SEPARATE AND COMBINED EFFECTS OF VISUAL SCHEDULES AND EXTINCTION PLUS DIFFERENTIAL REINFORCEMENT ON PROBLEM BEHAVIOR OCCASIONED BY TRANSITIONS

MELISSA B. WATERS, DOROTHEA C. LERMAN, AND ALYSON N. HOVANETZ

UNIVERSITY OF HOUSTON, CLEAR LAKE

The separate and combined effects of visual schedules and extinction plus differential reinforcement of other behavior (DRO) were evaluated to decrease transition-related problem behavior of 2 children diagnosed with autism. Visual schedules alone were ineffective in reducing problem behavior when transitioning from preferred to nonpreferred activities. Problem behavior decreased for both participants when extinction and DRO were introduced, regardless of whether visual schedules were also used.

DESCRIPTORS: autism, differential reinforcement, extinction, problem behavior, transitions, visual schedules

_____

Difficulty with transitions from one activity to the next is a problem for some children with developmental disabilities (Sainato, Strain, Lefebvre, & Rapp, 1987). A variety of antecedent-based interventions have been evaluated to address problem behavior that occurs during transitions. For example, Tustin (1995) found that providing advance notice of an upcoming change in tasks (i.e., a 2-min warning) decreased transition-related stereotypy in 1 individual with autism.

Visual prompts, often in the form of visual schedules, are commonly recommended to aid in transitions for children with autism. For example, Hodgdon (1995) suggested that using visual schedules to communicate transitions between activities to children with autism might decrease problem behavior. Despite recommendations that support the clinical utility of visual schedules and other types of visual prompts, few studies have directly examined the effects of these prompts on problem behavior during transitions or the conditions under which they might be effective. Dettmer, Simpson, Myles, and Ganz (2000) reported a decrease in 2 children's

noncompliance during transitions when visual prompts were combined with instructions. However, the mechanisms responsible for the effects were unclear, because the function of problem behavior was not identified prior to treatment.

McCord, Thomson, and Iwata (2001) extended functional analysis procedures to transition-related problem behavior. They suggested that the behavior may be maintained by avoidance of nonpreferred activities, access to preferred activities, or escape from the transition. The importance of identifying the function of problem behavior that is occasioned by transitions and developing treatments based on these results is commonly overlooked in recommendations to parents and teachers regarding the use of visual schedules (e.g., Hodgdon, 1995). In addition, the benefits of visual schedules beyond those provided by function-based interventions have not yet been evaluated. Thus, the purpose of the current study was to evaluate the separate and combined effects of visual schedules and a function-based intervention for problem behavior that occurred during transitions.

METHOD

Participants, Setting, and Materials

Participants were two 6-year-old boys who had been diagnosed with autism and who engaged in problem behavior reported to occur during transitions in a number of settings,

including their homes, special education classrooms, and inclusion classrooms. Jimmy communicated vocally using one- to two-word utterances, and Vern spoke in complete sentences. Jimmy and Vern could follow one-step directions (e.g., "come here," "sit down"), match pictures to objects, and expressively identify people and objects. Both participants had been taught to use visual schedules by their teachers and had a history with the pictorial stimuli used in the study.

During the functional analysis and treatment evaluation, two or three sessions were conducted per day, 3 to 4 days per week. Sessions were conducted in the participants' classrooms while other students and staff were out of the room. All transitions involved moving between two desks or small tables that were approximately 3.7 m apart. Materials included photographs with text for each activity (music, computer, work) affixed to laminated cards (7.6 cm by 12.7 cm), a binder with hook-and-loop tape (for Vern), smaller (2.5 cm by 2.5 cm) versions of the picture cards (for Jimmy), and a small plastic bag (for Vern). The stimuli chosen closely resembled those that had been used in their classrooms. Materials related to the preferred and nonpreferred activities, selected on the basis of teacher report and informal observations of the students during leisure time, also were present during the sessions. Preferred activities included playing computer games (Vern) and listening to music (Jimmy). Nonpreferred activities for both participants included a variety of academic tasks (e.g., writing, coin identification). A multiple-stimulus without replacement preference assessment (DeLeon & Iwata, 1996) was conducted with each participant to identify food items to be used during the treatment evaluation. Highly preferred food items were candy and potato chips for Jimmy and Vern, respectively.

