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A SYSTEMATIC EXAMINATION OF DIFFERENT PARAMETERS OF PRESESSION EXPOSURE TO TANGIBLE STIMULI THAT MAINTAIN PROBLEM BEHAVIOR

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We examined the effects of three different presession conditions on tangibly maintained problem behavior for 2 students with autism, using individual-participant multielement designs. First, an analogue functional analysis demonstrated that problem behavior was maintained by access to tangible items. Next, topographies of item rejection were identified. Finally, students were exposed to (a) brief access, (b) no access, and (c) satiation to the tangible items prior to tangible sessions. The results demonstrated high levels of problem behavior following the brief-access and no-access presession conditions and low levels of problem behavior following the satiation condition. The findings are discussed in the context of how satiation might best be defined for these sorts of evaluations.

DESCRIPTORS: problem behavior, deprivation, functional analysis, motivating operations, satiation

Vollmer and Iwata (1991) demonstrated the influence of motivating operations on reinforcement effects for individuals with intellectual disabilities. Since then, there has been a steady interest by behavioral researchers in examining both the functional properties and clinical applications of motivating operations with this population (e.g., Langthorne, McGill, & O'Reilly, 2007; McGill, 1999; Michael, 2000; Smith & Iwata, 1997; Wilder & Carr, 1998). Motivating operations are now known to be critical variables when developing and interpreting behavioral assessments such as functional analyses of problem behavior (Iwata et al., 1994; Worsdell, Iwata, Conners, Kahng, & Thompson, 2000) or choice-making and preference assessments (Hagopian, Long, & Rush, 2004; McAdam et al., 2005). The motivating operation concept has also created the opportunity for behavioral researchers to examine the interaction between various bio-

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logical conditions (e.g., health variables, genetic syndromes) and operant behavior with individuals with intellectual disabilities (E. G. Carr & Blakeley-Smith, 2006; Kennedy & Meyer, 1996; O'Reilly, Lacey, & Lancioni, 2000).

A typical procedure used by researchers to examine motivating operations has been to isolate a three-term contingency and hold these relations constant while various parameters of a putative motivating operation are manipulated. If changes occur in the strength of operant responding and these changes correspond with various manipulations of the putative motivating operation, then the researchers can infer more confidently that this third variable did in fact function as a motivating operation (see Vollmer & Van Camp, 1998, for a detailed discussion of this procedure).

For example, several researchers have examined the effects of free access versus restricted access to a reinforcing stimulus immediately prior to sessions in which this stimulus is made contingent on responding (e.g., McComas, Thompson, & Johnson, 2003; Vollmer & Iwata, 1991). Vollmer and Iwata, for example, varied the availability of music immediately prior to sessions in which music was used to reinforce responding. In one condition (described as a satiation condition by the authors) music was played in the vicinity of the participants for 30 min prior to sessions, and in another condition (termed deprivation by the authors) music was unavailable for 30 min prior to sessions. Sessions consisted of reinforcing a simple task with music on a fixed-ratio (FR) schedule. The authors demonstrated less responding during sessions that were preceded by the satiation condition. Presession access or no access to music acted as a motivating operation by either abolishing or establishing, respectively, the reinforcing effectiveness of music.

In some cases, however, presession manipulations of reinforcing stimuli have not produced clear differentiation of responding in subsequent sessions in which the reinforcing stimuli are made contingent on responding. O'Reilly et al. (2008) examined the effects of presession access (15 min) to or restriction of a preferred beverage on subsequent problem behavior that was maintained by access to the beverage. Very little difference was seen in problem behavior during leisure activities following presession access to or restriction of the beverage. This type of outcome has also occurred for some participants in other studies that have examined the effects of presession access or examined the effects of various levels of access within experimental sessions (e.g., Gutierrez et al., 2007; Vollmer & Iwata, 1991; Worsdell et al., 2000). In yet another study, Roantree and Kennedy (2006) demonstrated that presession access (20 min) to attention produced an increase rather than the expected decrease in attention-maintained stereotypy in subsequent sessions (in which stereotypy was reinforced on an FR schedule). Thus, Roantree and Kennedy demonstrated that presession attention had the paradoxical effect of being an establishing operation rather than an abolishing operation.

