a therapist's request.

Chris's target behaviors were (a) disruption, defined as verbally refusing to complete a task, physically moving the task item away from him, moving away from the task item, screaming (i.e., vocalizations above normal conversational volume), and spitting; (b) aggression, defined as hitting and kicking others; (c) appropriate mands, defined as activating a large microswitch that played a pretaped message saying "I would like a break please"; and (d) compliance, defined as completing a task as requested by his parent or therapist without physical guidance within 5 to 10 s of the initial verbal prompt.

Kim's target behaviors were (a) disruption, defined as screaming, verbally refusing to complete a task, physically moving a task item away from her, and moving away from a task item (e.g., running away from the table); (b) aggression, defined as slapping, hitting, or kicking others, and striking others with task materials; (c) appropriate vocalization, defined as saying "break please" in response to a therapist's request to complete an activity; and (d) compliance, defined as completing a task as requested by her parent or therapist without physical guidance within 5 to 10 s of the initial verbal prompt.

Observers recorded all behaviors using a 6-s partial-interval recording system, and interval measures were converted to a percentage. A second observer independently collected data for Sean, Kim, and Chris during 40%, 55%, and 35% of the functional analysis sessions, respectively, and during 38%, 47%, and 29% of the sessions during the extinction analysis, respectively. Interobserver agreement data were tabulated on an interval-by-interval basis, and scores were calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Average occurrence agreement scores exceeded 94% for all participants during the functional analyses and exceeded 89% for all participants during the extinction analysis.

Design and Analysis

The study was conducted in two phases. During Phase 1, a functional analysis was conducted using a multielement design as described by Iwata et al. (1982/1994). In Phase 2, an extinction analysis was conducted within a reversal design for Kim and Chris and within a brief multielement design (Northup et al., 1991) for Sean.

Two additional calculations were used for data analysis. First, the conditional probability of each topography given the initiation of a trial of the relevant establishing operation was calculated. A trial was defined as the initiation of the relevant establishing operation (e.g., demand for Chris and Kim) and the termination of the prompt contingent on problem behavior. For example, in

Condition A for Sean (when screaming was reinforced), the probability of screaming given restriction of access to toys was 1.0. Second, we evaluated the relative latency for the separate topographies given the initiation of a trial of the relevant establishing operation for all sessions in Phase 2. Relative latencies were used because exact latency could not be calculated given the use of a 6-s partial-interval recording system.

The temporal relationship among problem behaviors for Sean was calculated by giving a rank of 1 if the behavior occurred first or tied for first (occurred in the same interval as one or more of the behaviors), a rank of 2 was given if the behavior occurred second, and a rank of 3 was assigned if the behavior occurred third or did not occur during the trial. Data are presented in terms of mean rank for each topography during each extinction analysis session. To evaluate the temporal relationships among the problem behaviors for Chis and Kim, the percentages of trials in which disruption occurred first, aggression occurred first, or both occurred in the same interval were calculated for each phase of the extinction analysis.

Procedure

Phase 1: Functional analysis. During the functional analysis, all topographies of problem behavior produced the tested consequences. All sessions lasted approximately 5 min. In the free-play (control) condition, the therapist and parent provided constant attention, allowed access to a variety of toys, and placed no demands on the participant except to remain in the observation room. In the escape condition, the therapist or parent presented a request for the participant to complete an academic task (e.g., tracing letters) or daily living task (e.g., toy pick-up) once every 15 to 30 s. The parent or therapist responded to all problem behaviors by removing the task item and looking away from the participant for 10 to 30 s. Contingent on compliance to a request, the parent or therapist provided neutral acknowledgment of task completion and directed the child to complete another portion of the task. During the attention condition, the therapist or parent provided the participant with a wide variety of toys and materials and then diverted his or her attention from the participant by reading a magazine or talking to each other. The therapist or parent responded to all problem behaviors by providing a disapproving statement (e.g., "Don't scream, I am trying to read"). During the alone condition, the participant was left in a room with a variety of toys. The alone condition was conducted with toys to test the hypothesis that some forms of disruption (e.g., throwing toys) may have been maintained by automatic reinforcement. During the tangible condition, the therapist or parent removed the toy that the child was interacting with and stated, "Okay, it is someone else's turn to play with the toy." The adult then verbally interacted with the participant but continued to restrict the participant's access to that toy. A variety of other toys were available in the room, and if the participant played with a different toy for approximately 30 s, the therapist or parent restricted access to that toy also. The adult re-presented the toy to the participant contingent on problem behavior and stated, "Here, you can play with the toy now." The participant was allowed access to the toy for 10 to 30 s and then the toy was again removed.

