Developing Stimulus Control for Occurrences of Stereotypy Exhibited by a Child with Autism

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Stereotypic behavior exhibited by a third grade boy with autism was maintained by automatic reinforcement and occurrences of stereotypy were brought under stimulus control. The intervention consisted of pairing a green discriminative stimulus card (SD) with free access to stereotypy and a red card (SD absent) with vocal redirection and blocking stereotypy. After exposure to discrimination training, the student rarely engaged in stereotypy with the SD card absent, but he almost continuously engaged in stereotypy when the SD card was present. Experimental control over stereotypic behavior was demonstrated via a combination of within session sequential alternating treatments design and withdrawal design across sessions.

Stereotypy is a relatively common behavior exhibited by children with autism, and teachers report that stereotypy often interferes with teaching children functional and adaptive skills (Wehmeyer, 1991). Stereotypy is defined as repetitive behavior that does not serve an adaptive function (Baumeister & Forehand, 1973). Potential ramifications of high frequency stereotypy are social isolation, restrictive treatments, limited educational opportunities, and decreased educational programming due to increased emphasis on reduction of stereotypy (Dunlap, Dyer, & Koegel, 1983; Koegel & Covert, 1972). Many, but not all, cases of stereotypy are maintained by automatic reinforcement, and responses maintained by automatic reinforcement are difficult to treat because the reinforcer is directly produced by engaging in the behavior. This direct production of the reinforcer does not allow teachers or caregivers to systematically control and deliver the reinforcer for an appropriate alternative behavior. Although research on enriched environments, blocking stereotypy, and providing individuals with matched or competing stimuli have resulted in decreased occurrences of automatically maintained stereotypy, these treatments are often labor-intensive and difficult to maintain over long periods of time (Goh et al., 1995; Lalli et al., 1996; Piazza, Adelinis, Hanley, Goh & Delia, 2000; Shore Iwata, DeLeon, Kahng, & Smith 1997).

One alternative to attempting to reduce or eliminate automatically maintained repetitive behavior is to teach individuals when and where engaging in stereotypic behavior is appropriate (e.g., free choice times). The concept of using environmental manipulations to evoke certain behaviors correlated with specific antecedent stimuli is an important aim of nearly every type of instructional program (Green, 2001). Additionally, Charlop, Kurtz, and Casey (1990) demonstrated that one useful intervention for decreasing stereotypy is to use it as a reinforcer for the absence of stereotypy while students engaged in skill acquisition programming. That is, one potentially useful strategy is to teach children that they can engage in stereotypic behavior during specific environmental situations after they have refrained from engaging in stereotypic behavior and allocated responses to developing adaptive behavior. As such, it is important to provide instructional environments that decrease stereotypic behavior following specific antecedents and to allow stereotypy during different antecedent stimuli. This type of stimulus control intervention has previously been shown to be useful for controlling occurrences of mands in children with developmental disabilities (Fisher, Kuhn & Thompson, 1998) and occurrences of stereotypy (Conroy, Asmus, Sellers & Ladwig, 2005; Doughty, Anderson, Doughty, Williams & Saunders, 2007; Mckenzie, Smith, Simmons, & Soderlund, 2008; Piazza, Hanley, & Fisher, 1996; Richman, Lindauer, Crosland, Mckercher, & Morse, 2001; Rollings & Baumister, 1981; Woods, 1983). Most recently, Doughty et al. (2007) showed that stimulus control of stereotypy could be achieved via pairing one stimulus with free access to stereotypy while pairing a different stimulus with a response reduction procedure (i.e., hands down) delivered contingent on occurrences of stereotypy exhibited by three participants with severe-to-profound mental retardation. Similarly, Conroy et al. (2005) demonstrated the effectiveness of this type of stimulus control intervention in a general education classroom for a child with average intelligence and an autism spectrum disorder. In the present study, we replicated Doughty et al. and Conroy et al. by establishing stimulus control over stereotypy exhibited by a child with autism by pairing a green