Response Measurement and Interobserver Agreement

Aggression (Jimmy and Vern) was defined as hitting, kicking, biting, or scratching the thera-

pist. *Disruption* (Vern) was defined as throwing objects, pushing furniture over, kicking or hitting objects, or falling to the floor (recorded when any part of the participant's body other than his feet contacted the floor). Trained observers recorded the occurrence or nonoccurrence of problem behavior during each transition. A second observer independently collected data during 100% of functional analysis sessions and 79% of treatment evaluation sessions. Interobserver agreement was calculated on a trial-by-trial basis. The number of agreements on the occurrence or nonoccurrence of a response was divided by the number of agreements plus disagreements and converted to a percentage. Mean agreement was 100% for Jimmy and 99% for Vern (range, 67% to 100%).

Brief Functional Analysis

Similar to that described by McCord et al. (2001), each functional analysis session consisted of three different transitions. Each transition consisted of 2 min of pretransition activity, the transition itself, and 2 min of posttransition activity. During the activity-initiation (with location change) transition, the participant was instructed using least-to-most prompting (verbal, gesture, physical) to transition from no activity to a nonpreferred activity. Contingent on problem behavior, the participant was returned to the original location and the nonpreferred activity was terminated (test for negative reinforcement). During activity-termination (with location change) transitions, the participant was instructed to transition from a preferred activity to no activity. Contingent on problem behavior, the participant was returned to the original location and regained access to the preferred activity (test for positive reinforcement). For comparative purposes, a control condition also was implemented during which the participant was instructed to transition from no activity to a preferred activity (with location change), and no consequences were provided for problem behavior. Three sessions were conducted with each participant, such that each

type of transition was presented a total of three times. Mean session length was 14 min.

Treatment Evaluation

Results of the functional analyses for both participants suggested that problem behavior during transitions was maintained by avoidance of nonpreferred activities and access to preferred activities. Thus, treatment was conducted within the context of a transition designed to address both functions (i.e., a transition from a preferred activity to a nonpreferred activity). Each session consisted of three transitions. The participant had 2-min access to the preferred activity prior to each transition. A transition began after the therapist approached the participant and delivered the verbal prompt "music [computer] is finished; it's time to work." Following any completed transition, the participant was required to work on the nonpreferred activity for at least 2 min (with no problem behavior occurring during the last 1 min) before returning to the preferred activity. Mean length of treatment sessions was 17 min (range, 12 min to 39 min).

During baseline, a least-to-most prompting procedure (consisting of verbal, model, and physical prompts) was used to guide compliance with the transition. Contingent on problem behavior, the therapist terminated the transition and permitted the participant to return to the preferred activity for 2 min. During the visual-schedule-only condition, procedures were identical to those in baseline except that the therapist showed the participant pictures representing the current and upcoming activities while delivering the verbal prompt at the start of each transition. To increase the saliency of the visual prompts, the participant was physically prompted to grasp and move the pictures. The picture of the completed activity was removed from a schedule binder and placed in a bag (Vern) or removed from the desk and affixed to a larger picture (Jimmy). Both participants carried the picture of the upcoming activity to the new location and placed it on a hook-and-loop strip on the desk or table. During extinction and differential reinforcement of other behavior (DRO), procedures were identical to those in baseline; however, the therapist used a three-step prompting procedure (Wilder, Atwell, & Wine, 2006) to guide compliance to the transition regardless of problem behavior. In addition, the therapist delivered praise and preferred food if the participant completed a transition without engaging in problem behavior (approximate interval length was 120 s for Jimmy and 25 s for Vern). Finally, the procedures described above were combined when visual schedules were used in conjunction with extinction and DRO.

RESULTS AND DISCUSSION

Results of the brief functional analyses (Figure 1, top) indicated that problem behavior was maintained by escape from a nonpreferred activity and access to a preferred activity. Results of the treatment evaluation are shown in Figure 1 (bottom). Both participants engaged in problem behavior during 100% of the transitions during the baseline. When the visual schedule was introduced as the sole treatment for problem behavior during transitions, high levels of problem behavior persisted. Based on informal classroom observations conducted prior to the study, it was hypothesized that visual schedules alone would not reduce levels of problem behavior. As such, this phase was considered an extension of baseline and was not introduced in a staggered fashion across participants. When the extinction and DRO components were implemented, responding was reduced by 69% for Jimmy and 83% for Vern. Slightly greater reductions in problem behavior were obtained when the visual schedules were added (i.e., 76% reduction with visual schedules and 61% without visual schedules for Jimmy; 89% reduction with visual schedules and 77% without visual schedules for Vern).