The functional properties of these antecedent manipulations need to be further analyzed. Although not explicitly stated in every study in this research line, presession access and restriction conditions are designed to influence levels of satiation and deprivation of a reinforcer in subsequent sessions. Presession access should produce a level of satiation (an abolishing operation), and presession restriction should produce a level of deprivation (an establishing operation). This method of examining satiation or deprivation is somewhat unsystematic, because behavioral correlates of satiation and deprivation are rarely assessed during these presession conditions.

Researchers often control access to reinforcing stimuli for a brief time prior to sessions in which these stimuli are then made contingent on behavior. However, some of the unclear and paradoxical findings that have been reported (e.g., Roantree & Kennedy, 2006; Worsdell et

al., 2000) may be due to the presession conditions failing to produce the intended effect (satiation or deprivation) with some participants. Brief presession access to a stimulus may act as a form of reinforcer sampling or response primer (establishing operations) and actually increase the reinforcing effectiveness of the stimulus (Ayllon & Azrin, 1968; Azrin & Powell, 1969; Catania, 1998; O'Brien, Azrin, & Henson, 1969; Roantree & Kennedy). In fact, a very brief presession exposure (i.e., 10 to 30 s) to tangible stimuli is routinely used in functional analysis research with the intent of establishing the stimulus as a reinforcer prior to tangible-condition sessions (Iwata et al., 1994). Another impetus for a closer examination of the functional properties of these presession access conditions is that researchers are increasingly including these periods in intervention research (e.g., Gutierrez et al., 2007; O'Reilly et al., 2007, 2008). Characterizing presession conditions based on their functional rather than structural properties (e.g., 10 min of access) might produce a more cohesive literature.

In the current study we examined three parameters of presession access for tangibly maintained problem behavior of 2 children with autism. In one presession condition, we provided brief continuous access to the tangible reinforcer for 5 min prior to sessions in which this reinforcer was available contingent on problem behavior. In a second condition, participants were deprived of the items for at least 8 hr before the items were delivered contingent on problem behavior. In the final presession condition, the children were given continuous access to the items until they were rejected three times, after which the items were delivered contingent on problem behavior.

GENERAL METHOD

Participants, Therapists, and Classroom Settings

Two children who had been diagnosed with autism participated in this study. Both had been diagnosed by an independent psychologist prior to involvement in the study and attended private schools specializing in the education of children with developmental disabilities. Neither child was on medication while participating in the study. Rusty, an 8-year-old Caucasian boy, had no spoken language and used a speech-generating device for manding. His educational goals were focused on increasing self-help skills, reducing problem behavior, and increasing appropriate use of his speech-generating device. He scored a 40.5 on the Childhood Autism Rating Scale (CARS; Schopler & Reichler, 1980), placing him in the severe autism category. Terry, a 5-year-old Caucasian boy, communicated in two- to three-word sentences, primarily for manding. His educational goals included early literacy skills, language acquisition, and reducing problem behavior. He scored a 36.5 on the CARS, placing him on the borderline between moderate and severe autism.

All sessions and interobserver agreement observations were conducted by four advanced doctoral students in special education who were also board-certified behavior analysts. These therapists had extensive experience in conducting such research and were trained by the first author to conduct the experimental protocol and collect data prior to the study. All sessions were conducted in a screened-off area of their respective classrooms and contained a table, several chairs, and the experimental materials. No other students were present in the classroom during sessions.

