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Effects of Presession Satiation on Challenging Behavior and Academic Engagement for Children with Autism during Classroom Instruction

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Abstract: We evaluated the effects of presession satiation on challenging behavior and academic engagement during subsequent classroom activities for three 5–6 year-old children with autism. The percentage of 10-s intervals with challenging behavior and academic engagement during 20-min classroom activity sessions was observed under two conditions. One condition involved presession satiation, in which participants were given unrestricted access to tangible items that maintained their challenging behavior prior to the classroom sessions. This presession satiation continued until the children rejected the tangible item three times. The second condition did not entail presession satiation prior to the beginning of classroom sessions. Effects of the two conditions on challenging behavior and academic engagement were evaluated using individual participant alternating treatments designs. Results demonstrated that the presession satiation condition was associated with consistently lower percentages of intervals with challenging behavior and consistently higher percentages of intervals with academic engagement.

Children with autism spectrum disorder (ASD) often engage in challenging behaviors, which can lead to social isolation and decreased time spent in instruction (Horner, Albin, Sprague, & Todd, 2000). Antecedent interventions have been successfully used to decrease challenging behavior (Kern, Choutka, & Sokol, 2002). Antecedent interventions involve altering the environment to eliminate variables that set the occasion for challenging behavior (Luiselli, 2006). Recently, a subcategory of antecedent interventions for challenging behavior has gained attention. This category focuses on addressing an individual's motivation to engage in a specific behavior and is referred to as the manipulation of motivating operations (MO) (Laraway, Snycerski, Michael, & Poling, 2003). An MO is an event that alters the value of reinforcement and the frequency of behavior previously correlated with such reinforcement (Laraway, et al. 2003).

In some cases, biological events, such as hunger, lack of sleep, or illness can function as MOs by altering an individual's motivation to engage in a specific behavior (e.g. Carr & Smith, 1995; O'Reilly, 1995; O'Reilly, 1997). For example, Kennedy and Meyer (1996) conducted a functional analysis of three individual's challenging behavior across several weeks. They found that when the participants had less sleep (two participants) or were experi-

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encing allergy symptoms (one participant), they engaged in higher levels of challenging behavior in relation to instructional demands. Thus, these biological-setting events appeared to make demands more aversive, thereby increasing the participant's motivation to escape or avoid those tasks. This change in motivation resulted in an increase in challenging behavior, which had in the past enabled the individuals to escape from or avoid the tasks.

Previous access to reinforcement can also impact an individual's motivation to engage in challenging behavior. For example, McComas, Thompson, and Johnson (2003) examined the effects of prior attention on levels of challenging behavior. Participants were exposed to a functional analysis procedure similar to that described by Iwata and colleagues (1982/1994), following 10-min of presession attention or following 10-min of no attention. Results showed that the functional analysis that followed presession access to attention was associated with lower levels of challenging behavior than the functional analysis following presession periods without attention. Presession attention may have functioned as an abolishing operation (i.e., satiation) thus reducing levels of attention-seeking behavior while no presession attention may have functioned as an establishing operation (i.e., deprivation) and thus subsequently increasing the value of attention and the frequency of attention-maintained challenging behavior.

A core diagnostic feature for autism spectrum disorder according to the Diagnostic and Statistical Manual (DSM-IV) is engagement in compulsive or repetitive behaviors (American Psychiatric Association, 1994). Previous research has demonstrated that individuals with autism can engage in these repetitive interactions with tangible items. For example, Reese and colleagues (2003) conducted a functional assessment interview with caregivers of 100 young children with ASD. They found that 85% of participants engaged in perseverative behavior with 30% of the children engaging in challenging behavior in order to access perseverative activities. Based on these findings, it may be important to consider interventions that can successfully decrease the motivation to engage in such perseverative activities among individuals with ASD.

Over the course of several studies, we have developed a methodology to evaluate and treat challenging behavior by altering the individual's motivation to engage in such behavior (O'Reilly, et al. 2008; O'Reilly et al. 2009; Lang, et al. 2009; Lang, et al. in press; Rispoli et al. in press). This methodology involves conducting an analogue functional analysis to determine the maintaining consequence for the individual's challenging behavior. Next, we evaluate the child's mands to determine when they have reached a level of satiation. Communication of satiation was defined as the individual's rejection of the maintaining consequence (e.g., a highly preferred toy) of their challenging behavior. Satiation was believed to be achieved once the participant rejected the toy three times. Following the third rejection, the child enters into the problematic situation that was previously associated with challenging behavior. Results from these studies demonstrated that the participants engaged in lower levels of challenging behavior following the satiation condition when compared to a no presession access condition.

