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Evaluation of salient stimulus cues during brief functional analyses in a classroom setting

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**Evaluation of Salient Stimulus Cues During
Brief Functional Analyses in a Classroom Setting**

by

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Abstract

Previous research has shown that including salient stimuli (e.g., different colored rooms or different therapists associated with each condition) may enhance differential outcomes during a functional analysis (FA). However, clinicians may have limited resources for use on arranging discriminative stimuli when conducting an FA. Therefore, the purpose of this study was to evaluate the effects of using practical stimuli, (e.g., different colored shirts, poster boards, and photos of the participant contacting antecedent environmental events associated with FA conditions) on FA outcomes. In addition, because the inclusion of salient stimuli may be most helpful when conducting brief or nonstandard FAs, we evaluated the effects of using such stimuli during brief or latency-based FAs. Five individuals with autism, who exhibited severe problem behavior, participated. A multielement design was used to demonstrate experimental control. Blocks of 4 conditions (alone, attention, play, and demand) paired with discriminated stimuli were alternated with blocks of the same conditions not paired with these stimuli. Results indicated that the inclusion of salient stimuli may serve as a practical enhancement when conducting brief functional analyses. Interobserver agreement was conducted for over 30% of sessions and averaged over 90%.

Evaluation of Salient Stimulus Cues During Brief Functional Analyses
in a Classroom Setting

Iwata et al. (1982/1994) refined an operant methodology for identifying the variables that maintain problem behavior. This method consisted of conducting brief, repeated test and control conditions and, for 6 out of the 9 participants, higher levels of self-injury were consistently associated with a specific stimulus condition. These findings suggest that within subject variability is a function of distinct features of the social and/or physical environment such as attention from a therapist or the presentation of demands. Since the Iwata et al. (1982/1994) publication, functional analysis has been replicated across a range of different response topographies including aggression (Thompson, Fisher, Piazza, & Kuhn, 1998), stereotypy (Ahearn, Clark, MacDonald, & Chung, 2007), and property destruction (Fisher, Adelinis, Thompson, Worsdell, & Zarcone, 1998). Functional analysis has become a hallmark of behavioral assessment and has reemphasized the importance of determining the function of behavior prior to treatment identification (Hanley, Iwata, & McCord, 2003).

By increasing the likelihood of identifying effective function-based treatments for problem behavior, functional analysis has led to an increase in the use of reinforcement-based treatment and a decrease in the use of punishment. Pelios, Morren, Tesch, and Axelrod (1999) conducted a literature review to determine trends in the implementation of functional analysis methodology and subsequent reinforcement-based versus punishment-based treatment selection for problem behavior. They reviewed research articles for assessment and treatment of problem

behavior published in five major journals from 1968 to 1997 and noted whether a functional analysis was conducted and the type of subsequent intervention conducted. The results indicated that there was an increase in the number of articles conducted for treating SIB (self-injurious behavior) and aggression over time. For articles that included a functional analysis, results showed an upward trend in the use of reinforcement-based interventions rather than punishment-based interventions for treating SIB and aggression across years. By contrast, for those articles that did not include a functional analysis, no trend in the use of reinforcement-based versus punishment-based interventions was identified. These findings provide support for the impact functional analysis methodology has had on treatment selection for severe problem behavior.

Hanley et al.(2003) conducted a comprehensive literature review detailing the current state of knowledge regarding research and practice on functional analysis. The findings indicated a systematic growth in the use of functional analysis methodology and pointed out several areas in need of further research for conducting practical enhancements. Some suggestions included limiting response classes to one or a few behavior topographies, incorporating establishing operation influences before and during assessments, conducting relatively brief sessions, and including salient stimuli to facilitate discrimination of test conditions. Many of the studies reviewed by the authors used these, as well as other strategies, to obtain the clearest and most accurate functional analyses outcomes possible.

One practical enhancement that may be helpful when problem behavior is too severe for inclusion in a standard functional analysis is use of a latency measure and

single-trial FA sessions. Thomason, Iwata, Neidert, and Roscoe (in press) examined a latency-based modified functional analysis to determine whether response latency could be used as a reliable index of behavior during functional analyses. First, they examined the relation between overall response rate throughout a session and latency to the first response by comparing two graphs generated from the same assessments. The results of this study indicated a consistent inverse relation between rate and latency for most participants. Based on these outcomes, they developed a latency-based functional analysis and compared outcomes from this analysis to those from a standard functional analysis. During the latency-based functional analysis, sessions were terminated after the first instance of target behavior so that a single exposure to session contingencies occurred within a session, or when the session time had run out, whichever came first. Results showed correspondence in behavioral function for 9 out of the 10 participants. These findings suggest that latency may be a useful measure of responding when repeated occurrences of a behavior are impractical due to potential harm to the participant or others.