For Sean and Chris, escape, attention, tangible, alone, and free-play conditions were conducted during the functional analysis. The same conditions were conducted for Kim's functional analysis, with the exception of the tangible condition. A tangible condition was not conducted because information obtained during a parent interview did not indicate that restricted access to toys set the occasion for Kim's problem behavior.

Phase 2: Extinction analysis. Information provided during parent interviews and descriptive observations (Bijou, Peterson, & Ault, 1968), conducted while the child interacted with his or her parents outside of functional analysis sessions, indicated that the severity of problem behavior quickly escalated for all 3 participants. The escalation appeared to occur if the reinforcement contingency was not provided immediately after the occurrence of the initial problem behavior, which was generally relatively mild (e.g., scream, spit). This information led us to hypothesize that the children displayed aggression only when initial (less severe) topographies were not reinforced.

During the extinction analysis, only one topography was reinforced; all others were placed on extinction. The reinforcer identified during the functional analysis as maintaining problematic behavior was the only reinforcer delivered. Baseline was the most relevant condition from the original functional analysis, in which the maintaining variable for less severe problem behavior was identified.

During Phase 1, Sean's problem behavior appeared to be maintained by positive reinforcement in the form of access to attention and tangible items, but we selected the tangible condition only for the extinction analysis because the parents reported that the majority of Sean's severe problem behavior at home occurred when access to preferred toys was restricted. During Condition A, only screaming was reinforced. During Condition B, only grabbing was reinforced. During Condition C, only aggression was reinforced.

Although Chris's problem behavior appeared to be maintained by multiple functions, the extinction analysis in Phase 2 was conducted during demand situations because of the consistency of the findings during the escape condition in Phase 1. Information obtained during a parent interview indicated that Chris primarily engaged in aggression at home when his parents did not allow him to escape demands contingent on disruptive behavior. During Condition A, disruptive behavior was reinforced and aggression was placed on extinction. During Condition B, aggression was reinforced and disruption was placed on extinction.

For Kim, disruption during Condition A was reinforced and aggression was placed on extinction. During Condition B, aggression was reinforced and disruption was placed on extinction.

RESULTS

Phase 1: Functional Analysis

The results of the functional analysis for Sean, Chris, and Kim are presented in Figures 1 and 2. The first panel for each participant shows the percentage of 6-s intervals with the less severe problem behavior. The lower panels show the percentage of 6-s intervals with the more severe problem behavior. For Sean (Figure 1), results of the functional analysis indicated that screaming was maintained by positive reinforcement (i.e., contingent access to tangible items and attention). Some screaming occurred during escape, but it occurred at the highest rates in the positive reinforcement conditions. Although screaming, grabbing, and aggression all would have produced reinforcers, grabbing was not observed, and aggression was observed in only one interval of one attention session.

Chris (Figure 2, top two panels) displayed increased disruptive behavior in the escape, attention, and tangible conditions relative to the free-play condition. Disruptive behavior was consistently elevated in the escape condition and was variable in the tangible and attention conditions. Aggression rarely occurred. Chris's functional analysis suggested that disruptive behavior was maintained by negative reinforcement in the form of escape