The purpose of this study was to replicate and extend these procedures to classroom settings. Specifically, we evaluated the influence of presession satiation on levels of challenging behavior and academic engagement for three boys with autism in their classrooms during group instruction.

Method

Participants

Three boys with autism participated in this study. Participants were referred to the study by their teachers or administrators who reported that participants engaged in challenging behavior during group instruction when preferred items were in sight but unavailable. Preferred items were identified via a preference assessment described below. Each participant was assessed using the Vineland Adaptive Behavior Scales (Sparrow, Balla & Cicchetti, 1984) and the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1988). Analogue functional analyses (Iwata, et al. 1994) were conducted to assess the function of each participant's challenging behav-

TABLE 1

Participant Characteristics

Participant	*Gender*	*Age*	*Ethnicity*	*Diagnosis*	*CARS*	*Vineland adaptive age equivalent*	*Vineland adaptive behavior composite standard score*
Jacob	Male	5	African American	PDD-NOS	33 (mild to moderate autism)	2 years 9 months	64
Geoffrey	Male	6	Asian American	Autism	30.5 (mild to moderate autism)	1 year 8 months	40
Donovan	Male	6	African American	Autism, speech impairment	49 (severe autism)	1 year 0 months	37

iors. Table 1 provides participant descriptions with respect to gender, age, ethnicity, diagnosis, and diagnostic assessment results.

Jacob was a 5-year-old African-American male diagnosed with Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS). Jacob attended a self-contained classroom in a private school for children with disabilities. Jacob scored 33 on the CARS, which placed him in the mild to moderate range on the autism spectrum. His overall adaptive age equivalency on the Vineland Adaptive Behavior Scales was 2 years 9 months. Jacob communicated spontaneously using 5 to 6 word phrases. A preferred toy for Jacob was a toy microphone. When left alone with the microphone, Jacob would repeatedly sing the same song, "Twinkle, Twinkle, Little Star." If Jacob was unable to access the microphone he would engage in challenging behavior including (a) elopement: moving at least 2 feet away from the instructional area without the teacher's permission, (b) aggression: striking others with hand or object, and (c) protesting: loud vocalizations including "no," "stop," "go away," or crying.

Geoffrey was a 6-year-old Asian-American male diagnosed with autism. Geoffrey attended an inclusive kindergarten class in a small private school. He received a score of 30.5 on the CARS, which placed him in the mild to moderate range of autism and had an overall age equivalency of 1 year 8 months on the Vineland Adaptive Behavior Scales. Geoffrey communicated using two to three word utterances and manual signs. Geoffrey attended an inclusion classroom for part of his day. In this classroom, Geoffrey often played with a plastic ball slide. Geoffrey would watch the balls roll down the slide and count each ball. When access to the ball slide was prevented, Geoffrey's challenging behavior included (a) hand mouthing: placement of fingers past the plane of the lips in order to suck or bite, and (b) elopement: pushing his body away from table or teacher in an attempt to leave the instructional area.

Donovan was a 6-year-old African-American male diagnosed with autism and speech impairment. Donovan attended a self-contained classroom for students with autism in a public school. Donovan obtained a score of 49 on the CARS, which placed him in the severe range of autism. His overall adaptive age equivalency was 1 year on the Vineland Adaptive Behavior Scales. Donovan communicated requests by leading adults by the hand to items or activities in the room. Following verbal prompts, Donovan could request items using vocal approximations. Donovan's preferred toy in the classroom was a Magna Doodle®. Donovan would write the capital and lower case form of letters on the Magna Doodle®. When he could not access the Magna Doodle®, Donovan would engage in challenging behaviors including (a) elopement: rising from his chair in an attempt to leave the instructional area, (b) aggression: biting or attempting to bite others, and/or hitting others with his hands, and (c) jumping up and down on his toes repetitively.