Another practical enhancement that may facilitate implementation of functional analyses in clinical settings with limited resources is the use of a briefer functional analysis. Northup et al. (1991) evaluated the utility of a brief functional analysis of severe problem behavior in an outpatient clinic. The functional analysis was similar to that described by Iwata et al. (1982/1994) with a number of modifications. First, the entire assessment lasted 90 min, with each session lasting 5-10 min. Second, a contingency reversal phase was conducted, which consisted of three conditions. During the first contingency reversal condition, an appropriate

communicative response (e.g., manding) resulted in the consequence associated with the highest rate of problem behavior during the functional analysis. Next, a control condition (the condition associated with the highest rates of problem behavior during the brief functional analysis) was conducted. This control condition was then followed by a second contingency reversal condition. All participants showed substantial decreases in problem behavior and increases in the communication response during contingency reversal conditions. These findings suggest that functional analyses can be successfully conducted when there is a limited amount of time available and that the maintaining variables identified during the brief functional analysis could be used to reinforce appropriate, alternative behavior.

Although the results of Northup et al. (1991) suggested the utility of conducting brief functional analyses, they did not compare the results to those obtained from a complete functional analysis, making it unclear to what extent the brief analyses would have yielded similar outcomes to those obtained by a full multielement functional analysis. Kahng and Iwata (1999) extended Northup et al. (1991) by comparing outcomes obtained from a brief functional analysis (i.e., one session of each condition) with outcomes obtained from full functional analyses. Data from 50 completed full functional analysis data sets were used and brief functional analysis graphs were then created by depicting only the first session of each functional analysis condition. In addition, within-session analyses of the brief functional analyses were generated by replotting data as an average within successive 1-min bins. Data sets for the full, brief and within-session functional analyses were examined by seven to eight experienced behavior analysts until they reached a

consensus regarding the interpretation of each data set. Results indicated that interpretations of the brief and within-session data sets corresponded to those of the full FA in 66% and 68% of cases, respectively. The authors concluded that the results indicate a moderately high degree of overall correspondence between the brief and within-session methods with the full FA methods. More specifically, the brief method tended to identify a high proportion of false positives (i.e. suggested a function that was not indicated by the full FA). Because briefer assessments may be required in some clinical settings, it may be helpful to evaluate methodological enhancements for increasing the accuracy of brief functional analyses.

One explanation for why brief functional analyses may not correspond with outcomes obtained from a full functional analysis is due to limited exposure to the contingencies associated with each of the conditions. In addition, some behavioral processes, such as extinction, may not be evident in single case exposures. Wallace and Iwata (1999) attempted to examine these limitations associated with the brief analysis method by examining whether functional analysis using shorter session durations yielded similar outcomes to functional analyses using longer session durations. To this end, they compared outcomes from 46 functional analyses with 15-min session durations and generated an additional 97 data sets by subtracting either the last 5 min from each session (for 46 10-min duration data sets) or the last 10 min from each session (for 46 5-min duration sets). Individual functional analyses graphs depicting the 5-, 10- and 15-min session durations were then examined independently by experimentally blind observers, who determined whether each graph indicated attention, tangible, escape, or automatic reinforcement functions. Experimenters then

determined the extent to which the functions identified in the 5- and 10-min session functional analyses matched those identified in the full 15-min session functional analyses. Results showed that when comparing outcomes obtained from 10- and 15-min sessions, functional analyses suggested the same function in each instance. When comparing the 5-min and 15-min functional analysis sessions, three discrepancies were identified. In two of the three discrepancies, a clear function was identified based on the results of the 15-min and 10-min sessions, but no conclusive function could be determined from the 5-min session functional analyses. For the remaining discrepancy, the 5-min session data suggested an automatic function, whereas the 15-min session yielded inconclusive outcomes. The collective results of the study indicated that brief, repeated exposures to assessment conditions may, in many cases, be sufficient to identify a clear function of problem behavior. The authors suggest, however, that many considerations be taken into account when conducting functional analyses with brief session durations. For example, shorter session durations may make it more difficult for discrimination to form across conditions with similar features. In addition, antecedent manipulations associated with functional analysis conditions may not alter motivating operations during short durations. Extinction during control conditions may similarly require extended exposure to be effective.

