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Increasing functionally complex play skills by manipulating access to stereotypy as reinforcement in children with autism

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Running head: INCREASING FUNCTIONALLY COMPLEX PLAY

**Increasing Functionally Complex Play Skills by Manipulating Access to Stereotypy as
Reinforcement in Children with Autism**

A Thesis Presented

by

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In partial fulfillment of the requirements

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Increasing Functionally Complex Play Skills by Manipulating Access to Stereotypy as
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Abstract

The purpose of this study was to systematically replicate and extend the procedures presented in Hanley, Iwata, Thompson, and Lindberg (2000); using stereotypy as reinforcement to increase progressively more complex and age-appropriate play while decreasing rates of motor stereotypy. The current study examined motor stereotypy of one child diagnosed with an autism spectrum disorder (ASD). Two initial assessments were conducted prior to treatment. First, a competing items assessment which indicated that the participant's stereotypy and simple engagement persisted at high rates across all items. A functional analysis was then conducted in an attempt to identify the function of the participant's behavior. Variable rates of stereotypy across all social conditions were observed during this assessment; however, the highest rates of stereotypy occurred during the control condition, indicative of automatic reinforcement. Following initial assessments, we evaluated effects of enriching the environment on the occurrence of stereotypy, simple engagement and generic functional engagement using a multi-element design with withdrawals design. These variables were assessed in four activities and under three conditions: providing prompts for engagement, blocking all instances of stereotypy, and providing the participant a 30 s access period to engage in stereotypy when the contingency for reinforcement was met.

Keywords: motor stereotypy, automatic reinforcement, play, autism

Increasing Functionally Complex Play Skills by Manipulating Access to Stereotypy as
Reinforcement in Children with Autism

Individuals diagnosed with an autism spectrum disorder (ASD) and other related developmental disabilities have a propensity to engage in stereotypic behavior (Rapp, Vollmer, Peter, Dozier, & Cotnoir, 2004). Stereotypic behavior is included as one of the diagnostic criteria for autism spectrum disorders along with social interaction and communication deficits (DSM-IV; American Psychiatric Association, 1994). Lewis and Bodfish (1998) define stereotypy as “repetitive and apparently purposeless body movements (e.g., body rocking), body part movements (e.g., hand flapping, head rolling), or use of the body to generate object movements (e.g., plate spinning, string twirling)” (p.82). These repetitive body movements as described by Lewis et al. are believed to serve no apparent social function (Lewis & Baumeister, 1982) and as a consequence, can often interfere with the developmental of critical life skills as well as the many learning opportunities that are encountered on a daily basis.

Bodfish, Symons, Parker, and Lewis (2000) systematically assessed the occurrence, the range of specific topographies and the severity of stereotypic behavior in individuals diagnosed with both mental retardation (MR) and autism, as compared to individuals with MR that did not have an autism diagnosis (referred to as the “nonautistic-MR group”). A high rate of stereotypic behavior was observed in both groups. However, there were a greater number of participants diagnosed with both MR and autism that exhibited stereotypic behavior compared to the participants in the nonautistic-MR group. In addition, the group of participants diagnosed with both MR and autism displayed a larger number of topographies of stereotypy as well as the behavior occurring at higher rates. The results suggest that stereotypic behavior can have a

profound and disruptive effect on an individual's life and that stereotypy presents a greater concern for individuals diagnosed with autism.

The presence of stereotypy presents various challenges for an individual as a member of society. Stereotypic behavior is socially stigmatizing and often-times impedes on opportunities to engage socially with peers, and other members of the community as well as family members (e.g., Krantz & McClannahan, 1998; Vollmer, 1994; Wolery, Kirk, & Gast, 1985). In addition, Bodfish et al. (2000) conferred that stereotypy is persistent and invariable. As a result, the presence of stereotypy in an individual's repertoire of behavior has the potential to greatly interfere with the acquisition of academic and social skills. Such interference inhibits their ability to learn appropriate play skills and acquire the capacity to successfully engage in appropriate independent leisure (e.g., Singh & Winton, 1983; Singh & Millichamp, 1987).