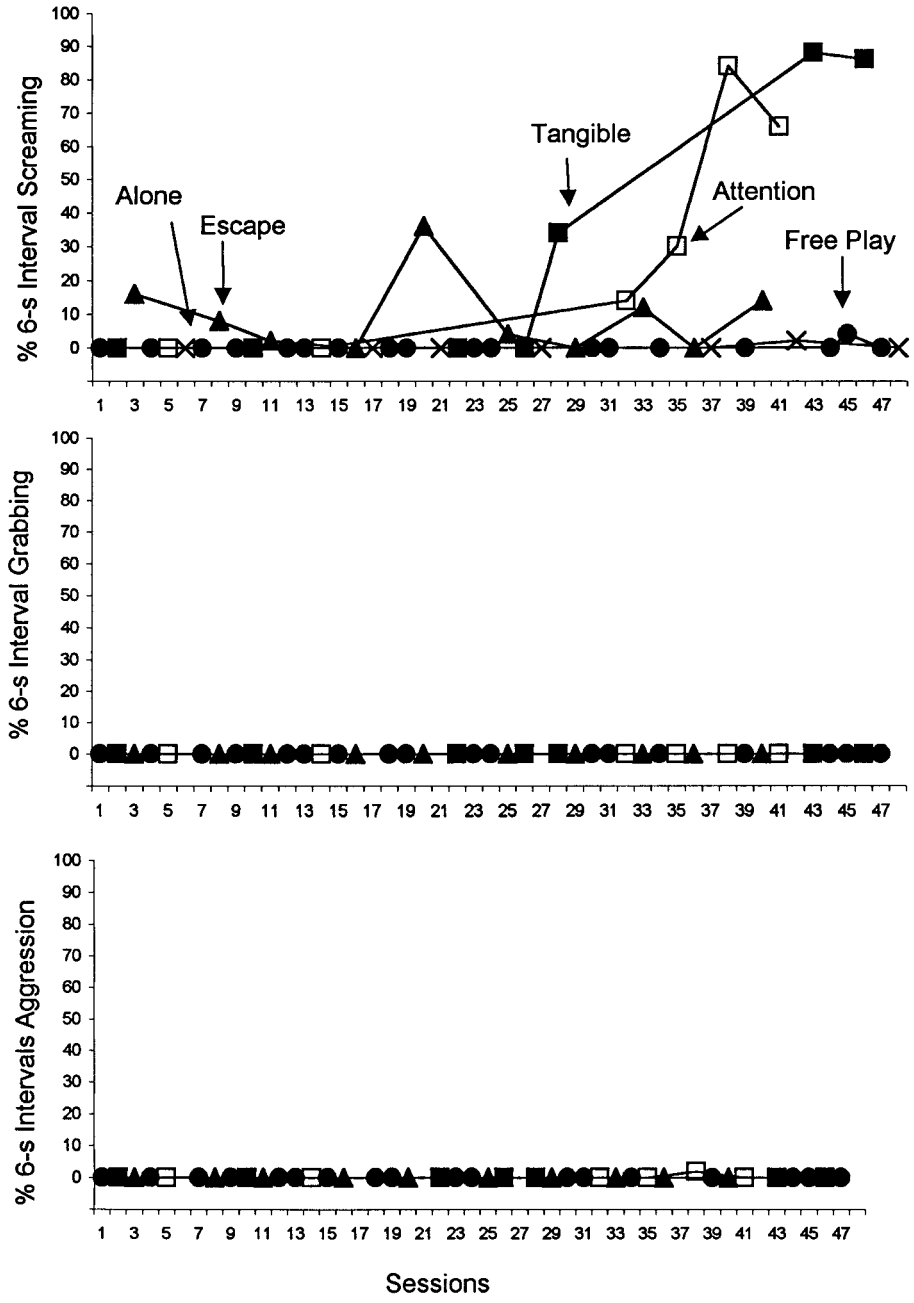

Figure 1. Percentage occurrence of screaming (top panel), grabbing (middle panel), and aggression (bottom panel) for Sean during the functional analysis.

from demands and positive reinforcement in the form of access to attention and tangible items.

Kim's functional analysis data are presented in Figure 2 (third and fourth panels). Kim's disruptive behavior occurred almost exclusively during the escape condition, indicating that her disruptive behavior was maintained by negative reinforcement. Kim's aggression rarely occurred in any condition.