Assessments

Preference assessment. Classroom teachers and parents were asked to provide a list of eight toys that they believed the participant preferred while at school. The participant's preference for these items was then assessed using a paired choice preference assessment (Fisher et al., 1992). Specifically, participants were presented with two toys at a time and the toy that the participant selected was recorded. Each of the eight items was paired with each of the other items in a randomized sequence with the location of each item alternated between the left and right side of the table to control for potential position biases. Trials continued until each toy had been paired with all other toys in each possible position. The percentage of opportunities in which each toy was selected was calculated to establish a rank order of toys from most to least preferred. Each participant's most preferred toy was used in the tangible condition of the functional analysis and in the presession satiation conditions.

Functional analysis. Eligibility for participation in this study required evidence that each child's challenging behavior was maintained by positive reinforcement in the form of access to preferred toys. Analogue functional analyses were conducted with each participant to determine the maintaining consequence(s) for his challenging behavior using individual multielement experimental designs (Barlow, Nock, & Hersen, 2009). The functional analysis consisted of four 5-min conditions: (a) attention, (b) tangible, (c) escape, and (d) play. The sequence of these conditions was held constant across each participant. Procedures were similar to those described by Iwata et al. (1994), however, an alone condition was not conducted because of school policy (children were not allowed to go unsupervised).

Analogue functional analyses were conducted in a conference room or an empty classroom within each participant's school. These rooms contained a table and at least three chairs and were void of extraneous instructional or play materials. During the functional analysis materials related to the assessment conditions were present. These included papers for the researcher to "read" during the attention condition of the functional analysis, the most preferred item identified via a paired choice preference assessment (Fisher et al., 1992) for the tangible phase, and instructional materials related to the participant's Individualized Education Program (IEP) goals. Instructional materials consisted of items such as shapes, letters, lacing cards, picture cards of animals, and colored blocks.

Results of the analogue functional analyses demonstrated that each participant's challenging behavior was maintained, at least in part, by access to their most preferred toy. (Functional analysis session by session data are available from the corresponding author upon request). Jacob engaged in challenging behavior in the tangible (M = 77%; range 50% to 100%) and attention conditions (M = 19%; range 3% to 33%) of the analogue functional analysis. Geoffrey's challenging behavior occurred primarily in the tangible condition (M = 22%; range 3% to 43%) with lower levels of challenging behavior in the demand (M = 4%; range 3% to 17%), and attention conditions (M = 3%; range 3% to 13%). Donovan's challenging behavior occurred primarily in the tangible condition (M = 43%; range 20% to 70%) with lower levels of challenging behavior in the attention (M = 3%; range 0% to 10%), and play conditions (M = 5%; range 0% to 27%). Donovan also showed an increasing trend in challenging behavior during the demand condition (M = 32%; range 3% to 77% of intervals) of the functional analysis.

Communication of rejection. Following the analogue functional analysis, behavioral indicators of satiation were assessed according to the methodology described by O'Reilly et al (2009). Teachers and parents were asked to identify how each participant communicated they no longer wanted to play with a toy or engage in an activity. To verify that participants used these behaviors to communicate rejection, each participant was exposed to two conditions: (a) access to a highly preferred item and (b) access to a non-preferred item. Each condition lasted 10 min and was conducted five times with each participant using an alternating treatments experimental design (Barlow et al., 2009).

In the highly preferred item condition, the participant was presented with a highly pre-

TABLE 2

Operationalized Definitions for Target Behaviors

Participant	*Challenging behavior*	*Rejecting Behavior*
Jacob	Moving at least 2 feet from instructional area, hitting others with hand or object, verbal protesting/crying	Says "He's all done," or "Finished"
Geoffrey	Hand mouthing, moving hands in air repetitively, pushing away from table/therapist	Pushes item away
Donovan	Lifts bottom off chair, biting or attempts to bite, hitting others with hands, jumping up and down	Walks 2 feet from item

ferred item, identified during the paired choice preference assessment. Using a partial interval recording system, data were collected on the percentage of 10-s intervals in which the participant engaged in the identified rejecting behavior. The first author was present during each session but did not interact with the participant except to re-present the item to the participant following rejecting behavior.

In the non-preferred item condition, the participant was presented with a non-preferred item. This item was the lowest ranked item according to the results of the paired choice preference assessment. Procedures during this condition were identical to those used in the highly preferred item condition and data were collected on the percentage of 10-s intervals in which the participant engaged in the identified rejecting behavior. Table 2 provides operational definitions for each participant's challenging behaviors and rejecting behavior.