Lovaas, Newsom and Hickman (1987) suggested that stereotypic behavior can potentially be maintained by the sensory consequences produced by these repetitive motor movements. Turner (1999) provided three examples taken from several studies examining stereotypy and its reinforcing consequences. First, Turner states that these behaviors "are often an obvious source of perceptual, auditory, or tactile stimulation" (p. 842). Second, allowing individuals with ASD the opportunity to access equivalent yet alternative modalities of stimulation can reduce their rates of stereotypic behavior (MacLean & Baumeister, 1982; Rincover, Cook, Peoples, & Packard, 1979). Third, repetitive behavior in individuals with ASD can be programmed as reinforcement for alternative, more acceptable behavior (Charlop, Kurtz, & Casey, 1990; Wolery et al., 1985). These studies have provided compelling evidence that stereotypic behavior can operate as a reinforcer for alternative, more desirable behavior.

Stereotypy is frequently referred to as being “automatically reinforced” (Lovaas et al., 1987). Automatic reinforcement refers to a process by which a specific behavior is maintained independently from the social environment. It can be difficult to identify the variable(s) that are maintaining this behavior if, in fact, it is automatically reinforced (Vaughn & Michael, 1982). A functional analysis is one assessment tool that researchers have used to identify the potential variable(s) maintaining an undesirable response.

According to Vollmer, Marcus, Ringdahl, and Roane (1995), one of the primary advantages of running a functional analysis prior to treatment is that reinforcer(s) that maintain problem behavior which are identified in such assessments can be withheld during treatment and delivered only when a more desirable response is emitted; this treatment procedure is referred to as differential reinforcement of alternative behavior (DRA). Vollmer et al. acknowledge the value of conducting pre-treatment functional analyses by stating that since the development of this assessment tool, (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) research based on functional analysis results has become more prevalent in the field of applied behavior analysis.

A number of effective treatment strategies have been developed for automatically reinforced behavior, in general, and stereotypy, in particular. Vollmer et al. (1995) discussed several potential strategies for treatment of behavior when the results of a functional analysis are undifferentiated. Vollmer et al. proposed that treatment may be more successful, particularly when implementing a differential reinforcement procedure, if the value and preference of the reinforcers are assessed. Vollmer et al. continued to suggest that by maximizing the quality of the reinforcers, the rate of responding should increase in the direction of more appropriate and desired behavior.

Fellner, Laroche, and Sulzer-Azaroff (1984) examined the use of a differential reinforcement treatment package and its effectiveness on reducing stereotypic behavior among individuals with ASD and/or other developmental disabilities. The lowest levels of stereotypic behavior were observed when the differential reinforcement and response blocking procedure (i.e., any instance of stereotypic behavior resulted in a brief hands-down procedure in order to stop the behavior as soon as it was emitted by the participant) were implemented concurrently. The authors concluded that a response blocking procedure in addition to differential reinforcement for desired (alternative) responses may be a successful treatment for reducing rates of stereotypy.

Sensory extinction is another method used to treat automatically reinforced stereotypy. Rincover (1978) demonstrated that the removal of sensory consequences from an individual's environment can decrease stereotypic behavior. For example, in the same study, one of the participant's topography of motor stereotypy took the form of spinning a plate on a hard surface. When the hard surface was covered with carpeting this response decreased considerably and the researchers concluded that the addition of the carpet removed the auditory feedback that this particular response was producing. Rincover suggests that sensory reinforcers that maintain stereotypic behavior can occasionally be clearly defined for individuals with autism. It is necessary to consider different extinction procedures when aiming to decrease specific stereotypic behavior maintained by the sensory consequences that engaging in that behavior produces (Aiken & Salzberg, 1984).

Ahearn, Clark, MacDonald, and Chung (2007) assessed and treated vocal stereotypy in children with ASD by developing a response interruption and redirection (RIRD) procedure that was similar to response blocking for motor stereotypy, as an intervention for vocal stereotypy.

Ahearn et al. (2007) used the RIRD strategy because the response blocking procedure had been shown to reduce other forms of automatically reinforced behavior. The RIRD procedure involved a teacher presenting a sequence of vocal demands on the participant contingent on the occurrence of vocal stereotypy.

Ahearn et al. (2007) conducted an initial functional analysis in order to determine the variable(s) that were maintaining the frequency of stereotypy and found that all participants' vocal stereotypy was unlikely to be maintained by social consequences. Following the functional analysis, the RIRD procedure was applied as a treatment procedure in order to evaluate its effectiveness for interrupting and redirecting vocal stereotypy. Each participant produced considerably lower levels of vocal stereotypy when the RIRD was in effect as compared to baseline. These results replicate the findings of several other studies which demonstrated that stereotypic behavior can be modified by blocking or interrupting the behavior contingent upon its occurrence.