In summary, the literature on brief functional analysis methodology suggests that this method may be a viable alternative for assessing problem behavior when extended functional analyses may not be appropriate or possible. The data do suggest, however, that modifications may be needed to ensure clear and accurate detection of behavioral function. Basic research on stimulus control may suggest methods for

enhancing clear detection of function when brief analyses are used. Because brief functional analyses may yield unclear or incorrect outcomes due to poor stimulus control of relevant contingencies associated with functional analysis conditions, it may be helpful to incorporate methods previously reported in the literature for enhancing stimulus control.

In basic research, stimulus control has been trained for key pressing with pigeons. For example, Terrace (1963a) evaluated the effects of including enhanced stimulus cues, including illumination of reinforcement and extinction keys with red and green lights, duration of illumination, and responding to the extinction key for promoting acquisition of a task. A two-component multiple-schedule procedure was used in which one component was associated with a red color (the S+ stimulus) and reinforcement and the other component was associated with a green color (the S- stimulus) and extinction. Results showed that an operant discrimination was acquired through this procedure with minimal responding on the key associated with the S- stimulus and extinction. Overall, the authors concluded that the necessary conditions for the acquisition of a discrimination response without the occurrence of error responses are the introduction of the S- stimulus immediately after conditioning the response to the S+ stimulus, and an initially large difference between S+ and S- stimuli (e.g. bright green and red lights) that is progressively reduced to a smaller (e.g. dimmed green and red lights) and constant difference between the two.

In a follow-up study, Terrace (1963b) utilized the methods found optimal in the earlier experiment by progressively decreasing the difference between a pair of discriminative stimuli in transferring from a discrimination of color to a more difficult

discrimination involving the orientation of a line. More specifically, the authors evaluated behavioral contrast, or the equivalent increase in rate of responding to the S+ stimulus during acquisition, by looking at whether or not responding to the S- key was necessary to acquire discrimination. The authors also evaluated the effects of differential reinforcement in the presence of two or more discriminative stimuli producing the contrast. In this study, the keys associated with reinforcement (S+) and extinction (S-) were designated by the illumination of red and green lights as before, but could also have a horizontal or vertical line present as well. As before, for all the pigeons taught to discriminate between red and green stimuli, the discrimination was acquired without errors (i.e., without responding to the S- key). Next, vertical-horizontal discrimination training started so that transfer from the red (S+)-green (S-) to the vertical (S+)-horizontal (S-) discrimination was established by first superimposing the vertical and the horizontal lines on the red and green backgrounds and then fading out the backgrounds. A few other stimulus features associated with the keys were manipulated. The overall results indicated that a pigeon can be trained, in successive order, an easy discrimination of color and a more difficult discrimination of the orientation of a line without making a single error in either case. Again, the critical aspect of obtaining these errorless results appeared to be gradually transitioning from an easy to a more difficult discrimination.

More recently, studies involving human subjects have included salient stimulus cues in order to facilitate discrimination across various treatment components. For example, Hanley, Piazza, Fisher, Contrucci, and Maglieri (1997) conducted a modified concurrent-chains procedure to evaluate participant preference

between two response options associated with different treatment procedures. The initial link of the chain involved the presentation of three different colored switch presses. Responding on a blue switch press resulted in a 2-min functional communication training (FCT) condition. Responding on the red switch press resulted in a 2-min non-contingent reinforcement (NCR) condition, and responding on the white switch press resulted in a 2-min extinction session. During the FCT condition, contingent on initiating a pro-social response (i.e. vocalizing “play with me” or handing the therapist a communication card), the therapist delivered 20 s of attention. During the NCR condition, the therapist delivered non-contingent attention on a time-based schedule, independent of participant behavior. Also, during the terminal link of the chain, a colored poster board that corresponded with the switch press color activated during the initial link was continuously present. During both NCR and FCT conditions, inappropriate behavior was ignored. The authors report including the stimuli (colored construction paper and poster board) in order to establish associations between the initial link response options and their corresponding terminal link contingencies. After the training trials were completed, participants’ preference for both treatment types was assessed using a modified concurrent-chains procedure.