Target Behaviors and Data Collection

Rusty's problem behavior was defined as loud vocalizations (significantly above the conversational level) that lasted at least 2 s and usually took the form of an "eeee" sound. His item-rejection behavior was dropping the tangible item to the floor with no attempt to retrieve it for 3 s. Terry's problem behavior was throwing objects (e.g., pencils, books), which was defined as the object leaving Terry's hand and traveling at least 0.3 m through the air. His item-rejection behavior was defined as placing items

in his left hand (his nondominant hand) and actively manipulating other objects with his right hand. For example, Terry would hold a crayon in his left hand and play with the legs of his chair with his right hand or rub his right hand on the wall. Observers recorded target behaviors (problem behaviors in both the functional analysis and manipulation of presession conditions, item-rejection behaviors in the identification of item-rejection behaviors phase) using a 10-s partial-interval procedure.

Interobserver Agreement

Interobserver agreement data were collected for each participant during 60%, 40%, and 40% of the sessions in the functional analysis, item-rejection behaviors, and the manipulation of presession conditions, respectively. Agreement was calculated using an interval-by-interval method. The number of intervals in which both observers agreed on occurrence or nonoccurrence was divided by the total number of intervals of agreements plus disagreements, and the ratio was converted to a percentage. Mean interobserver agreement for the functional analysis for Rusty was 94% (range, 93% to 96%) and 97% (range, 96% to 100%) for Terry. During the item-rejection analysis, mean interobserver agreement was 98% (range, 94% to 100%) for Rusty and 100% for Terry. During the presession conditions, mean interobserver agreement was 99% (range, 94% to 100%) for Rusty and 100% for Terry.

Experimental Design

Individual-participant multielement designs (Kennedy, 2005) were used to demonstrate experimental control within each of the three phases of the study.

FUNCTIONAL ANALYSIS

Method

A functional analysis was conducted to identify the contingencies that maintained problem behavior for Rusty and Terry. The procedures were similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994).

Procedure

Rusty and Terry were exposed to four analogue assessment conditions: (a) play, (b) attention, (c) demand, and (d) tangible. Five 10-min sessions of each condition were conducted with each participant. In the play condition, an array of medium-preference toys (different from the toys used in the tangible condition) was available, and a therapist continuously interacted with the participant in a pleasant manner. In the attention condition, medium-preference toys (different from the toys used in the tangible condition) were again available, but the therapist ignored the participant by pretending to read a book. When the targeted problem behavior occurred, the therapist interacted with the participant for 10 s (e.g., "Don't do that. Are you okay?") and then returned to the book. During the demand condition, the therapist engaged the participant in academic tasks that were selected from his current individualized education plan. These tasks included matching pictures to objects, tacting pictures of objects, writing his name, and writing letters. Contingent on problem behavior, the therapist withdrew the task for 10 s and then reintroduced the task after the 10 s elapsed and the child had desisted in problem behavior. In the tangible condition, highly preferred items were visible to the participants throughout the session but were only made available for 10 s contingent on problem behavior. Children's books that played songs or made other noises were delivered to Rusty, and crayons and paper were delivered to Terry. These items were identified by teacher and parent report and were then verified in a paired-stimulus preference assessment (Fisher et al., 1992). Teachers and parents also reported that these particular toys were often associated with problem behavior when attempts were made to remove them. The attention, demand,