Piazza, Adelinis, Hanley, Goh, and Delia (2000) examined three different forms of aberrant behavior, two of which were stereotypic (i.e., spit play and hand mouthing), displayed by three children diagnosed with ASD. Each participant demonstrated a lack of sensitivity to the social consequences presented during the functional analysis and therefore the authors concluded that the participants' aberrant behavior was maintained by automatic reinforcement. Following the functional analyses, Piazza et al. conducted preference assessments with each individual to classify whether or not these stimuli were (matched) "items that matched the hypothesized sensory consequences of the aberrant behavior" or (unmatched) "items that produced sensory consequences that were not similar to those produced by aberrant behavior" (p. 19).

The matched and unmatched stimuli were presented in random order for each participant during the preference assessment. Based on the results of the preference assessment, items were chosen for the subsequent evaluation if the participant demonstrated low levels of aberrant behavior when the item was presented and also demonstrated high levels of interaction with the item. The results demonstrated lower levels of aberrant behavior occurred when the matched stimuli were presented in comparison to the presentation of the unmatched stimuli.

There are, however, limitations to these function-based approaches that aim to reduce stereotypic behavior by replacing the undesirable response with a more desirable appropriate response that deliver the same sensory consequences. Experimental analyses of stereotypy show that the stereotypic behavior is persistent across time because the sensory consequences of engaging in that behavior are reinforcing or that it is controlled by several sources of reinforcement, including the sensory consequences the behavior produces (Iwata et al., 1999; Kennedy, Meyer, Knowles & Shukla, 2000).

It is also important to consider how labor-intensive most of these treatment approaches are. For instance, to effectively implement an RIRD procedure (described by Ahearn et al. 2007), would require at least 2 or 3 trained teachers that would reliably implement the procedure 24 hr a day, 7 days a week and these resources are not only limited but also extremely costly.

Results from several previous studies have suggested that the opportunity to engage in stereotypic behavior may function as reinforcement for alternative, more socially desirable behaviors. However, the procedural components of this intervention include several distinct operations whose effects have not been analyzed separately. As a result, Hanley et al. (2000) conducted a component analysis by using a “stereotypy as reinforcement” contingency in order

to analyze the procedural components separately and to evaluate a treatment program designed to strengthen an alternative behavior.

Hanley et al. (2000) used participants' stereotypy as reinforcement for engaging in various leisure activities. All participants included in this study engaged in high levels of stereotypy. The analysis consisted of four conditions: baseline, prompting, response blocking and differential reinforcement. During baseline, the participant was alone and presented with several leisure activities without any operant contingencies in place. Then prompts were delivered for desired responses, followed by the implementation of response blocking for all stereotypic behavior and lastly, providing a brief access period for the participant to engage in stereotypy contingent upon the desired, alternative response. When treatment was completed, all three of the participants were engaging in low levels of stereotypy and higher levels of engagement with the provided leisure items compared to baseline.

The current research extended and replicated the procedural components and treatment program used by Hanley et al. (2000). The purpose of this study was to increase more complex and age-appropriate play skills and decrease motor stereotypy by using the motor stereotypy itself as reinforcement.

General Method

Participant and Setting

The participant was a 16-year-old boy who had been diagnosed with an autism spectrum disorder (ASD). Patrick was a residential student at the New England Center for Children (NECC) in Southborough, Massachusetts. Patrick communicated vocally; however, his most commonly occurring behavior was requesting particular items or food, and tacting objects. He also answered simple social questions (e.g., "where do you go to school?" "when is your

birthday?” “what is your brother’s name?”). Patrick was selected to participate in the study because he engaged in high persistent rates of motor stereotypy that greatly interfered with his ability to acquire appropriate and independent leisure skills. All sessions in Experiment 1 were conducted in the vocational classroom at Patrick’s school. Sessions were 5 min in length and videotaped. Materials present in all sessions included a table, chair with wheels, digital timer, a laminated piece of red construction paper with a white cross, and three leisure activities (legos, string and beads, and a shape sorter).

Response Measurement and Interobserver Agreement

The dependent variables assessed throughout the study were stereotypy, simple engagement (SE) and generic functional engagement (GFE). All data were collected using a handheld IPAQ computer. Simple engagement (SE) was defined as simply touching a leisure item or any non-functional manipulation and/or engagement with an item. Generic functional engagement (GFE) was defined by specific manipulation of a leisure item. An access period was defined as 30 consecutive seconds when no consequences for engaging in stereotypy were in place. When the participant earned an access period, his chair was physically pulled away from the table. When the access period ended after 30 s, the participant’s chair was pushed back to the table and the contingency reset. Simple engagement was recorded as duration and reported as percentage of session. Stereotypy, GFE, prompts, and number of access periods earned per session were measured as frequency and reported as rate per minute (rpm).