Similarly, Tiger and Hanley (2004) used schedule-correlated stimuli (colored leis and verbal rules) to signal the availability of teacher attention and therefore influence the development of discriminated manding in a preschool classroom setting. In this procedure, in addition to stating the rules associated with each condition, the teacher wore a colored lei which mirrored the rules and signaled that the therapist

would answer questions for one child (red), would answer questions for a different child (blue), or would not answer questions for either child (white). During one phase, the stimuli were then changed randomly so that a new lei color now signaled the availability of teacher attention for each child. The results of the study demonstrated that for all 3 participants, manding behavior always occurred exclusively during times when reinforcement was available, suggesting that the cues enhanced discrimination of the contingencies available at any given time.

The previous studies illustrated the effectiveness of using discriminative stimuli to enhance discrimination. Inclusion of such stimuli may be especially useful during brief analyses, when there is limited exposure to the relevant contingencies. Conners et al. (2000) evaluated whether including programmed discriminative stimuli during a standard functional analyses would facilitate differential responding. Eight participants were exposed to four functional analysis conditions (attention, play, alone, demand) based on the procedures described by Iwata et al. (1982/1994). During the first phase of the study, each functional analysis condition for each participant was always conducted by a specific therapist in a room painted a specific color. For example, each demand condition was conducted by Therapist A in the blue room, and all attention conditions were conducted by Therapist B in the red room. Sessions were run until differentially higher rates of responding occurred consistently in one test condition. During the second phase of the study, all discriminative stimuli associated with functional analysis conditions were withdrawn. Procedures were identical to the first phase, except that the same therapist conducted each condition in the same room. This phase similarly continued until differentially higher rates of

responding were associated with one test condition, or until twice as many sessions were conducted as during the first phase, whichever came first. When each condition was associated with a specific discriminative stimulus, differentially higher rates of responding during one condition occurred for all eight participants. When these discriminative stimuli were then removed, the functional analysis outcomes became unclear for half of the participants. These results suggest that the presence of the salient cues may have increased either the efficiency of functional analyses or the likelihood of obtaining clear outcomes. The authors noted that this may be of particular benefit when conducting either very few sessions or when employing brief session durations. Although the inclusion of salient discriminative stimuli resulted in a beneficial outcome for half of the participants, one potential reason a higher success percentage was not observed is because the functional analysis with discriminative stimuli present always preceded the functional analysis with discriminative stimuli absent. This sequence could have biased results such that when the stimuli were removed, differential responding occurred because it had already been established when the stimuli were present and simply carried over into the next phase. Therefore, it is possible that differential responding would not have been observed at all or as quickly if the Sds present functional analysis had not been conducted first. Another potential concern is that the discriminative stimuli used may have been impractical for use in all settings. For example, different colored rooms and different therapists for each condition may not be available in all clinical settings. Therefore, it may be helpful to evaluate whether more practical programmed discriminative stimuli which could easily be incorporated in a range of classroom or clinical settings (e.g. different

colored T-shirts, poster boards, photos) could enhance the effects of FA outcomes. In addition, because functional analyses may be required in resource limited settings, another purpose of this study was to evaluate the stimuli using a brief functional analysis conducted in a classroom setting, the outcomes of which may greatly benefit from the inclusion of discriminated stimuli. And finally, to incorporate a multielement design to eliminate potential history effects associated with the multiple baseline design.

Method

Participants and Setting

Five children diagnosed with developmental disabilities participated. Bob was a 15-year-old male, diagnosed with Fragile X syndrome, with an extensive verbal repertoire. He engaged in aggression to others in the form of hitting, kicking, pushing and hair pulling. Mary was a five-year-old female, diagnosed with autism spectrum disorder, with a limited verbal repertoire. She engaged in frequent screaming, which interfered with daily activities. Jeremy was a 14 year-old male diagnosed with autism spectrum disorder with high functioning verbal skills. He engaged in aggression in the form of hitting, pulling, scratching and non-contextual touching. Jerry was a 16-year-old male diagnosed with autism spectrum disorder, with high functioning verbal skills and limited physical mobility, who engaged in object biting. Emma was a 10-year-old-female diagnosed with autism spectrum disorder with limited verbal skills (i.e. 1 to 2 word verbal approximations). She engaged in aggression to others in the form of hitting, kicking, punching, and scratching.