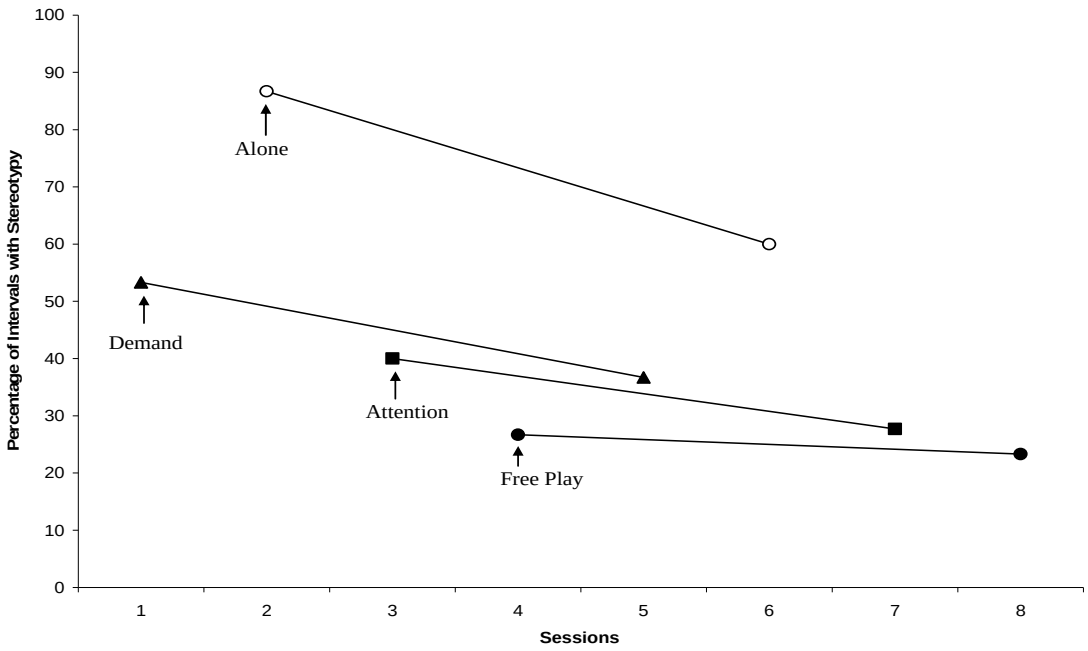

Figure 1: Percentage of intervals with stereotypy during the analogue functional analysis.

card with free access to engage in stereotypy and a red card with vocal redirection and blocking stereotypy.

Method

Participant, Setting, Data Collection, and Interobserver Agreement

Mark was an eight year old Caucasian boy diagnosed with autism. He spoke in full sentences and he could accurately follow simple one-to-two step vocal instructions. However, Mark rarely engaged in spontaneous conversations and he frequently emitted vocal echolalia. He also frequently engaged in stereotypic behavior that consisted of shaking objects, primarily string, in front of his face. String play occurred frequently enough that it interfered with daily instruction in the classroom, and simply removing string and string-like objects frequently set the occasion for Mark to repeatedly attempt to find a piece of string or destroying items (e.g., rip paper) that he could shake.

All sessions were conducted by the student teacher in a self-contained special education public school classroom. Mark and the teacher sat at a table in the back of the classroom, and similar materials were present for all baseline and intervention sessions. Occurrences of stereotypy were documented via a 10 sec partial interval paper-pencil data collection system. The primary data collector used a watch with a second hand to monitor 10 sec intervals. The primary data collector signaled the end of each 10 sec intervals with a subtle head nod (or hum if the reliability coder was not in direct view). A second observer in the classroom collected interobserver agreement data for 100% of the sessions with a mean exact interval occurrence agreement of 97.3% (range, 81% - 100%).

Dependent and Independent Variables and Design

The dependent variable was occurrences of stereotypic string play. String play was defined as shaking the string back and forth more than two times within 3 sec. However, all attempts to engage in string play (e.g., grabbing the string) were recorded during discrimination training phases because string play was blocked and redirected during these phases. The independent variable was an discrimination training package that included (a) 3 inch by 3 inch stimulus cards, (b) vocally informing the student of the contingencies for string play when the SD card was present or absent, and (c) vocally redirecting and blocking string play that occurred in the absence of the SD card. The experimental design for the functional analysis was a multielement design. Experimental control of stereotypy during discrimination training phases was demonstrated via a within session sequential alternating treatments design (i.e., multiple schedule alternating SD card present or absent). Experimental control of overall levels of stereotypy was demonstrated via a withdrawal design.