Presession Satiation versus No Presession Access Conditions

Participants were exposed to two conditions (a) presession satiation of preferred toy versus (b) no presession access to the preferred toy (i.e., deprivation) prior to 20-min classroom sessions. An alternating treatments design (Barlow et al., 2009) was used to compare the effects of the two conditions on each participant's subsequent challenging behavior and academic engagement during the 20 min classroom sessions.

Setting and materials. Classroom sessions were conducted in the participant's typical classroom during group instructional activities. These instructional activities varied across participants but were held constant for each participant. For example, group instruction in Donovan's and Jacob's class activities included listening to a story, watching a video, and building with blocks. Group instruction for Geoffrey focused on academic skills such as completing phonics worksheets, writing in a journal, and listening to poems. During the classroom sessions, three to four students were seated at a table or on the floor with access to instructional materials. The item maintaining challenging behavior (i.e., each participant's preferred tangible toy) was visible but not accessible during the classroom sessions.

Data collection. Two dependent variables, challenging behavior and academic engagement, were defined and measured in this study. Challenging behavior was defined individually for each participant. Operationalized definitions of these behaviors are presented in Table 2. Challenging behavior data were collected using 10-s partial interval recording. Academic engagement was defined as being appropriately involved with the instructional materials (c.f., O'Reilly et al., 2005). Appropriate involvement required that the participant engage with the materials in the manner intended, for example placing puzzle pieces in a puzzle, looking at picture books, and placing pegs into pegboards. Academic engagement was measured during classroom sessions using 10-s whole interval recording.

Interobserver agreement. A second observer simultaneously and independently recorded data on the target behaviors for at least 30% of all sessions for each participant during each phase of the study. Interobserver agreement (IOA) was calculated by dividing the total number of agreements for each interval by the total number of intervals. IOA scores for each session were added together and divided by the total number of sessions in which reliability data were gathered in order to calculate the overall mean IOA. The mean IOA combined across all sessions, dependent variables, and participants was 96% (range, 82% to 100%).

Procedural fidelity. Task analyses of the procedural steps were created for each phase of this study. Procedural fidelity was calculated by dividing the number of steps completed correctly by the total number of steps in the procedure and multiplying by 100%. Procedural fidelity was assessed by an independent observer for 33% of sessions for each participant in each phase of the study with 100% correct implementation.

Procedure

Presession conditions. During the presession satiation condition, participants were given free access to their preferred tangible item in an empty conference room or classroom within the school. The first author handed the preferred item to the participant and instructed him to play with the item. The first author remained in the room but did not provide any additional attention or instruction. If the participant engaged in rejecting behavior, the first author re-presented the item to the participant. This procedure was followed for the first and second instances of rejecting behavior. Following three rejections, the presession condition was terminated and the participant immediately entered into the classroom session.

The no presession access condition involved prohibiting the participant from accessing the preferred tangible prior to the classroom session that day. The participant participated in all school routines, but did not have access to his or her preferred tangible item. Classroom sessions were held at the same time of day for each participant. This allowed the duration of the no presession access condition to remain constant for each participant.

Classroom sessions. Classroom sessions immediately followed presession conditions. During classroom sessions, participants were seated at a table or on the floor near three to four peers. Instructional materials were available and all students were instructed to interact with the materials. The first author sat with the participant on the floor or at the table. Classroom sessions were characterized by low levels of demands and high levels of attention, which approximated typical classroom conditions and served to control escape-maintained and attention-maintained challenging behaviors. The first author modeled appropriate use of the materials but never prompted the participant to engage with the instructional materials. Additionally, the first author provided attention (praise) to the participant every 30 seconds. The first author did not respond to instances of challenging behavior except to physically guide the individual back to the instructional area or to block access to the preferred tangible. The discriminative stimulus (S^D) for challenging behavior (each child's preferred tangible item) was present but unavailable throughout the classroom session.