All sessions were conducted at a school for children diagnosed with autism spectrum disorder or at an integrated public school classroom designed to provide intensive, individualized instruction to students with autism spectrum disorder. Sessions were conducted in participants' typical classroom setting, in desk or cubby areas used for classroom work. Each classroom contained 2 to 3 desk or cubby areas with 2 to 4 chairs in each area. Two or three additional students and teachers were present, in addition to standard classroom materials, including acquisition skill stimuli (e.g. household items, books, and number blocks), leisure items, and occupational therapy items such as therapy balls. For one participant, sessions were conducted with only the therapist present because of the severity of his behavior.

Response Measurement, Interobserver Agreement, and Procedural Integrity

The dependent variable of interest was participant's problem behavior, including screaming, aggression, and object biting. Screaming was defined as any non-contextual vocalization over conversation level, not paired with a smile and lasting greater than 1 s. Aggression was defined as any instance of hitting, kicking, pushing, or hair pulling, and for Jerry also included any non-contextual touching. Object biting was defined as any instance of an inedible object passing the plane of the lips. Data were collected by trained observers using frequency measures during 5-min sessions. Session time was segmented into 10-s bins.

During the latency-based functional analysis, response latency data were collected. Response latency was measured by recording the duration in seconds from the start of each 5-min session to the first instance of the target behavior. When interpreting latency data during the functional analysis, shorter latencies are

indicative of higher probabilities of responding. Thus, conditions functionally related to the occurrence of behavior would be expected to produce relatively short latencies.

Interobserver agreement was assessed by having two trained observers collect data simultaneously and independently. Observers' 10-s interval-by-interval records were compared for agreements and disagreements. Interobserver agreement for frequency data was calculated by dividing the smaller number of responses recorded in each interval by the larger number, averaging those fractions, and multiplying by 100%. Agreement for latency data was calculated by dividing the shorter latency by the longer latency and multiplying by 100%. For each participant, IOA data were collected during at least 33% of sessions and all scores ranged between 98.8% and 100%.

Procedural integrity percentages were collected for consequence delivery from the therapist by dividing the amount of times the therapist delivered the appropriate consequence by the number of times the target behavior occurred. Data were collected among at least 33% of all sessions and mean procedural integrity for reinforcer delivery was 99.5% across participants.

Functional Analysis

A functional analysis based on procedures described by Iwata et al. (1982/1994) was conducted. Test and control sessions were alternated in a multielement design. All analyses included attention, demand, alone or ignore, and play conditions, with one exception: an alone or ignore condition was not included when the sole target behavior was aggression. Also, for Emma, a tangible condition was included based on anecdotal

reports of aggression occurring when tangible items were removed. The play condition served as the control condition against which responding in other conditions was compared.

Attention. At the beginning of each session, the therapist indicated that (s)he “had work to do,” and ignored all of the participant’s non-target behavior. Following each occurrence of the target problem behavior, the therapist delivered a brief statement of concern and non-punitive physical contact (e.g., the therapist would say “don’t do that, that hurts” while placing a hand on the participant’s shoulder).

Demand. Approximately 3 to 4 tasks were identified for use in the session through teacher interview and informal observation. During each session, the therapist initiated instructional trials using a three-step, 5 s delay, graduated prompting procedure (instruction, demonstration, and physical prompts). Compliance resulted in verbal praise, whereas problem behavior resulted in termination of the instructional sequence for approximately 30 s.

Alone/Ignore. The participant was either alone in the room or at least 2.5 m away from observers, with no access to leisure items or interaction. There were no programmed contingencies for problem behavior during sessions.

Tangible. Prior to the start of the session, the participant had brief access to preferred leisure items for 2 min. At the start of the session, the therapist removed the items. Contingent on occurrences of the target behavior, the therapist represented the items and they remained available for 1 min.

Play. The therapist placed preferred leisure items within reach of the participant prior to the start of each session and initiated brief social interaction on a fixed-time 30-s schedule throughout the session or more frequently if initiated by the participant. All problem behavior was ignored.

Latency-based Functional Analysis

For one participant, Bob, a latency-based functional analysis similar to that described by Thomason et al. (in press) was conducted. During this procedure, attention, demand, alone, and play conditions were conducted as described above, with a few modifications. All session contingencies were the same as described previously; however, each session was a maximum of 5 min in duration. For example, attention and escape sessions were terminated immediately following the delivery of programmed consequences for the first instance of a target problem behavior or when 5 min elapsed, whichever came first. Alone and play sessions were terminated either 1 min after the occurrence of target problem behavior (to prevent inadvertent social consequences for behavior) or when 5 min elapsed, whichever came first. The dependent variable in this analysis was the latency to the target problem behavior.