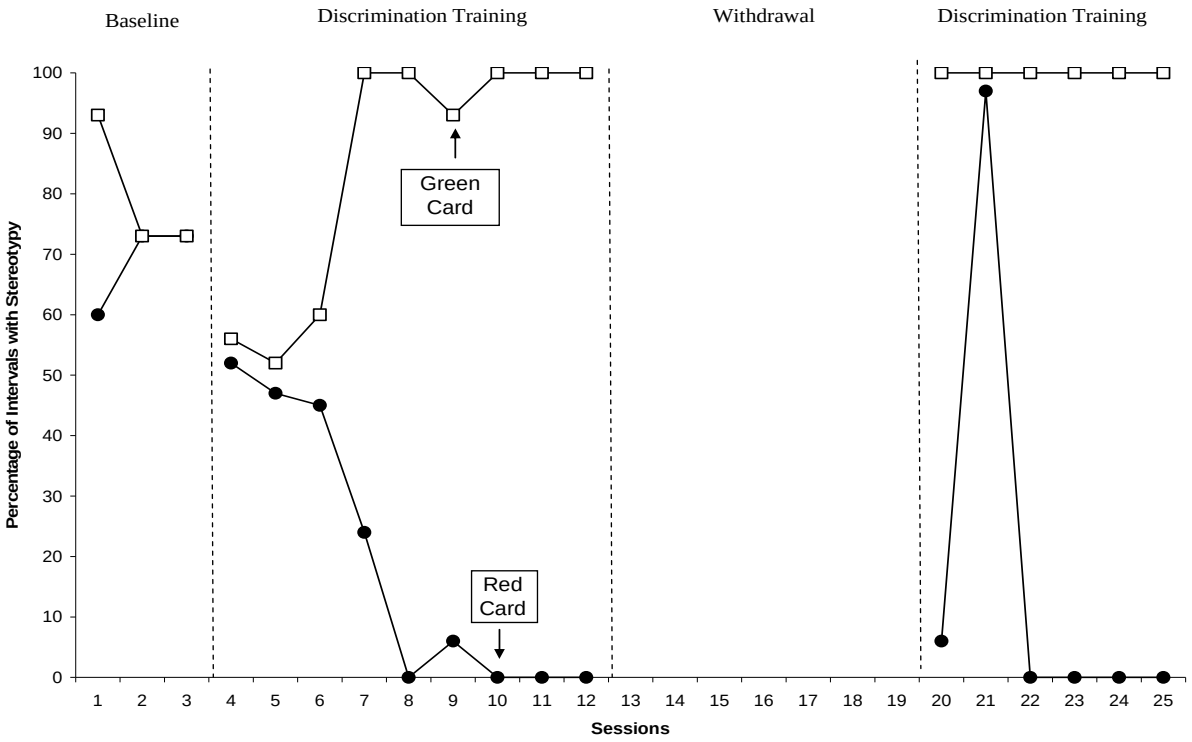

Figure 2: Percentage of intervals with stereotypy when the S^D card was present or absent during discrimination training sessions. Data points are missing for sessions 13-19 because the cards were not present during this withdrawal phase.

Procedures

Functional analysis manipulations: A series of 5 min functional analysis sessions were randomly conducted across attention, alone, demand, and free play conditions (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994; Northup et al., 1991). In the free play condition, Mark had access to a variety of play activities, string, and teacher attention. String play was ignored during free play sessions. In the attention condition, he was ignored and received attention in the form of a brief reprimand contingent on engaging in string play. During the alone condition, Mark had access to string, no one interacted with him, and he did not have access to play activities. In the demand condition, the teacher prompted Mark to work on academic tasks, and he was provided with a brief break (approximately 30 sec) contingent on string play. After the break interval, the string was set beside him and prompts to work continued until another occurrence of string play.

Baseline: Baseline sessions lasted 5 min, and Mark had free access to string and all string play was ignored. In addition to string, he had access to a variety of leisure activities and teacher attention, and he was told that he could play with anything he wanted to at the table. The presence of the red (SD absent) and green (SD) cards were alternated every 10 sec, but the procedures remained the same when either card was present during baseline. Presenting the red and green stimulus cards during baseline assessed whether the cards exerted stimulus control over string play prior to discrimination training.