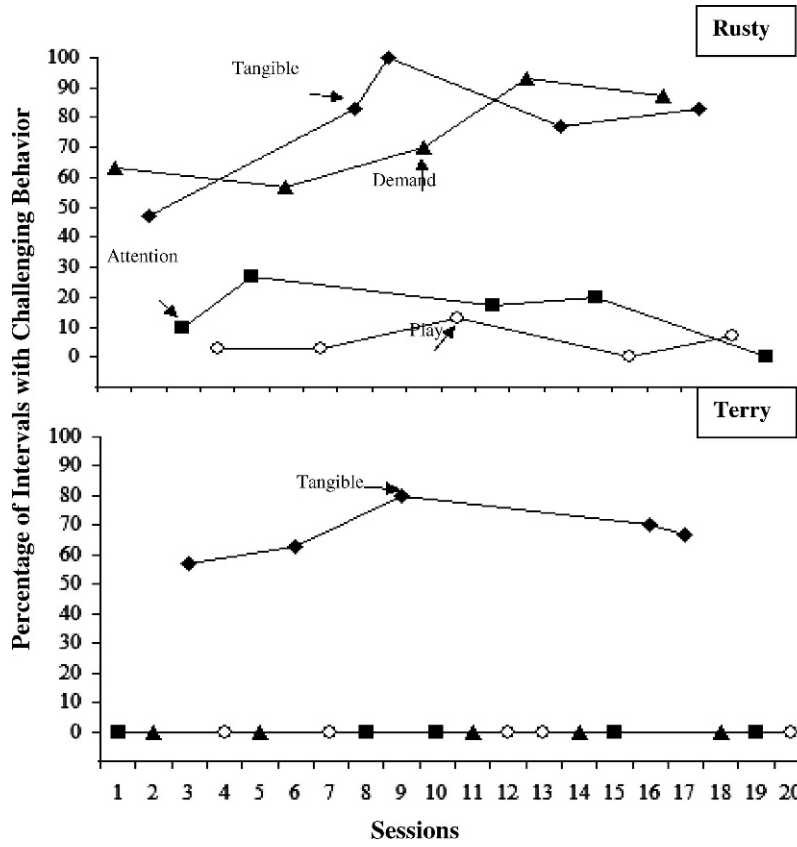

Figure 1. Percentage of intervals with problem behavior during attention, demand, tangible, and play conditions for Rusty (top) and Terry (bottom).

and tangible conditions were designed to assess whether access to attention, escape from demanding instructional activities, or access to tangible items was maintaining problem behavior. The play condition served as a control for the other three conditions, in that no demands were placed on the children while attention and toys were freely available.

Results and Discussion

Results of the functional analyses are presented in Figure 1. Problem behavior occurred for Rusty primarily during the tangible (M = 78% of intervals) and demand (M = 74% of intervals) sessions. Low levels of problem behavior occurred during the attention (M = 15% of intervals) and play (M = 5% of intervals) sessions. These results indicated that Rusty's problem behavior was primarily maintained by access to tangible items (i.e., children's books that played songs) and escape from instructional demands. Terry's problem behavior occurred exclusively during tangible sessions (M = 67% of intervals), indicating that it was maintained by access to tangible items (i.e., crayons and drawing paper).

IDENTIFICATION OF ITEM-REJECTION BEHAVIORS

Method

An analysis was conducted to identify response topographies that Rusty and Terry used to reject tangible items.

Procedure

Parents and teachers were interviewed, and both parties concurred on the item-rejection behaviors identified for Rusty and Terry (see above). The following analysis was used to verify these nominations.

Rusty and Terry were exposed to two conditions: (a) high-preference item and (b) low-preference item. Five 10-min sessions of each condition were conducted with each participant. Observers measured the percentage of intervals of item-rejection behaviors during each session. In the high-preference item condition, the therapist continuously exposed Rusty and Terry to the highly preferred item demonstrated to reinforce problem behavior in the tangible condition of the functional analysis (books that produced songs for Rusty, crayons with paper for Terry). For example, a therapist sat opposite Rusty at a table and presented him with a book that produced songs. If Rusty rejected (i.e., dropped) the book during the session, the therapist physically re-presented the book to him at the table and indicated to him to continue playing with the book. In the low-preference item condition, the therapist presented participants with a toy that neither of the children selected in the earlier paired-stimulus preference assessment (a red plastic frog for Rusty, a cloth doll for Terry). The therapist continuously re-presented these items if the child rejected them during the session.

Results and Discussion

The results of the item-rejection analysis are presented in Figure 2. During the low-preference item condition, there were high levels of item rejection (dropping the frog for Rusty; holding the doll in the nondominant hand while manipulating other items for Terry). Very little item rejection was observed for either child during sessions with high-preference items. This analysis supported parent and teacher reports regarding item-rejection topographies. This information was used in the behavioral definition of satiation in the manipulation of presession conditions.