Experimental Design

The effects of programmed discriminative stimuli (Sds) during functional analyses were evaluated using a multielement design. A series of three or four conditions including alone, attention, play, demand, tangible (Emma only), or some combination, with Sds present were conducted first, followed by a series of three or four functional analysis conditions with Sds absent. These two phases, Sds present

and Sds absent, were alternated across successive series of the three or four functional analysis conditions. Functional analysis sessions were 5 min in duration. Criteria for completing a functional analysis included a minimum of three functional analysis series, for both Sds present and Sds absent phases, and either differentially higher responding in either Sds present or Sds absent phases, or a maximum of six series with both Sds present and Sds absent.

Sds Present Condition. Salient stimulus cues were presented during these functional analysis sessions. These stimuli included different colored poster board (55 x 70 cm in green, red, blue, or black) associated with each condition, 20 x 25 cm photos depicting the participant and therapist in the relevant condition (e.g., the photo present in the demand condition depicted the therapist manually guiding the participant to complete a work task in the natural environment), and different colored t-shirts worn by the therapist. Immediately before each functional analysis session, the therapist placed the corresponding colored poster board on the wall or partition in view of the participant. The therapist also wore the same colored t-shirt and instructed the participant to attend to the corresponding photo for approximately 10 s before placing it on the wall near the poster board.

Sds Absent Condition. All procedures were identical to those in the Sds Present Condition except no programmed stimuli were presented before or during functional analysis sessions.

Results

Figure 1 shows the results from Mary's functional analysis. When Sds were present (top panel), screaming was differentially higher in the demand condition as

compared to the other conditions, suggesting that Mary's screaming was maintained by escape from demands. When Sds were absent (bottom panel), responding was initially differentially higher in the demand condition relative to the other conditions. However, by the end of the third series, problem behavior decreased during demand and remained low in attention, making a clear determination of function difficult. These results suggest that the presence of the discriminative stimuli facilitated clearer functional analysis outcomes.

Figure 2 shows the results of Bob's latency-based functional analysis. Higher response latencies are indicative of lower response probabilities, whereas lower response latencies indicate higher response probabilities. During both Sds present and absent phases, the latency to respond was consistently differentially lower in the demand condition relative to the other conditions, in which maximum latencies (or no responding) was observed. These data suggest that, for this participant, Sds did not have an enhancing effect in that clear outcomes were obtained regardless of whether or not salient stimulus cues were added.

Figure 3 shows the results of Jeremy's functional analysis. When Sds were present, responding was initially differentially higher in the demand condition. During the second series, responding decreased to zero during the demand session. However, responding recovered to differentially higher levels in the final demand session. When Sds were absent, responding was initially slightly higher in the demand condition relative to the other conditions. Again, responding decreased to zero during the second demand session and then recovered to a differentially higher level during the final demand session. Although some variability in the pattern was

observed during both Sds absent and Sds present functional analysis sessions, similar patterns were observed across the two types of functional analysis sessions, suggesting that Sds were not necessary for obtaining clear functional analysis outcomes for this participant.

Figure 4 shows the results for Jerry. When the Sds were present, responding was differentially higher in the demand condition for the first two series, but decreased during the third series, and during the fourth series it increased slightly. Additionally, during the second and third series, responding increased in the alone conditions. Because of the variability of responding during the Sds present conditions, an additional two series were conducted where responding did not occur across all conditions. Similarly, during the initial three series of Sds absent conditions responding was undifferentiated across the attention, alone, and demand conditions, possibly suggesting an automatic function. One additional series was conducted, however, and responding did not occur across all conditions. Therefore, the initial variability in both Sds present and Sds absent conditions, and subsequent decrease in responding make a clear determination of function difficult, and therefore it remains unclear what effect inclusion of Sds had on the functional analysis outcome for this participant as well.

Figure 5 shows the results from the abbreviated functional analysis for the final participant, Emma. When the Sds were present, responding was differentially higher in the tangible condition for the first 2 series. For the third series, responding decreased in the tangible condition. However, when the Sds were absent, responding remained differentially higher in the tangible condition. Because behavior decreased

in all conditions during the third series of the Sds present FA, an additional three series were conducted for both types of functional analyses. During the additional three series of the Sds present condition, responding only occurred in the second to last series of the attention condition. During the additional three series of the Sds absent condition, behavior decreased and remained at zero rates. Therefore, although the initial couple of series indicated that Emma's aggression was maintained by access to tangibles, the subsequent decrease in responding and variability obtained make a clear determination of function difficult. In addition, due to the variability in responding across both Sds present and Sds absent functional analyses, it remains unclear what effect inclusion of Sds had on the FA outcome for this participant.