Discrimination training package: Mark continued to have free access to the same leisure activities and teacher attention available during baseline sessions during the 5 min discrimination training sessions. During discrimination training, Mark was taught to discriminate the contingencies in place when one of two stimulus control cards was present. A red card was used to signal that string play would be blocked and vocally redirected, and a green card was used to signal that string play could occur without blocking or vocal redirection. In correspondence with the stimulus control cards, Mark also received a vocal description of the contingencies (i.e., "the red card is out; please set the string down, "The green card is out; you can shake the string now if you want to") during the first presentation of the red and green cards for each session. Also, prior to the first formal discrimination training session, the student teacher vocally described the contingencies for each card as previously described, and the teacher also showed the red card for 2-3 sec while blocking him from picking up the string. As soon as Mark did not attempt to pick up the string she immediately presented the green card and told him he could

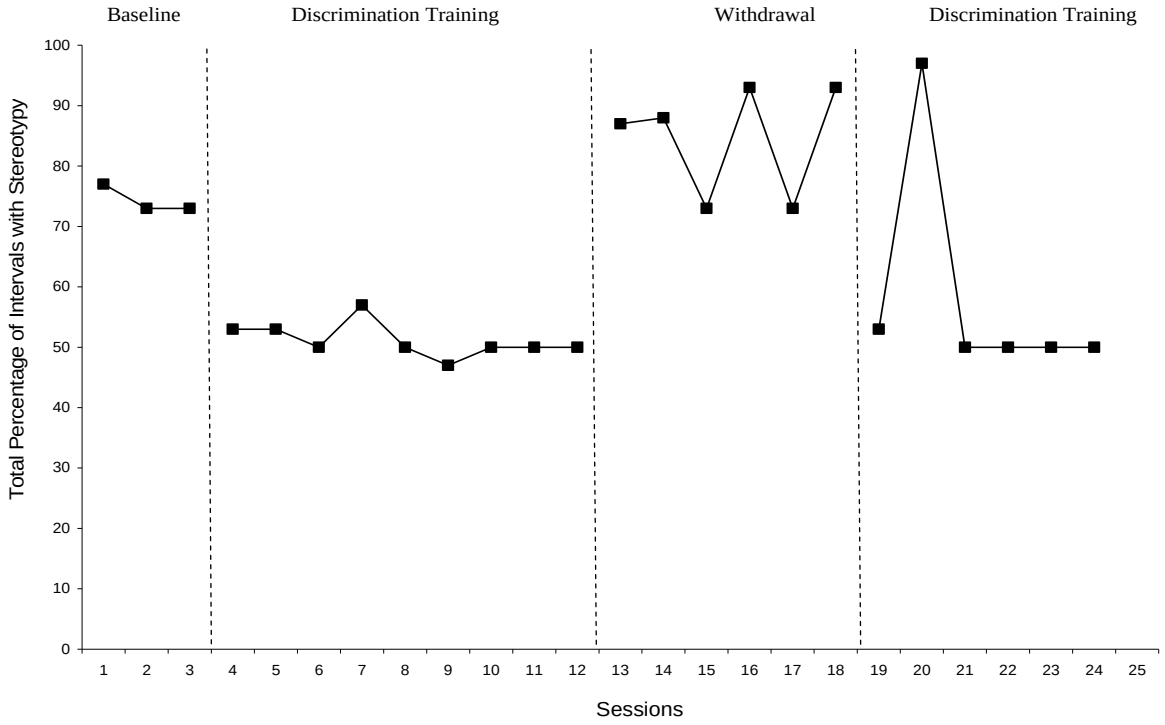

Figure 3: Total percentage of intervals with stereotypy during discrimination training.

play with the string while the green card was out. No formal data were taken during this pre-discrimination training phase while the teacher attempted to facilitate discrimination of the contingencies for each card.

Each formal discrimination training session began with placing the red card in front of Mark and vocally informing him that he could play with anything except the string for 10 sec while the red card was out. Mark was also told that if he left the string alone for 10 sec, the green card would be presented, and he could then have 10 sec to play with the string while the green card was out. If Mark played with the string while the red card was out, he received another vocal prompt to play with anything except the string when the red card was present. The string was then removed from his hands and placed on the table and he was required to wait another full 10 sec interval without engaging in string play before the green card was presented (i.e., resetting Differential Reinforcement of Other Behavior schedule). After he engaged in other behavior than string play for one full 10 sec interval in the presence of the red card, Mark was praised, and the green card was set in front of him on the table and string play was allowed. The 10 sec intervals were signaled to the teacher by a subtle head nod or hum from the primary data collector.