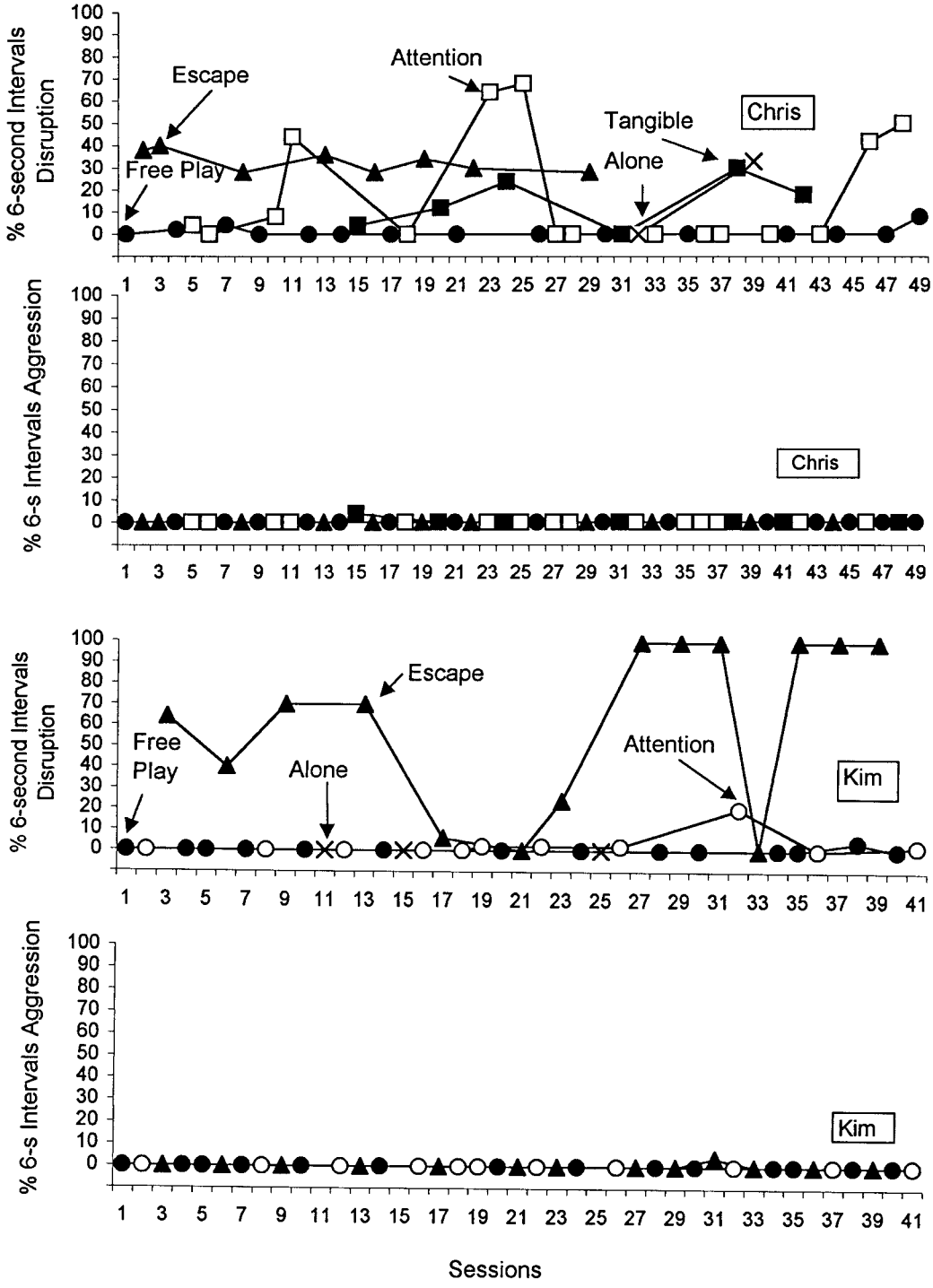

Figure 2. Percentage occurrence of disruption and aggression for Chris (top two panels) and Kim (bottom two panels) during the functional analysis.

It was observed in two of the 6-s intervals during the 44 sessions.

During the functional analysis phase, the outcome was inconclusive for each participant's more severe problem behavior. The inconclusive results were due to the low occurrence of more severe problem behavior when all topographies of problem behavior produced reinforcers in the functional analysis.

Phase 2: Extinction Analysis

Figure 3 depicts the results of the extinction analysis. During baseline for Sean (the tangible functional analysis condition), only screaming occurred when all three topographies of problem behavior were reinforced. During the first Condition A session, when screaming only was reinforced, screaming occurred during 100% of the intervals, and grabbing (17%) and aggression (0%) occurred substantially less often. During the first Condition B session, when grabbing only was reinforced, grabbing increased to 50% of intervals, and screaming decreased (78%) and aggression (5%) remained relatively low. Sean continued to scream often, but he escalated to grabbing each time access to the tangible item continued to be restricted after screaming occurred. When aggression only was then reinforced, in the first Condition C session, aggression increased (21%), and screaming (72%) and grabbing (56%) remained stable. Thus, in the first session of each condition, each topography increased when it was reinforced. Sean appeared to progress through a hierarchy of topographies, with each topography more severe than the last (i.e., screaming, grabbing, and then aggression).