Stereotypy was defined as any instance of repetitive (i.e., occurring 2 or more times within 2 consecutive seconds) body movements that have no apparent function and are not teacher-directed. These body movements include hand flapping or other non-functional hand movements, positioning hands in front of face or over ears, twisting his ears, finger flicking, rapid finger movements with one or both hands, spinning objects, jumping paired with flicking

his fingers, tapping objects/people, pressing or rubbing fingers or whole hand against surface or body part, and biting the surface of his hand(s) that do not leave teeth marks. Examples include, tapping pages of a book forcefully with one or more fingers during leisure, and placing hands over one or both of his ears outside the context of a noisy environment. Nonexamples include tapping his teacher on the shoulder to make a request or raising his hand in response to a teacher directive.

Interobserver agreement (IOA) was collected for a minimum of 20% of sessions in each condition across all analyses and mean agreement was always above 80%. Interobserver agreement was collected independently by a second observer using a second IPAQ handheld computer.

Competing Item Assessment (CIA)

Procedure

Two competing item assessments, analogous to the procedures described by Piazza et al. (2000) were conducted prior to implementation of treatment. Data were collected on stereotypy and simple engagement (Figure 1). The items included were stimuli that the participant could easily manipulate and could engage in for long periods of time. Each item was presented, in a randomized order, for 5 min on 2 occasions. In other words, a total of sixteen 5-min sessions were conducted during this initial assessment. At the beginning of each session, the therapist placed one item on the table where the participant was seated the table and stated, “You can play with ‘X’ if you want.” Following the initial instruction, removed all attention and sat in a chair that was positioned approximately 12 feet from the participant.

Results

High rates of stereotypy and SE were observed across all leisure items that were presented during both competing item assessment 1 and 2. Four leisure items were selected to be used during subsequent treatments and included: legos, stamps, a shape sorter and stringing beads. These items were chosen based on the idea that they could develop into multifaceted more age-appropriate play skills. (Note: stamps were removed after the functional analysis was completed and before treatment analysis began because Patrick had a new IEP/Occupational objective that involved stamping, and this could interfere with the reliability and generality of results).

Interobserver agreement was collected during a minimum of 22% of sessions (7 of 32 total sessions). Mean IOA for stereotypy was 77% (range, 65 - 89%), mean agreement for SE was 93% (range, 89 - 95%).

Functional Analysis

Procedure

A functional analysis was conducted based on the procedures described by Iwata et al. (1982/1994). The purpose of this assessment was to determine whether or not the participant's motor stereotypy would be sensitive to various social consequences (e.g., escape from work, receiving attention from others) and/or whether the participant's stereotypy would persist in the absence of socially mediated consequences. Four conditions were included in the functional analysis: social attention, demand, alone and control condition. The leisure items selected following the competing item assessments (legos, stamps, a shape sorter and stringing beads) were present during all conditions of the functional analysis. All sessions were 5 min and at least three sessions of each condition were completed in a counterbalanced order.

Attention condition. During this condition, the participant was seated at the table with all activities in front of him. The therapist began the session by moving one of the three activities toward the participant and stating, “here’s X, play as much or as little as you want.” Following the initial instruction, the therapist positioned herself a few feet away from the table seated in a chair and removed all attention by pretending to read. If the participant engaged in stereotypy, the therapist would tell the participant to “stop that” or “don’t do that, that doesn’t look right” paired with lightly touching his shoulder or arm. This verbal and light physical attention continued until the participant stopped engaging in stereotypy for 2 consecutive seconds. When the participant stopped engaging in stereotypy for at least 2 s, the therapist would again return to her chair, remove all attention and repeat the procedure for all occurrences of stereotypy during the session.

Escape condition. During this condition, the participant was seated at the table facing the activities. The therapist was seated in a chair next to the participant and delivered a demand every 15 s throughout the 5-min session. A demand consisted of the therapist instructing the participant to manipulate an activity in a specific way. For example, the therapist would pick up a lego and attach it to another lego and say, “build like this.” If the participant responded correctly to the demand, verbal praise was delivered; however, if the participant did not comply with the demand within 5 s or made an incorrect response, the therapist physically guided the participant’s hands to make the correct response. If at any point during the session, the participant began to engage in stereotypy, the therapist removed the materials by pushing them towards the back of the table and instructed the participant by saying, “oh, you don’t have to,” and removed attention by turning away from the participant in her chair. All behavior (including

stereotypy) that occurred outside of the scheduled intervals for verbal and light physical praise were ignored.