Results

Figure 1 shows the percentages of 10-s intervals with challenging behavior across classroom sessions and under the two conditions for each participant. All three children had higher levels of challenging behavior under the no presession access condition and lower levels of challenging behavior following presession satiation. Jacob engaged in higher levels of challenging behavior in the classroom following no presession access (M = 64%; range 46% to 95%) than following the presession satiation condition (M = 0.2%; range 0% to 1%). Similarly, Geoffrey engaged in higher levels of challenging behavior following the no presession access condition (M = 16%, range 10% to 23%) compared to the presession satiation condition (M = 3%; range 1% to 4%). Donovan engaged in comparatively higher levels of challenging behavior following the no presession access condition (M = 28%, range 20% to 35%) and lower levels of

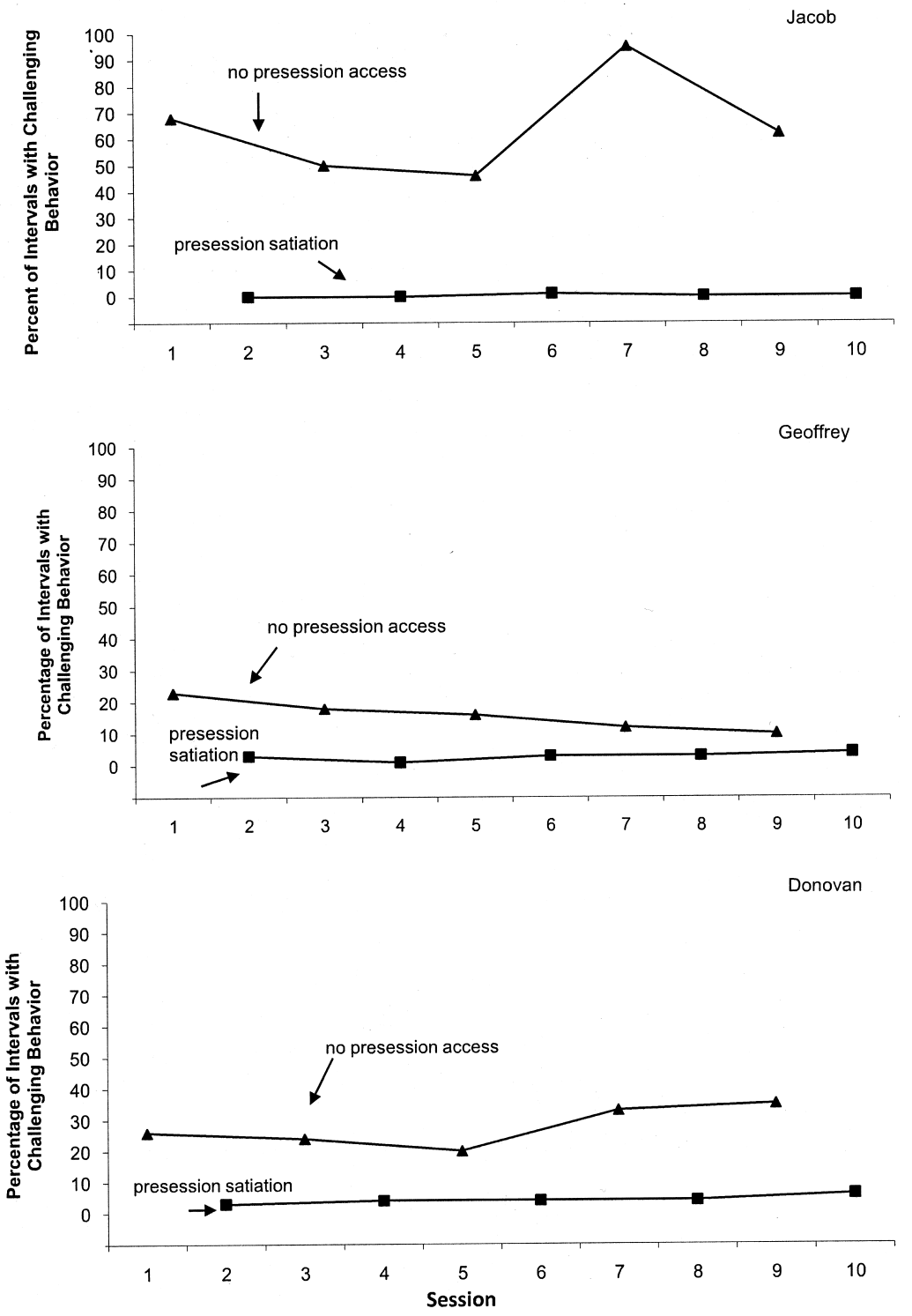

Figure 1. Percentage of intervals with challenging behavior.

challenging behavior in the presession satiation condition (M = 4%, range 3% to 6%).