To replicate these initial findings, we repeated sessions of these three conditions in a counterbalanced order to control for possible sequence effects. We conducted a second Condition B session in which grabbing only was reinforced; grabbing occurred during 35% of the intervals, and aggression (7%) decreased while screaming (83%) remained stable. We then provided reinforcement for aggression only, but aggression increased only slightly (11%). During a second Condition A session, in which screaming only was reinforced, screaming occurred during 100% of the intervals, whereas grabbing (5%) and aggression (3%) rarely occurred. Grabbing only was reinforced in the next session (Condition B), and grabbing again increased to 54% of the intervals, aggression did not occur, and screaming remained stable (92%). In the final session, we reinforced screaming (Condition A), and screaming occurred in 100% of the intervals, grabbing decreased (12%), and aggression did not occur.

For Chris, the topographies of problem behavior consisted of disruptive behavior and aggression. The data from the escape condition of the functional analysis were used as the baseline for the extinction analysis, and results show that disruption was the only topography that occurred when disruption and aggression were reinforced. During Condition A, in which disruptive behavior was reinforced and aggression was placed on extinction, Chris's disruptive behavior occurred frequently (M = 34% of intervals; range, 30% to 44%) and aggression did not occur. During Condition B, in which aggression was reinforced and disruptive behavior was placed on extinction, aggression increased to a mean of 18% of intervals (range, 0% to 36%) and showed an upward trend, while disruptive behavior increased to a mean of 74% (range, 56% to 100%). In general, Chris screamed several times before exhibiting aggression. These effects were replicated in subsequent reversals to Conditions A and B. The results of Chris's extinction analysis showed that when disruptive behavior was reinforced, aggression rarely occurred. When disruptive behavior was placed on extinction, Chris typically displayed dis-