The current results suggest that visual schedules alone, a commonly recommended classroom
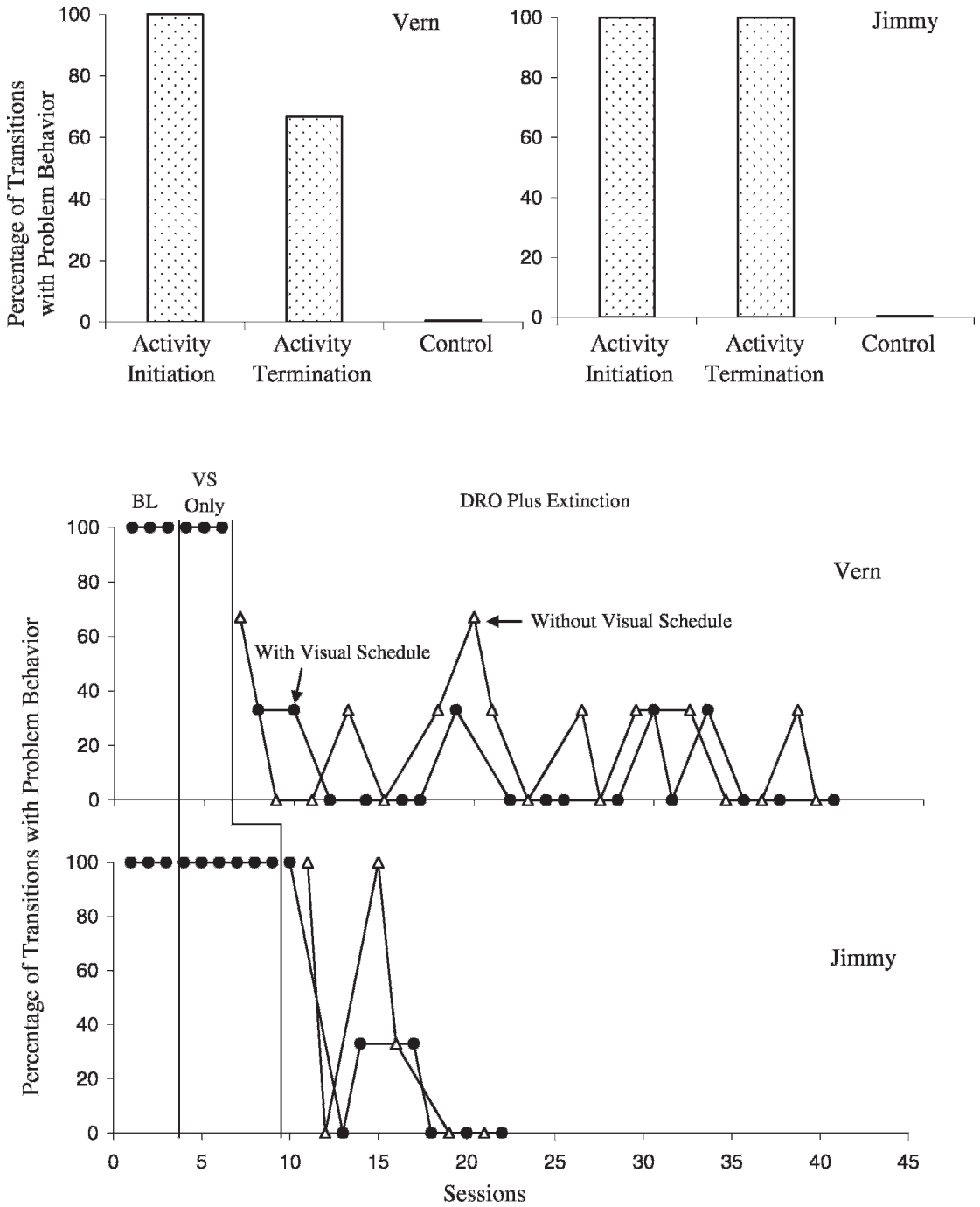
Figure 1.   Percentage of transitions with problem behavior for Vern and Jimmy during the brief functional analysis (top) and during the treatment evaluation (bottom). VS = visual schedule; DRO = differential reinforcement of other behavior.