Results and Discussion

Figure 1 shows the results of the functional analysis. String play occurred at variable levels across all conditions. Close examination of trends within the functional analysis reveal a downward trend in levels of stereotypy across the alone, demand and attention conditions. A limitation of the functional analysis is that data were not collected across conditions until steady-state responding occurred. Ideally, additional sessions across all conditions would have continued for a minimum of three sessions per condition to more accurately inspect trends within and across conditions. However, Mark engaged in string play for a mean of 74% intervals with a range of 60-87% during the alone condition. The persistence of string play during the alone condition indicates that this behavior was maintained, at least in part, by some form of automatic reinforcement.

During baseline, the percentage of intervals for string play when the green or red stimulus card was present is shown in Figure 2 (percent of green and red card intervals within sessions) and Figure 3 (total stereotypy across sessions). Mark exhibited

relatively similar levels of string play during baseline sessions when either the green (80%, range 73-93%) or red (69%, range 60-73%) stimulus card was present. During the first discrimination training phase, Mark initially continued to engage in similar levels of string play with the green or red card present. However, after three sessions of exposure to discrimination training, Mark engaged in higher levels of string play when the green card was present. During the final three sessions of the first phase of discrimination training, Mark exclusively engaged in string play in the presence of the green card. That is, the red and green cards exerted stimulus control over stereotypy. After stable levels of string play occurred in the presence of the green and red stimulus cards, the cards were withdrawn and levels of string play immediately returned to baseline levels (see Figure 3). The intervention effects were then replicated via reintroducing the discrimination training package. Once again, Mark's stereotypy did not occur in the presence of the red card and occurred at high levels when the green card was present. Although we did not conduct a pure test of inhibitory stimulus control via presenting the red and green cards in the absence of programmed consequences, the last 3 sessions in the first discrimination training phase (and the last 4 sessions during the second discrimination training phase) functioned as this test because stereotypy did not occur in the presence of the red card.

The dotted line in Figure 3 denoting 50% of intervals during intervention sessions indicates that all sessions on or below the dotted line represents perfect inhibitory stimulus control. That is, the green card was present during 50% of the intervals for all sessions signaling to Mark that stereotypy could occur without blocking and vocal redirection to engage in any behavior other than stereotypy. Ideally, the length of time (i.e., percentage of intervals with red card present) would have been extended to produce a more robust and clinically significant reduction in the overall levels of stereotypy.

Results of Doughty et al. and Conroy et al. were replicated in that automatically maintained stereotypy exhibited by a young boy with autism was brought under stimulus control. Although the current study was conducted with only one participant, the results, in combination with findings from previous research begin to establish an emerging literature base demonstrating the potential generality of stimulus control interventions for treatment of stereotypy exhibited by children with various types of developmental disorders. Of equal importance is that all aspects of the assessment, development of the intervention, and treatment implementation were conducted in the child's classroom by his student teacher. This suggests that this type of stimulus control intervention was a socially valid and acceptable treatment for all stakeholders involved in providing Mark with an educational environment that decreased his response allocation to stereotypy.

One limitation of this study is that it is unclear what variable, or combination of variables, was responsible for establishing stimulus control of stereotypy. That is, several potentially important variables were operative at the same time. These variables included vocally redirecting and removing the string from Mark's hands in the presence of the red card, vocally describing the contingencies in place for the red and green card, and providing Mark with access to the green card contingent on him not engaging in string play for one full 10 sec interval. Finally, the most significant practical limitation was that the length of time that Mark was required to refrain from engaging in stereotypy was not extended beyond 10 sec. This was a goal at the beginning of the study, but the end of the school year did not allow sufficient time to extend the length of time the SD card was absent.

Even with these limitations, the current study provides an initial replication of the very limited previous research on stimulus control of stereotypy. This study may also set the occasion for future research on the necessary and sufficient conditions for establishing stimulus control of stereotypy. That is, several questions remain about the separate and combined effects of vocal instructions and descriptions of contingencies to assess whether pure stimulus control by nonvocal stimuli can be accomplished. This could have a very important impact on maintenance and generalization of treatment effects when a teacher or therapist is not directly interacting with the child and available to provide vocal descriptions of contingencies for the cards and occurrences of stereotypy. Finally, research needs to identify modifications to this intervention package that will maintain positive treatment effects while extending this intervention across the day for children who emit high frequency stereotypy. As teachers and

direct service providers extend the time that the red card is present (i.e., further reducing the overall levels of stereotypy during treatment sessions), they may need to expand the time that the SD is present and allow children to control their own schedule of access to stereotypy through appropriate requests for breaks from instructional programming.

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