Alone condition. During this condition, the participant was seated facing the table with all activities present. There were no contingencies in place for engaging in stereotypy or for manipulating the activities. The therapist did not provide any instruction prior to or at any point during this condition. The therapist positioned herself behind a bookshelf so she was not visible to the participant. The therapist, however, continuously monitored the participant by looking through the video camera that recorded the sessions. The only time the participant had contact with the therapist was in the occasion the participant attempted to walk away from his chair and had to be redirected back to the table.

Control condition. During the control condition, the participant was seated in front of the table with all four leisure items present. The session began when the therapist provided light physical guidance to make contact with one of the items and stated, “Here are some toys to play with.” The therapist delivered social praise (e.g., “well done” or “your shirt is really clean”). The therapist also delivered brief physical contact (e.g., a friendly pat on the shoulder) every 15 s unless stereotypy occurred directly before the praise was scheduled to be delivered. In this case, the delivery of praise was delayed by 5 s. If the participant engaged in stereotypy during the session, the therapist acted as if the behavior had not occurred. No demands were placed on the participant during this condition.

Results of the functional analysis are shown in Figure 2. Variable rates of motor stereotypy were observed across all social conditions, however, the highest levels of motor stereotypy were observed during the control condition suggesting that the behavior was not mediated by social contingencies but rather, maintained by the sensory consequences of

engaging in the behavior itself (automatic reinforcement). A fourth control session was conducted because there was a downward trend in the level of stereotypy during the second and third control sessions. The additional control session was necessary in order to reliably determine the function of the behavior. There was a high level of stereotypy in the fourth control session, and this was taken to suggest that the participant's stereotypy was maintained by automatic reinforcement; therefore, his participation in the treatment analysis was considered appropriate.

Interobserver agreement was collected in 31% of sessions (4/13 of total sessions). The mean IOA for stereotypy during functional analysis sessions was 80% (range, 75 to 85%).

Experiment 1: Treatment Analysis

This experiment attempted to replicate Hanley et al. (2000) and extended this research by measuring effects of a differential reinforcement of alternative behavior (DRA) treatment package while simultaneously decreasing the rate of stereotypy in the participant.

Method

Activities-only. The activities-only condition was identical to the control condition of the functional analysis. The participant was seated at the table facing the leisure activities. The therapist removed all attention, did not deliver any instructions to the participant and there were no contingencies in place. Data were recorded on stereotypy, SE and GFE.

Activities + prompting condition. During this condition, the activities were placed on the table, identical to how they were during the activities-only condition; the session began when the therapist took the participant's hands and physically guided them to make contact with one of the activities on the table. The therapist stood behind the participant and prompts were delivered approximately every 30 s throughout the session. However, if the participant was functionally

engaging with an activity at the 30 s interval when the prompt was scheduled to be delivered, the therapist waited 5 s (or until functional engagement had ended) before prompting the participant. No contingencies were in place for the participant's motor stereotypy. Data were recorded on stereotypy, SE, GFE, and number of prompts.

Activities + prompting + blocking condition. During this condition, in addition to the activities and prompting components being present, a blocking contingency was introduced. During this condition, all occurrences of stereotypy were blocked by the therapist placing the participant's hand or hands down on the table for approximately 2 s. The therapist stood behind the participant with both arms extended around the sides of the participant with both hands positioned approximately 6-8 in above the participants' hands. The therapist's positioning was necessary for immediate and effective blocking of stereotypy. Because the topography of the participant's motor stereotypy was so complex and in order for the therapist to effectively and reliably block the participant's stereotypy, the therapist was required to occasionally place her hands in between the participant's and move them apart or guide them up and apart as a means of blocking. Data were recorded on stereotypy, SE and GFE.

Activities + prompting + blocking condition + DRA of GFE condition. During this condition, the blocking and prompting procedures remained the same as previous conditions, however, when the participant functionally engaged with a pre-determined number of items without engaging in stereotypy, he would earn a 30 s access period. The therapist stood behind the participant with both arms extended around the sides of the participant with both hands positioned approximately 6-8 in above the participants' hands. When the DRA treatment condition was initially implemented, the participant was required to complete three functional engagement responses (e.g., stringing 3 beads or stringing 1 bead and connect 3 legos) without

engaging in stereotypy. When this requirement was achieved, the participant was provided a 30 s access period. The access period was signaled by the therapist stating “good” or “nice” when the participant completed the requirement and then turned his chair away from the table. After each access period was signaled, the therapist walked approximately 10-12 feet away from the participant and removed attention for the 30 seconds. Data were collected on SE, GFE, prompts and stereotypy when the treatment contingency was in effect and stereotypy during each access period(s), number of prompts and number of access periods earned.