MANIPULATION OF PRESESSION CONDITIONS

Method

In this phase, the children were again exposed to the tangible condition of the functional analysis. Immediately prior to these sessions, they were exposed to one of three presession conditions (no access, brief access, satiation) to determine their influence on problem behavior.

Procedure

Each session in this analysis was identical to the tangible condition from the functional analysis. Rusty and Terry received 10 s of access to the preferred items (music books, crayons and paper) contingent on problem behavior. All sessions lasted 10 min.

No access. Sessions were conducted when the children had not had prior access to the preferred tangible items for at least 8 hr. On the days that a no-access session was conducted, the therapist instructed parents not to provide access to the identified toys that morning prior to school, and the toys were unavailable in the classroom until the afternoon following the session.

Brief access. In the brief-access condition, Rusty and Terry received continuous access to the preferred tangible item for 5 min immediately prior to the session. For example, the therapist gave Rusty a preferred music book to play with for 5 min. After 5 min of access, a tangible session was conducted in which the therapist made the book available for 10 s contingent on problem behavior.

Satiation. The therapist gave Rusty and Terry continuous access to the preferred item until they rejected the item three times using the behaviors identified earlier. No time limit was set for these satiation periods. For example, the therapist gave Rusty access to a preferred music

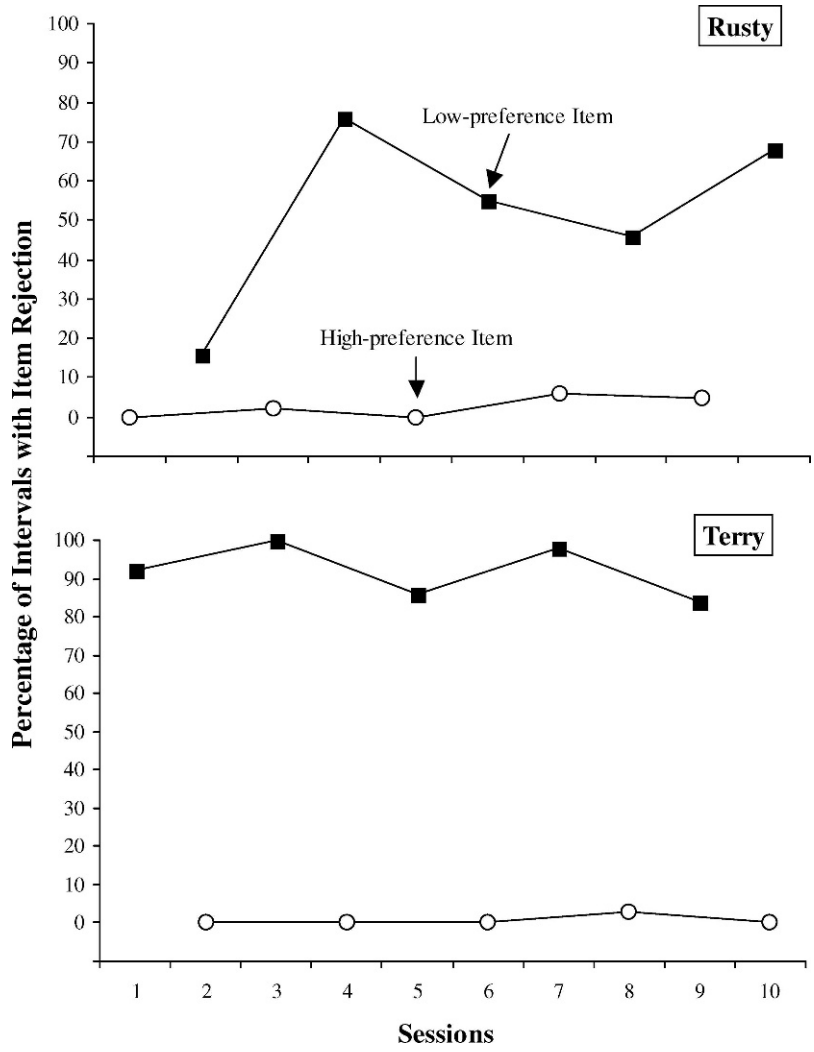

Figure 2. Percentage of intervals with item rejection with high- and low-preference items for Rusty (top) and Terry (bottom).

book. A therapist remained in close proximity and immediately re-presented the book until it was dropped the third time, at which point a tangible session was conducted.