Figure 2 presents the effect of the MO manipulation on academic engagement. Higher levels of academic engagement following presession satiation to the preferred tangible were observed for all three participants. Following presession satiation to the microphone Jacob engaged in very high levels of academic engagement in the classroom (M = 91%; range 85% to 100%). In the no presession access condition Jacob's academic engagement in the classroom was considerably lower (M = 26%; range 5% to 46%). In the presession satiation condition Geoffrey demonstrated high levels of academic engagement (M = 91%; range 88% to 96%). During the no presession access condition, Geoffrey had lower levels of academic engagement (M = 43%; range 26% to 58%). In the presession satiation condition Donovan demonstrated higher levels of academic engagement (M = 79%, range 57% to 91%). During the no presession access condition, Donovan had lower levels of academic engagement (M = 29%, range 17% to 46%).

A NAP (Non-overlap of All Pairs) analysis (Parker & Vannest, 2009) was conducted for each participant's data across the two conditions of presession satiation and no presession access using the dominance statistic, Mann-Whitney U, (MW-U) within the NCSS statistical package (Hintze, 2004). MW-U outputs smaller and larger U values (US and UL), and NAP equals their difference divided by their sum: (UL - US)/(UL +US). The resulting NAP value was 1, indicating that 100% percent of the data showed no overlap between the two conditions for each participant on both challenging behavior and academic engagement. Therefore the two data clusters were highly separated.

The non-overlap NAP indices calculated for the three separate series (one for each participant) were then combined, using Meta-analysis methods in the free software package, WinPEPI (Abramson & Gahlinger, 2001). NAP values and their standard errors were entered into WinPEPI, and were combined using a fixed effects model, which assumes that each individual series is an estimation of the same true effect. The combining method was based on weighted averages, with the weights being reciprocals of the variances. This more heavily weights longer data series (Abramson, 2004). The omnibus NAP nonoverlap for the three individual series for challenging behavior and all three individual series for academic engagement was 100%, with 95% confidence limits 0.57 to 1.43. Therefore, for our obtained overall NAP of 1 for challenging behavior and NAP of 1 for academic engagement, we can be 95% sure that the true NAP is somewhere between 0.57 and 1.43.

Discussion

The purpose of this study was to evaluate the effect of presession satiation on challenging behavior and academic engagement for three boys with autism who engaged in tangibly maintained challenging behavior. Participants were exposed to one of two conditions prior to group instruction sessions in their classroom: presession satiation or no presession access to their preferred tangible item. It was hypothesized that participants would engage in lower levels of challenging behavior following presession access to the preferred tangible. This access decreases the reinforcement value of the tangible item and correspondingly decreases the frequency of challenging behavior previously correlated with accessing the tangible (i.e., toys). It was also hypothesized that following presession satiation, participant academic engagement would increase as a by-product of the reduction in challenging behavior based on previous study outcomes (Rispoli et al., in press). Results of the MO manipulation support these hypotheses. All participants engaged in lower levels of challenging behavior and higher levels of academic engagement following presession satiation. These results also support previous research demonstrating reductions in challenging behavior as a result of presession manipulations (e.g. Lang et al., 2009; McComas, Thompson, & Johnson, 2003; O'Reilly, 2008; Rispoli et al., in press).

One explanation for these results is the manipulation of the MO. In this study, satiation may have been achieved by providing the participants with presession access to their highly preferred tangible. By creating a state of satiation the reinforcing value of the tangible may have been reduced. The participant's rejec-