Generalization probe sessions

Probe sessions were conducted exactly as the activities-alone sessions. No programmed contingencies were in place during these sessions. One probe session was conducted after every two DRA sessions. Data were recorded on stereotypy, SE and GFE.

Results and Discussion

Patrick demonstrated high levels of simple engagement with all of the leisure items during the both competing items assessments. Patrick’s rate of stereotypy occurred at moderately high levels with every leisure item in both assessments. Stereotypy occurred at 9.5 rpm when stamps were presented during both assessments. The average rate of stereotypy during the shape sorter sessions was 8 rpm (rates ranged between 7.9 and 8.2 rpm), rate of stereotypy during legos and stringing beads sessions ranged from 3.8 rpm to 5.9 rpm with an average rate of 5.6 rpm.

During the activities-only condition of the treatment analysis (Figure 3); the rate of stereotypy ranged from 3-10 responses per minute, SE occurred at high levels and the percentage of occurrence during sessions ranged from occurring 78% to 100% of the session, GFE ranged from 2-5 rpm, and prompts were not delivered during this condition. When prompting was

introduced, stereotypy, SE, and GFE remained at baseline levels and prompts slightly increased, however, returned to zero levels during the last session of the prompting condition. When blocking was implemented, stereotypy decreased to a lower level and remained low and stable across blocking sessions, SE remained at baseline levels, GFE increased and by ninth session occurred at moderately low, stable levels (ranging from 5 to 13 rpm) and prompts increased and remained above baseline level, averaging less than 1 prompt per min.

When the DRA treatment was introduced, rates of stereotypy remained at baseline levels for approximately the first 10 sessions. However, as the DRA treatment continued, rates of stereotypy during treatment sessions decreased to below baseline levels and remained at low to almost zero rates of stereotypy during the subsequent 25 treatment sessions. Simple engagement immediately decreased and occurred at a moderately high level and an upward trend was obtained. Generic functional engagement remained at baseline levels and when the response requirement was set at 5, GFE increased and obtained an upward trend with the highest rate reaching 35 rpm. Prompts initially remained at baseline levels then significantly increased during session 55 and reached almost 4 rpm before rates steadily decreased and returned to zero levels. During probe sessions, stereotypy continued on an increasing trend and became moderate and stable, SE occurred at highly variable rate (ranging from 0% to 98% of session), GFE remained at steady low to zero levels.

Interobserver agreement was collected for 22% of sessions (22/99 of total sessions) of the treatment components in Experiment 1. Overall average agreement for stereotypy was 84% (range, 70 – 100%), SE agreement was 94% (range, 81 – 100%), GFE agreement was 91% (range, 84 – 95%), agreement for prompts was 99% (range, 94 – 100%), number of access

earned per session agreement was 98% (range, 94-100%), and agreement for stereotypy during access was 82% (range, 72 - 84%).

Experiment 2: Treatment Preference Assessment

Once functional control of behavior was observed in Experiment 1, a treatment preference assessment (Experiment 2) was conducted for the purposes of determining which treatment was most preferable for the participant. The treatments evaluated in Experiment 2 included: activities-only, blocking-only and the DRA treatment package.

Method

A paired-stimulus color preference assessment was conducted based upon the procedures outlined by Fisher et al. (1992). Eight, randomly selected, colors were included in the assessment. A total of 56 trials were conducted during the assessment. During each trial, two colors were presented to the participant, with each color being paired once with every other stimulus. Three colors (pink, yellow, and green) that were observed as being neither highly nor least preferred were selected to be used in Experiment 2.

Following the paired-stimulus color preference assessment, the participant was exposed to a concurrent-chain schedule in which the three treatments were correlated with a pink, yellow or green stimulus. Treatment preference was evaluated when the colored stimuli were correlated with initial and terminal link contingencies. The procedure was designed to evaluate to determine which of the three treatment procedures; activities-only, blocking-only and the DRA treatment package, that were assessed in Experiment 1 was most preferred by the participant.