Results and Discussion

The effects of the no-access, brief-access, and satiation conditions on problem behavior during tangible sessions are presented in Figure 3. Overall, the results are consistent for both children, with little problem behavior occurring following the satiation sessions and high levels of problem behavior following the no-access and brief-access conditions. Problem behavior was somewhat higher in the brief-access condition (M = 65% of intervals for Rusty, M = 71% of intervals for Terry) than in the no-access condition (M = 51% of intervals for Rusty, M = 58% of intervals for Terry). These results seem to indicate that the brief-access and no-access conditions produced an establishing operation, increasing the reinforcing value of the tangible item. Interestingly, the brief-access condition appeared to have been a

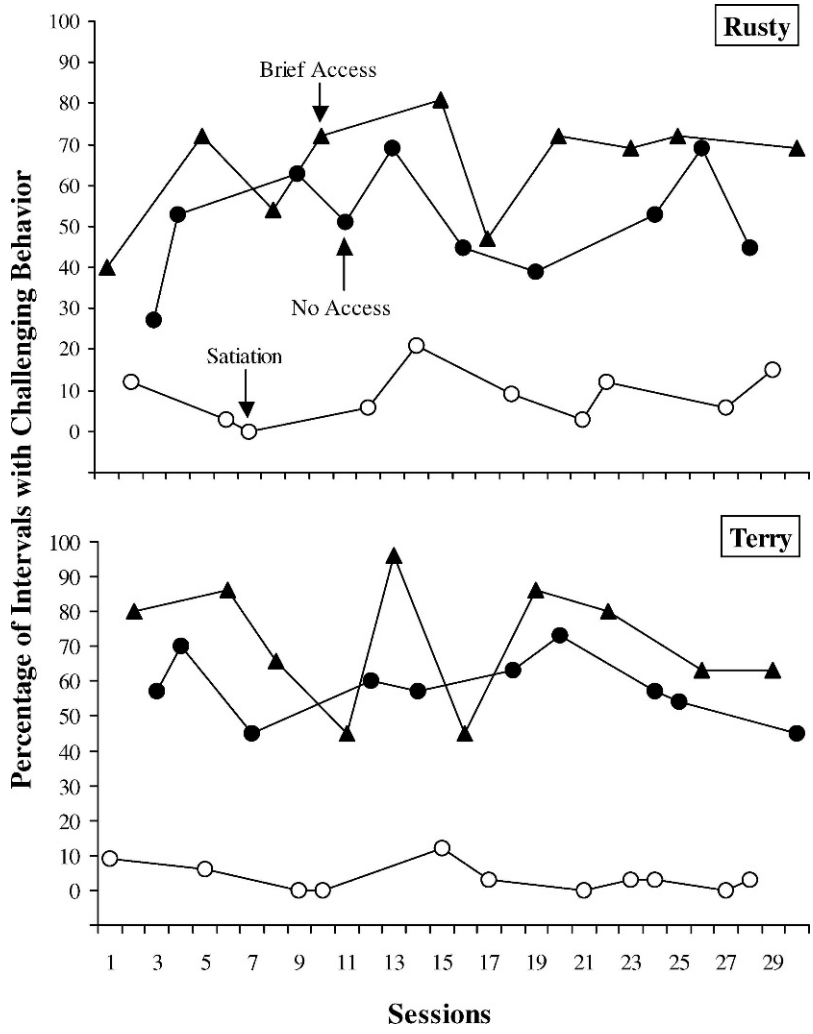

Figure 3. Percentage of intervals with problem behavior during the tangible condition following no-access, brief-access, and satiation conditions for Rusty (top) and Terry (bottom).

slightly more powerful establishing operation than the no-access condition. Problem behavior was consistently low in tangible conditions following the satiation condition for Rusty (M = 9% of intervals) and Terry (M = 3% of intervals).