Discussion

The current study extended previous research by evaluating the effects of practical stimulus cues that can readily be incorporated into clinical settings, evaluating the effects of Sds during brief FAs, and by conducting a multielement design rather than a reversal design/multiple baseline across subjects design to evaluate the effects of Sds.

Specifically, we examined the extent to which the inclusion of discriminative stimuli would facilitate obtaining clear outcomes during brief analyses conducted in the classroom setting. For one participant, Mary, a slight enhancing effect was suggested when responding was more differentiated during one condition with Sds present. Mary's data suggest that the inclusion of discriminative stimuli during brief functional analyses may enhance outcomes. However, because she is the only participant whose data indicated a beneficial outcome, this finding is tentative and

additional data are necessary to further evaluate the effect of including Sds. For the two participants who showed clear outcomes regardless of whether or not Sds were present, their data suggested that the natural discriminative stimuli embedded in the functional analysis were sufficient to occasion differential responding, even though their functional analyses were brief (i.e., included three series of 5 min sessions).

Although two of the five participants showed clear outcomes during both brief functional analyses, it is unclear what proportion of participants across a large sample size might yield such an effect. For the two remaining participants, because undifferentiated responding was observed across conditions during both types of functional analyses, the data did not allow for an examination of the effect of the presence of the stimuli. Although we conducted an additional one to three series, it is possible that conducting more sessions, longer sessions, a different experimental design, or examining within session patterns, may have led to clear outcomes.

A potential concern when evaluating the effects of Sds on functional analysis outcomes is that it requires obtaining clear and differentiated outcomes when Sds are present. Because obtaining clear functional analysis outcomes may require conducting extended sessions, it may become difficult to keep the analysis brief when obtaining the data necessary for examining the effects of Sds.

In addition, although a multielement design eliminates potential confounds associated with sequence effects, rapid alternation across a larger number of conditions (8 in the current study) may increase the likelihood of obtaining unclear outcomes during both functional analysis types. Therefore, future research is needed

to evaluate the best way to identify the effects of including salient stimulus cues during brief functional analyses.

Future research should explore other methods for enhancing efficient functional analyses that yield clear outcomes. For example, manipulating pre-session conditions to enhance potential motivating operations during functional analyses and using information from descriptive analyses to inform modifications of standard functional analysis methods when they yield unclear outcomes.