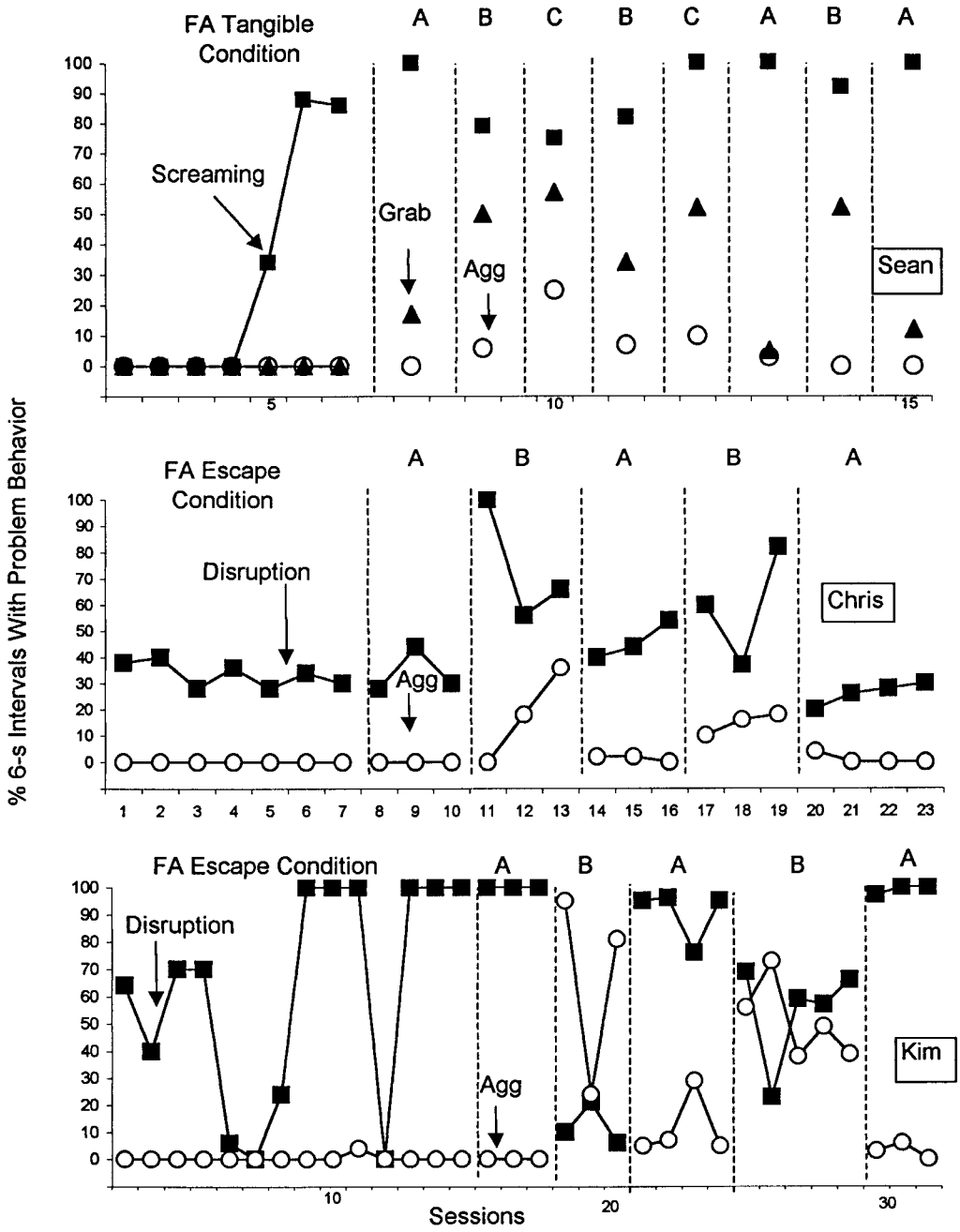

Figure 3. Percentage occurrence of problem behavior across conditions during the extinction analysis. The top panel represents Sean's extinction analysis with the baseline condition representing occurrence of screaming, grabbing, and aggression during the tangible condition of the functional analysis. Condition A = reinforcement for screams; Condition B = reinforcement for grabbing at the tangible item or his parent or therapist; Condition C = reinforcement for aggression; FA = functional analysis. The middle panel represents Chris's extinction analysis with the baseline condition representing occurrence of disruption and aggression during the escape condition of the functional analysis. Condition A = reinforcement for disruption; Condition B = reinforcement for aggression. The bottom panel represents Kim's extinction analysis with the baseline condition representing occurrence of disruption and aggression during the escape condition of the functional analysis. Condition A = reinforcement for disruption; Condition B = reinforcement for aggression.

Table 1
Conditional Probability Results

Participant	Condition	Scream	Disruption	Grab	Aggression
Sean	A	$M = 1.0$		$M = .10$	$M = .007$
	B	$M = .93$		$M = .47$	$M = .08$
	C	$M = .90$		$M = .56$	$M = .19$
Chris	A		$M = .99$		$M = .01$
	B		$M = .91$		$M = .22$
Kim	A		$M = .96$		$M = .04$
	B		$M = .44$		$M = .64$

Note. For Sean, Condition A = reinforcement for screaming, Condition B = reinforcement for grabbing, Condition C = reinforcement for aggression; for Chris, Condition A = reinforcement for less severe problematic behavior, Condition B = reinforcement for aggression; for Kim, Condition A = reinforcement for disruption, Condition B = reinforcement for destructive behavior.

ruptive behavior first, but then displayed aggression.

For Kim, the topographies of problem behavior consisted of disruption and aggression. The data from the escape condition of the functional analysis served as the baseline for the extinction analysis, and results show that disruption was the only topography that occurred when disruption and aggression were reinforced. During Condition A, in which disruption was always reinforced and aggression was placed on extinction, disruption occurred during 100% of the intervals and aggression never occurred. During Condition B, in which aggression was reinforced and disruption was placed on extinction, aggression increased to a mean of 67% of intervals across sessions (range, 24% to 95%), and disruption decreased to a mean of 12% of intervals (range, 6% to 21%). To replicate these findings, we again provided reinforcement for disruption (next four sessions), and disruption increased to a mean of 90% (range, 76% to 96%) and aggression decreased to a mean of 11% (range, 5% to 29%). These findings were further replicated in the final two conditions, when reinforcement was provided contingent on aggression ($M = 51\%$) and when reinforcement was again provided for disruption ($M = 99\%$).