Initial link contingency

During the initial link contingency condition, the participant was seated in the same location as during Experiment 1. A three-stimulus array board (24 in X 6 in) with three colored

squares (4 in X 4 in) positioned horizontally and attached with velcro was used to present the stimuli in a clear and systematic fashion. The three stimuli were presented in random position across the three-stimulus array board. For each stimulus selection, the initial links all resulted in the delivery of one red skittle. Once the participant selected a stimulus, his chair was moved to the table and the therapist placed a large (12 in X 8 in) piece of construction paper (the same color that was selected) and placed a red skittle on the paper.

Two-minute terminal links

Each treatment was correlated with one of the three colored stimuli. The treatments were randomly assigned to the stimuli as terminal links. The activities-only treatment was correlated with the yellow stimulus, the blocking-only treatment was correlated with the pink stimulus and the DRA treatment package was correlated with the green stimulus. For example, if the participant selected the pink stimulus, the blocking-only terminal was presented for 2 min. Procedures for the terminal links were identical to corresponding treatment procedures described in Experiment 1.

Six-minute terminal links

All terminal links remained the same; except that the trials were 6 min in duration rather than 2 min. The purpose of increasing session duration was to allow for the participant to contact the terminal links for a longer period of time.

Two-minute terminal links + research room + photograph/color contingency

The procedures in this phase were similar to procedures described in the previous 2 min terminal link condition; however, several modifications were made. First, the sessions were no longer conducted in the vocational room and conducted in one of three rooms that were all the same size (1.5 m X 3 m). Second, a photograph for depicting each of the three terminal links

were placed on construction paper that was the same color correlated to the terminal link. A brief verbal description was given to the participant prior to each session. The photographs of the terminal links were placed on the doors of each of the rooms. The photographs were moved to different rooms in a counter-clockwise fashion in between trials.

Return to initial-links

During this condition, the pink, yellow and green initial-link stimuli were reintroduced and procedures were identical to the previous initial-links. The only difference was that the trials were conducted using the three rooms rather than the vocational classroom.

Results

Figure 4 displays the results of the paired-stimulus color preference assessment. The three colors chosen to be included Experiment 2 (pink, yellow and green) are denoted by an asterisk. All three colors were selected at approximately the same number of times that they were presented.

During the initial-link condition, Patrick chose the initial-link correlated with the pink stimulus 12 times, the initial-link correlated with the green stimulus 7 times and the initial-link correlated with the yellow stimulus 5 times. Patrick showed a slightly higher preference for the initial-link correlated with the pink stimulus during the initial-link condition. When terminal-links were correlated with the colored stimuli, Patrick did not show a preference for any of the terminal-link stimuli during the 2 min terminal-link condition (Figure 5). Patrick selected the blocking-only terminal-link stimuli 9 out of 24 opportunities (38%); the activities-only terminal-link stimuli, 8 out of 24 opportunities (33%); and the DRA treatment package terminal-link stimuli, 7 out of 24 opportunities (29%).

When the terminal-link sessions were extended to 6 min in duration, Patrick chose the terminal-link correlated with the green stimulus 7 times and chose the terminal-link correlated with the yellow stimulus 7 times across the 24 sessions of the condition. Patrick selected the terminal-link correlated with the pink stimulus at a differentially higher rate between sessions 58 to 70.

Patrick chose the DRA treatment package at a differentially higher rate when session duration returned to 2 min. When the duration returned to 2 min, Patrick chose the DRA treatment package 14 out of the 18 session opportunities (78%); the activities-only 3 times out of the 18 session opportunities (17%) and the blocking condition only 1 time out of the 18 session opportunities (1%). When initial-links were reintroduced, Patrick's stimulus selection was highly variable across all 18 sessions of the condition. The initial-link associated with the blocking-only treatment was selected 8 out of the 22 sessions (36%), the initial-link associated with the activities-only selected 7 times out of 22 opportunities (32%) and the initial-link associated with the DRA treatment package was selected 7 out of the 22 sessions (32%).

General Discussion

Behavior that is maintained by automatic reinforcement is difficult to treat because there is no direct access to the reinforcement contingency. The relatively high and consistent rates of stereotypy exhibited by the participant during both of the initial assessments, the competing item assessments and the functional analysis, indicated that the participant's stereotypy was maintained by automatic reinforcement.

In Experiment 1, an observable change in behavior did not occur until the blocking condition was introduced; rates of stereotypy decreased while the rate generic functional engagement increased. These changes continued to follow in the same direction during the DRA

condition (which included the response blocking component). These findings support the implications of the work by Fellner et al. (1984), which found it imperative to include response blocking paired with a differential reinforcement procedure in order for the treatment to be effective in reducing rates of stereotypical behavior.