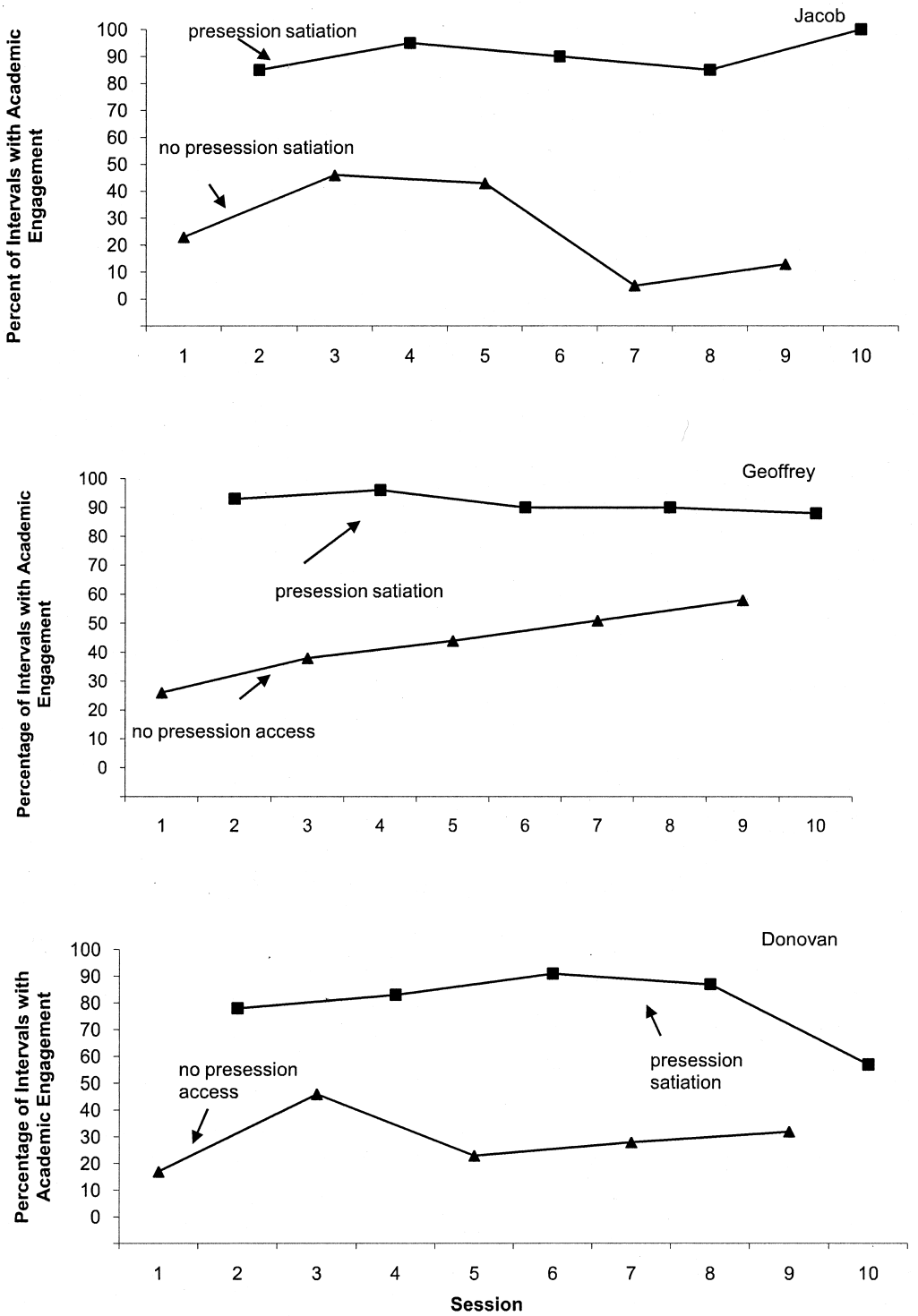

Figure 2. Percentage of intervals with academic engagement.

tion of the preferred item signaled a reduction in that item's reinforcing value and functioned as a behavioral indicator of satiation.

This presession access may have also contributed to the increase in academic engagement in the subsequent classroom session. By decreasing each child's motivation to engage in challenging behavior, the child may have allocated his behavior towards accessing reinforcement derived from academic engagement. With the decrease in the reinforcing value of the tangible item, the participants may have had more opportunity to seek out and access novel communities of reinforcement. Interactions with the classmates, the teacher, or instructional materials may have become more reinforcing relative to the tangible item following presession satiation. Additionally, most of the participants' topographies of challenging behavior conflicted with academic engagement. For instance elopement and aggression are incompatible with academic engagement. Thus, by reducing the frequency of challenging behavior there may have been an increase in opportunities for academic engagement.

The reductions in challenging behavior in the classroom following the presession satiation condition suggest that the MO was successfully isolated and manipulated. In all classroom conditions tangibly maintained challenging behavior was placed on extinction such that the participants were never given access to the tangible items. By holding consequences constant across the two conditions, the only manipulation was presession access to the tangible item. Furthermore, classroom activities were held constant for each participant thereby reducing the influence of possible extraneous variables such as task preference, on levels of challenging behavior.