Conditional Probabilities

Table 1 shows the conditional probability of each topography of problem behavior given the initiation of the relevant establishing operation (i.e., restricted access to tangible items for Sean; demands for Chris and Kim) across all conditions of the extinction analyses. Overall, a strong response bias occurred for screaming (Sean) or disruption (Chris) prior to displays of grabbing and aggression (Sean) or aggression (Chris), regardless of the reinforcement contingency. However, when reinforcement was contingent on screaming or disruption, grabbing or aggression rarely occurred. When reinforcement was available only for grabbing or aggression, the probability of those behaviors increased substantially while the other behaviors remained relatively stable. Kim, however, exhibited a different pattern of responding. When her less severe problem behaviors were reinforced, responding was allocated to less severe problem behaviors. When reinforcement was provided for aggression only, responding was allocated primarily to aggression.

Temporal Relationship of Topographies

Table 2 presents the mean ranking of Sean's three topographies of problem behav-

Table 2
Mean Rank of Topographies for Sean

Topography	Condition						
	A	B	C	B	C	A	B
Scream	1.0	1.1	1.1	1.0	1.0	1.0	1.0
Grab	2.7	1.6	1.5	1.6	1.8	2.9	1.6
Aggression	3.0	2.7	2.8	2.7	2.5	2.9	2.9

ior. The ranking represents the relative latency to the occurrence of each topography, given the initiation of a trial of the relevant establishing operation. The mean rankings for Sean's topographies show a hierarchical sequence among the three topographies. The mean rankings indicate that screaming typically occurred before grabbing and grabbing occurred before aggression (with the exception of the second session of Condition A), regardless of which topography produced reinforcement.

Table 3 presents the temporal relationships for Chris's and Kim's behaviors, and depicts the percentage of trials in which disruption or aggression occurred first and those in which disruption and aggression occurred in the same interval. Chris's data show a hierarchical tendency, in that disruptions typically occurred prior to aggression even when aggression was the only topography that resulted in reinforcement. Kim's data reflect a differential reinforcement effect in that the first response tended to be the one that was reinforced in a given condition. When reinforcement was provided for disruption, she almost exclusively displayed disruption. When disruption was placed on extinction and aggression resulted in reinforcement, she initially (in the first few trials of each session) displayed disruption before aggression, but then allocated the majority of responding to aggression (the operative topography).

Table 3
Order of Topographies for Chris and Kim

Participant	Topography	Condition				
		A	B	A	B	A
Chris	Disruption	100	67	94	59	98
	Aggression	0	5	0	18	0
	Both	0	29	6	23	2
Kim	Disruption	100	8	97	33	100
	Aggression	0	78	0	58	0
	Both	0	14	3	9	0

Note. The above cell values represent the percentage of trials in which disruption or aggression occurred first. Both = the percentage of trials in which disruption and aggression occurred in the same 6-s interval.

DISCUSSION

A functional analysis of each participant's problem behavior identified the reinforcers that maintained relatively minor disruptive behavior, but aggression (or grabbing) rarely occurred during the functional analysis. Thus, when reinforcement is provided for less severe problem behavior, the unintended effect may be that more severe topographies cannot be clearly analyzed, thereby limiting the identification of maintaining contingencies for severe problem behavior. During the extinction analysis, when less severe problem behavior was placed on extinction and reinforcement was provided for more severe problem behavior, all topographies occurred, and functional relations were identified. Thus, the results of the extinction analysis provide an example of one method of clarifying inconclusive functional analysis outcomes. Specifically, the analysis showed that reinforcing some topographies of behavior could serve the unintended function of reducing other forms of target behaviors.

The results of the extinction analyses suggested a hierarchical sequence for 2 participants' problem behavior, and the 3rd participant displayed a pattern of responding consistent with differential reinforcement effects (i.e., responding was allocated to the topography that produced reinforcement). One possible conceptualization for the different

pattern of results for Chris and Sean versus Kim is that the contingencies of reinforcement exerted discriminative control over Kim's allocation of responding. Conversely, the hierarchical sequence of topographies for Chris and Sean suggests that the contingencies of reinforcement failed to exert discriminative control over responding during the relatively brief exposure to the reinforcement contingencies presented during the extinction analysis.