The findings from the manipulation of presession conditions indicate that our method of determining satiation by examining its behavioral correlates (i.e., rejecting the tangible item three times) did indeed predict satiation of the reinforcer during subsequent tangible sessions. We can conclude from these findings that the satiation condition acted as an abolishing operation, decreasing the reinforcing value of the tangible items. Time to satiation (i.e., defined as three rejections of the tangible item) varied during satiation sessions and ranged from 15 to 35 min (M = 23 min) for Rusty and 8 to 24 min (M = 14 min) for Terry. This approach to defining satiation offers advantages over previous methods in that it includes observable evidence of satiation (i.e., item rejection) rather than exposing the partic-

ipant to a reinforcer for predetermined periods of time. This method does not seem to be unwieldy, because time to satiation was similar to many studies that have used time exposure alone as a measure of satiation (e.g., O'Reilly et al., 2008; Vollmer & Iwata, 1991).

GENERAL DISCUSSION

In the current study we examined the influence of various parameters of presession access (no access, brief access, and satiation) to tangible reinforcers that maintained problem behavior for 2 children with autism. Results demonstrated that each presession condition produced distinct patterns of responding under subsequent tangible sessions. High levels of problem behavior occurred in tangible sessions in the no-access condition, suggesting that the 8 hr of deprivation functioned as an establishing operation. This finding replicates the results of several previous studies (e.g., Berg et al., 2000; Vollmer & Iwata, 1991) and reiterates the importance of considering levels of deprivation for reinforcers when conducting assessments and interventions with individuals with intellectual disabilities. This phenomenon has been clearly demonstrated and described with regard to conducting functional analyses of problem behavior and preference assessments (Berg et al.; Iwata et al., 1994; McAdam et al., 2005). In addition, item deprivation has also been incorporated into intervention packages (e.g., J. E. Carr, Bailey, Ecott, Lucker, & Weil, 1998; Klatt, Sherman, & Sheldon, 2000).

We demonstrated what might best be described as a priming effect with the brief-access presession condition. Problem behavior was highest in the brief-access condition. Response priming or reinforcer sampling has been described early in the applied behavioral literature as a brief exposure to a reinforcer or practice of a response prior to reinforcement contingencies that then increases the probability of the response (e.g., Allyon & Azrin, 1968). From a functional perspective, response priming and reinforcer sampling might best be described as an establishing operation, because they seem to evoke operant responding and increase the power of the reinforcer. There is some evidence to suggest that interventions using priming techniques can be used to teach social and academic skills to students with intellectual disabilities (e.g., Zanolli, Daggett, & Adams, 1996), although the functional properties (i.e., how priming enters into a functional relation with the three-term contingency) are rarely clearly demonstrated in such work. Brief exposure to a reinforcer prior to instructional sessions might increase the power of that stimulus and thus produce positive effects on acquisition, generalization, and maintenance of skills. Future research should examine these questions.

In the present study we provided a preliminary demonstration of how researchers might approach the examination of satiation beyond merely exposing participants to reinforcers prior to sessions in which these reinforcers are then made contingent on responding. We examined possible behavioral indicators of satiation (i.e., rejecting the stimulus three times in the presession condition). This method of defining satiation seems to be a more sensitive measure of this phenomenon. Other behavioral measures of satiation, such as latency to response, might also be examined in future research. Indeed, given the results of our brief-access condition in this study and the results of the recent study by Roantree and Kennedy (2006), it is important that we continue to examine behavioral indicators of satiation. Our field continues to demonstrate and clarify the functional properties of motivating operations (Michael, 2000), so a closer scrutiny of such phenomena is warranted.

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