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Figure Caption

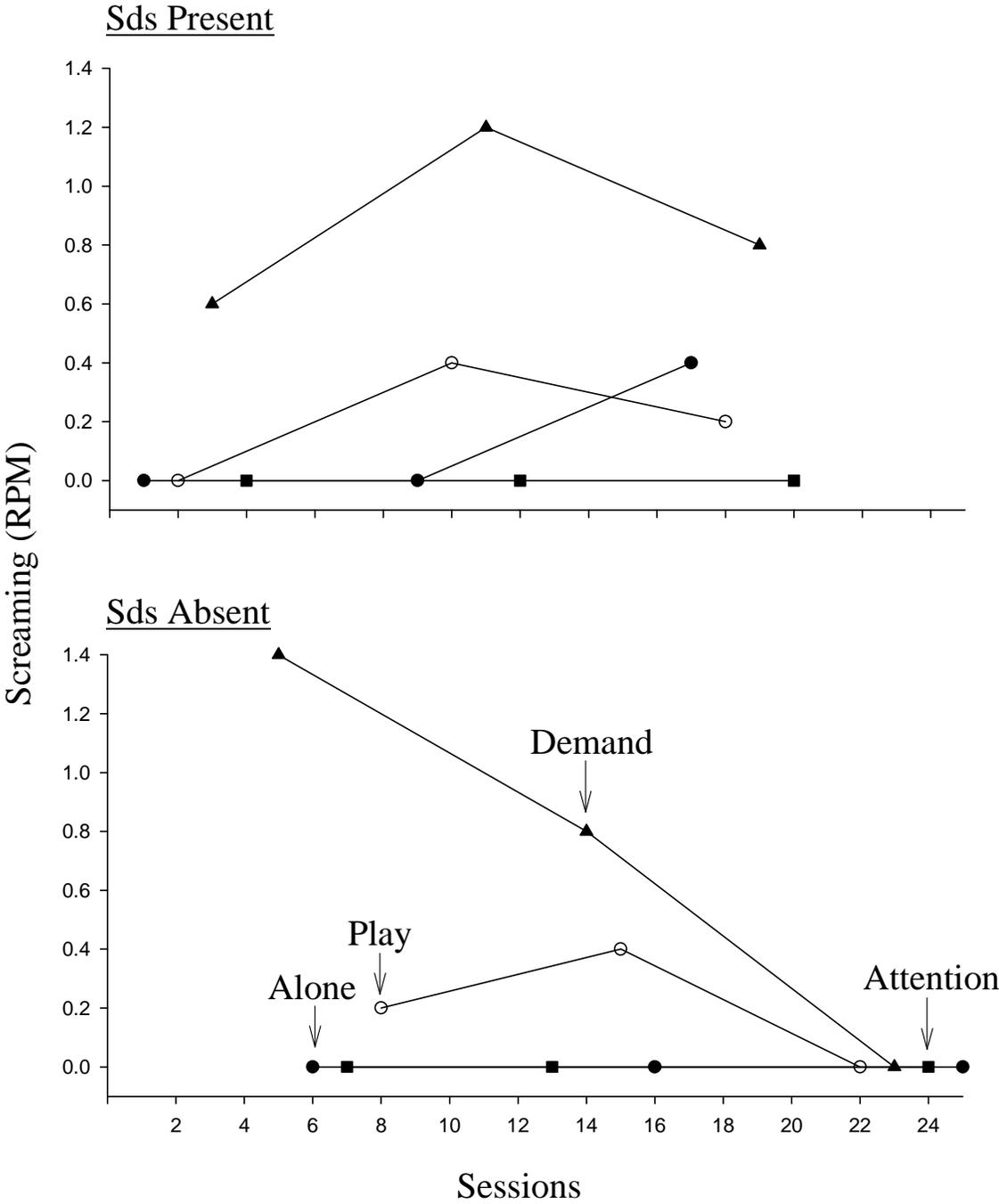
Figure 1: Sds present versus absent functional analyses results for Mary.

Figure 2: Sds present versus absent functional analyses results for Bob.

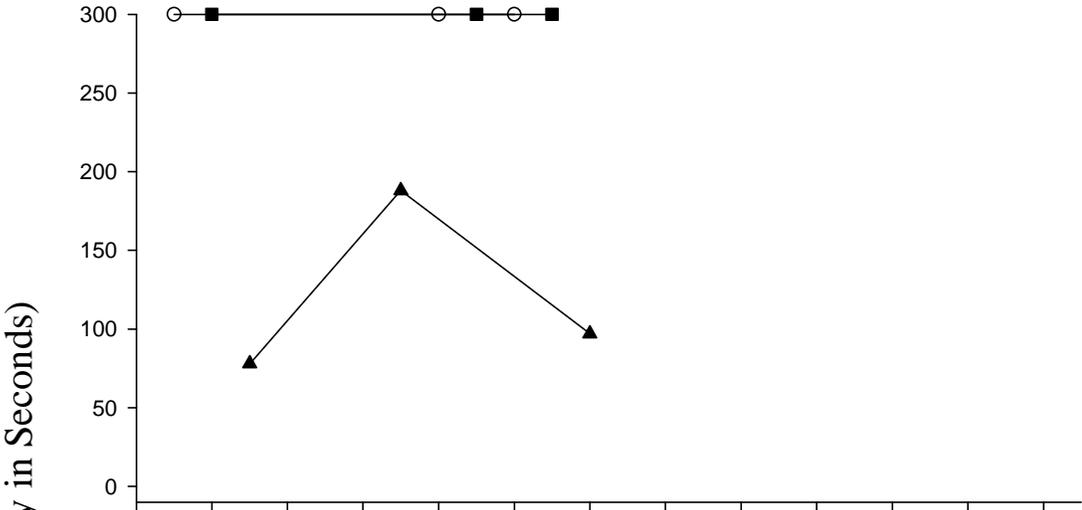
Figure 3: Sds present versus absent functional analyses results for Jeremy.

Figure 4: Sds present versus absent functional analyses results for Jerry.

Figure 5: Sds present versus absent functional analyses results for Emma.



Sds Present



Sds Absent