While presession satiation may explain the reduction in challenging behavior, other variables may have also contributed to the effectiveness of this intervention. For example, the effectiveness of the presession satiation condition on reducing challenging behavior may have been enhanced by the consideration of functional analysis results. Previous research has shown that MO interventions may not be effective when they are not matched to the function of challenging behavior (McComas et al., 2003). In light of this, each participant's challenging behavior was first assessed using analogue functional analyses. The presession satiation condition was then carefully designed to reflect the tangible function of the participants' challenging behavior. Furthermore, the tangible item used was confirmed by the results of a paired choice preference assessment and presession access was determined by behavioral indicators of satiation. Thus, the MO manipulation was directly linked to assessment results for each participant.

The decrease in challenging behavior and increase in academic engagement reported here may also depend, in part, on the characteristics of the participants. Each participant had a diagnosis of an autism spectrum disorder. It is possible that the MO manipulation addressed a core behavioral characteristic of autism. The Diagnostic and Statistical Manual (DSM-IV) describes individuals with autism as often engaging in compulsive or repetitive behaviors. All participants in this study engaged with their preferred tangible in a restrictive and repetitive manner. Jacob sang "Twinkle, twinkle litter star" into his microphone repeatedly and would verbally protest when asked to sing a different song. Geoffrey counted each ball as it exited the plastic ball drop. Finally, Donovan drew the uppercase and lowercase letters F and R on the Magna Doodle®. The presession access to the toys may have reduced the value of the participants' compulsive engagement with these items thereby allowing them to engage in other behaviors, including academic engagement.

Several limitations of this study must be considered when interpreting these results. First, the influence of MOs is only one explanation for the changes in performance. Other behavioral mechanisms (e.g., schedules of reinforcement) may have influenced the results even though the manipulation of the MO fits conceptually with the outcomes of this study and supports previous research in this area. Second, the experimental design did not include a baseline phase. Thus, while the effects of the presession satiation condition appeared to improve both dependent variables as compared to the no presession access condition, a comparison against baseline levels of these responses cannot be made. Third, the duration of presession satiation conditions varied

across and within participants. The mean lengths of presession satiation conditions were 11, 21, and 23 minutes for Jacob, Geoffrey, and Donovan, respectively. Such variability may present an additional consideration when scheduling and implementing this intervention in regular public school settings.

Results from this study have several implications for practitioners. First, this intervention may be especially useful when the discriminative stimulus for challenging behavior cannot be removed from the environment. In such instances, addressing the motivation to engage in challenging behavior may provide an effective means of reducing challenging behavior (O'Reilly et al., 2008). Classroom teachers may incorporate periods of free access to the maintaining consequence for challenging behavior in their daily classroom schedule. If a student is known to engage in tangibly-maintained challenging behavior during a particular activity, the teacher may provide the student with access to the tangible item for periods of time immediately prior to the difficult activity.

Second, presession interventions may reduce the need for one-on-one support in inclusive classrooms. By abolishing the value of reinforcement for challenging behavior prior to a classroom situation, the individual may be less likely to engage in such behavior and thus require less behavioral support from teachers and staff. Another benefit that is particularly noteworthy is the effect of this MO manipulation on multiple outcomes. Students with autism often require multiple interventions for decreasing challenging behaviors (Reese et al., 2003) and additional interventions for increasing appropriate skills. Implementing numerous interventions for multiple students in a classroom may impede treatment fidelity and overwhelm service providers. Therefore, the efficiency of this intervention may be appealing to practitioners. More research is needed to examine the use of MOs to affect multiple response classes of behavior simultaneously.

This study highlights several areas that warrant further empirical attention. First, researchers should explore the application of MO interventions in other applied settings including the community and home environments. Second, previous research has shown that preferences for specific tangible items may vary across time (Zhou, Iwata, Goff, & Shore, 2001). As a result, a tangible item that does not evoke challenging behavior one day may evoke such behavior on another day. For individuals whose challenging behavior is maintained by access to multiple tangible items, it may be helpful to assess preferences prior to MO manipulations regularly in order to enhance intervention effectiveness.

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