Lalli et al. (1995) discussed how response classes could be conceptualized in terms of a concurrent-operants paradigm; that is, the relative frequency of each topography was due to the rate of reinforcement historically produced by each topography. Alternative conceptualizations related to response effort associated with each topography are also plausible for the current results. For example, as discussed by Lalli et al., screaming appeared to require less effort than aggression, and thus screaming may result in less cost to the individual than aggression (Mace & Roberts, 1993). If minimal effort responses do not result in reinforcement, then the individual may display more effortful topographies that historically are associated with the same reinforcers. One additional conceptualization is that the sequence of topographies may have been influenced by the participant's history of punishment associated with each topography. That is, less severe topographies of problem behavior such as screaming and verbal refusal may have been less likely to result in punishment than aggression or property destruction. To test this hypothesis, a detailed analysis of the client's history of reinforcement and punishment is required (Lattal & Neef, 1996).

The current study provides a replication of Lalli et al. (1995) by demonstrating that the manipulation of extinction and reinforcement schedules for separate topographies within a hypothesized response class is a useful method for empirically verifying response class hierarchies. The current investigation extends the results of Lalli et al. (1995) by providing a response class hierarchy analysis for problem behavior maintained by positive reinforcement. In addition, the design for Sean addressed a potential limitation of the Lalli et al. study by counterbalancing the order of conditions during the extinction analysis.

Two aspects of the current results are of particular interest and invite further analysis. First, these results and those reported by Lalli et al. (1995) suggest that future researchers should carefully analyze the interrelationship of responses to each other as well as their relationship to reinforcement contingencies. Second, all 3 participants showed a bias toward less severe problem behavior. For example, (a) during the initial functional analysis, all responding was allocated to less severe problem behavior; (b) during the A conditions in the extinction analysis, responding was almost exclusively allocated to less severe problem behavior; and (c) during B conditions, less severe behavior usually occurred first for Sean and Chris (Kim showed a similar pattern during the initial trials of the B condition, but a transition occurred after the operative topography contacted reinforcement). The different pattern for Sean and Chris compared to that of Kim may indicate that their response bias toward less severe behavior was more extreme. The underlying mechanism for the strength of the response bias is unknown and warrants further investigation.

Further investigation is also warranted with regard to altering a participant's response class hierarchy to include a functionally equivalent mand (i.e., appropriate behavior). Following the current investigation, a functional communication training treatment package was used to reduce occurrences of problem behavior. We trained the participants, using a three-step prompt hierarchy (i.e., verbal, model, physical guidance),

to use a mand (e.g., "please" or "break, please") that produced the same reinforcer (break from demands or access to a tangible item) evaluated in Phase 2. Thus, in addition to clarifying the relationship between various topographies of aberrant behavior for each client, the assessment results were also used to develop an effective treatment package. Further research is needed to identify the necessary treatment components to alter a child's response bias towards appropriate behavior.

Finally, the current investigation also contributes to the literature on escalation of problem behavior during extinction. Lerman and Iwata (1996) noted that few applied studies have demonstrated a clear link between escalation of self-injury or aggression during extinction, and such results were observed in this study. It should be noted, however, that the escalation in severity of problem behavior (i.e., an extinction burst) was quickly reduced when the functional communication training package was introduced.

The primary limitation of this study was the lack of sensitivity of the 6-s partial-interval recording system that was used during the extinction analysis. This system only permitted an evaluation of the relative latency between topographies. The use of an exact latency measure would have allowed a more precise evaluation of the temporal relationship among topographies.

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STUDY QUESTIONS

1. What are some difficulties in interpreting the results of functional analyses in which consequences are provided for multiple topographies of problem behavior?

2. Briefly describe how conditional probabilities and temporal sequences were determined. What was the significance of these measures?

3. What were the procedural differences between the Phase 1 and Phase 2 functional analyses?

4. Summarize the results of the initial functional analyses for all participants.

5. What hypotheses were generated from the descriptive assessment?

6. What results were obtained during Phase 2, and how do these results support the authors' hypothesis regarding response class hierarchies?

7. To what extent do the data presented in Tables 1 and 2 correspond with those presented in Figure 3?

8. What feature of the experimental design used during Sean's extinction analysis might account for the lack of a substantial reduction in unreinforced topographies?

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