The probe sessions, conducted during the blocking and DRA treatment conditions, provided more assurance that the treatment was effective. In other words, when and only when all contingencies were removed during the probe sessions was there an observable change in behavior (i.e., an increase in rates of stereotypy and a reduction in generic functional engagement). Further, when the contingencies in the treatment procedure were reintroduced, rates of stereotypy returned to their previous levels and the frequency of generic functional engagement increased to either the same level as or even higher than before the probe session was conducted. The noticeable change in behavior reflected by these data, before, during and after each probe session was conducted, demonstrates greater reliability and generalizability of the DRA treatment procedure outlined in Experiment 1.

Experiment 2, the treatment preference assessment, provided the participant with the opportunity to indicate which treatment he most preferred. The goal of this assessment was to determine whether or not the DRA treatment package, which resulted in the highest levels of generic functional engagement and consistently low to near zero levels of stereotypy, was the most preferred treatment procedure for the participant in comparison with the activities-only and blocking-only treatments.

There was a noticeable lack of stimulus control, evidenced by the invariability of terminal-link selections during the 2 min terminal-link condition. As a result, terminal-links were lengthened to 6 min trials in order for the participant to come into contact with the

contingency for a longer period of time; providing more opportunity for the participant to contact the terminal-links associated with the different stimuli.

No observable change in terminal-link selection occurred when the duration was increased to 6 min trials. As a result, several modifications were made to the procedure. First, the session location was moved. Second, photographs depicting the terminal-links related to the corresponding stimuli were included and a brief verbal description about what would occur under each of the three terminal-link selections that were assigned to each of the three rooms. When these procedural changes were introduced, Patrick showed a strong and consistent preference for the terminal-link associated with the green stimulus (plus photograph) which was selected 14 out of the 18 trials conducted during this condition.

The majority of the treatments that have been shown to be effective in reducing automatically maintained behavior, such as the RIRD procedure discussed by Ahearn et al., (2007), are labor-intensive approaches. One limitation of this study, similar to the RIRD treatment approach, was that the treatment procedure required 1:1 instruction, therapist training in ABA and consistency as well as procedural integrity across staff and settings (i.e., day-instructional setting and residential setting). For instance, the participant in the current study is a residential student (i.e., is a student who is provided with supervision 24 hr a day 7 days a week) who has funding for 1:1 instruction, 30 hr a week. It would be nearly impossible to carry out this procedure when the participant is only provided 3-4 hours a day for 1:1 instruction.

Another potential limitation to this study was the change in prompting procedures during the DRA treatment condition. The participant was having a difficult time engaging with the items once he was brought back in front of the table after a break. The participant then began to engage in 2-3 responses of GFE and then fold his hands in front of him and repeat “ready” and

wait to be told what to do next (which was scheduled to occur 30 s after his last GFE response). As a result, starting at session 55, point prompts were added after 5 s of Patrick emitting the verbal response of “ready.” As can be seen in figure 3, following the implementation of point prompts, the latency between returning to the table and engaging with one of the activities decreased, and this decrease resulted in his meeting the requirement to an access period quicker.

In conclusion, the results of Experiment 1 (the treatment analysis) and Experiment 2 (treatment preference analysis) suggest that the DRA treatment procedure (which included prompting, blocking and differential reinforcement of generic functional engagement with contingent access to stereotypy) may be an effective intervention for decreasing the frequency of stereotypy maintained by automatic reinforcement. Additionally, results from the treatment preference analysis imply that using an individual’s own stereotypy as reinforcement to increase functional engagement with leisure activities may be an effective approach as well as a preferable treatment procedure for the participant.

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Figure Caption

Figure 1. Percent of intervals with engagement and rate of motor stereotypy during the Competing Items Assessment 1 and Competing Items Assessment 2

Figure 2. Functional Analysis of motor stereotypy

Figure 3. Rate of motor stereotypy, duration of simple engagement, rate of generic functional engagement, and rate of prompts during Experiment 1

Figure 4. Percentage of color selection during the Paired-Stimulus Color Preference Assessment

Figure 5. Cumulative number of selection of terminal link color contingencies during Experiment 2

Figure 6. Rate of motor stereotypy, duration of simple engagement, rate of generic functional engagement, and rate of prompts during Experiment 1 and Experiment 2