intervention, may not produce decreases in transition-related problem behavior unless extinction is also used. Although DRO may have enhanced the effectiveness of extinction, it is unlikely that DRO alone or in combination with visual schedules would have been successful, because the participants never met the reinforcement criterion until extinction was introduced. Thus, extinction was likely a necessary component of treatment. DRO was combined with extinction to decrease the likelihood of undesirable side effects, such as response bursting (Grow, Kelley, Roane, & Shillingsburg, 2008; Lerman, Iwata, & Wallace, 1999).

These findings replicate previous studies that have demonstrated the applicability of functional analysis procedures to transition-related problem behavior (e.g., McCord et al., 2001; Wilder, Chen, Atwell, Pritchard, & Weinstein, 2006). Results for both participants suggested that their problem behavior was maintained by both positive and negative reinforcement. The establishing operations and maintaining consequences for these two functions may frequently co-occur during transitions. Thus, a single transition that addressed both functions was conducted during treatment, perhaps increasing the efficiency of the intervention.

Limitations of the brief functional analysis included the absence of a location-change-only condition. That is, changes in both location and activity were not separated during the assessment. However, the control condition included a location change, and neither participant engaged in problem behavior during this type of transition. Additional limitations of the study included the brevity of the treatment evaluation, the possibility of multiple treatment interference, and the relatively imprecise measure of responding (i.e., occurrence or nonoccurrence of problem behavior during each transition). In addition, no data on the participants' correct use of the visual schedules were collected prior to or during treatment. Further research should evaluate the potential benefits of using antecedent-based interventions, such as visual schedules, in combination with extinction to treat problem behavior occasioned by transitions. Although the treatment comparison was somewhat brief, results suggested that visual schedules might enhance the effectiveness of extinction and differential reinforcement.

REFERENCES

DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis*, *29*, 519–533.

Dettmer, S., Simpson, R. L., Myles, B. S., & Ganz, J. B. (2000). The use of visual supports to facilitate transitions of students with autism. *Focus on Autism and Other Developmental Disabilities*, *15*, 163–169.

Grow, L. L., Kelley, M. E., Roane, H. S., & Shillingsburg, M. A. (2008). Utility of extinction-induced response variability for the selection of mands. *Journal of Applied Behavior Analysis*, *41*, 15–24.

Hodgdon, L. Q. (1995). Solving social-behavioral problems through the use of visually supported communication. In K. A. Quill (Ed.), *Teaching children with autism: Strategies to enhance communication and socialization* (pp. 265–286). New York: Delmar.

Lerman, D. C., Iwata, B. A., & Wallace, M. D. (1999). Side effects of extinction: Prevalence of bursting and aggression during the treatment of self-injurious behavior. *Journal of Applied Behavior Analysis*, *32*, 1–8.

McCord, B. E., Thomson, R. J., & Iwata, B. A. (2001). Functional analysis and treatment of self-injury associated with transitions. *Journal of Applied Behavior Analysis*, *34*, 195–210.

Sainato, D. M., Strain, P. S., Lefebvre, D., & Rapp, N. (1987). Facilitating transition times with handicapped preschool children: A comparison between peer-mediated and antecedent prompt procedures. *Journal of Applied Behavior Analysis*, *20*, 285–291.

Tustin, R. D. (1995). The effects of advance notice of activity transitions on stereotypic behavior. *Journal of Applied Behavior Analysis*, *28*, 91–92.

Wilder, D. A., Atwell, J., & Wine, B. (2006). The effects of varying levels of treatment integrity on child compliance during treatment with a three-step prompting procedure. *Journal of Applied Behavior Analysis*, *39*, 369–373.

Wilder, D. A., Chen, L., Atwell, J., Pritchard, J., & Weinstein, P. (2006). Brief functional analysis and treatment of tantrums associated with transitions in preschool children. *Journal of Applied Behavior Analysis*, *39*, 103–107.