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NONCONTINGENT ACCESS TO PREFERRED SENSORY STIMULI AS A TREATMENT FOR AUTOMATICALLY REINFORCED STEREOTYPY

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Researchers have previously suggested that interventions designed to decrease stereotypic behavior are most effective when they include access to stimuli that are matched to the specific sensory consequences hypothesized to maintain the stereotypy. In an attempt to replicate this finding, we used stimulus preference assessments and a reversal design to evaluate the effectiveness of noncontingent access to highly preferred stimuli that were matched to the specific sensory consequences hypothesized to be maintaining the stereotypic behavior of an individual with developmental disabilities. The participant was also given noncontingent access to a highly preferred edible stimulus as a control condition. Results indicated that noncontingent access to a matched sensory stimulus produced consistent decreases in aberrant behavior while access to a highly preferred edible stimulus did not. Copyright © 2005 John Wiley & Sons, Ltd.

LeBlanc, Patel, and Carr (2000) have categorized three primary assessment methods for evaluating automatically reinforced stereotypy. They are, in order of increasing experimental rigor, (1) non-hypothesis-based stimulus preference assessments, (2) hypothesis-based stimulus preference assessment, and (3) hypothesis-based assessments that utilize noncontingent reinforcement (NCR) and/or sensory extinction procedures. While hypothesis-based assessments that include experimental manipulations such as applications of NCR and extinction represent the most rigorous method of evaluating automatically reinforced stereotypy, these intense and sometimes extended assessments may not be possible due to the nature of the stereotypy (e.g. sensory consequences cannot be blocked without blocking the behavior itself) or due to practical constraints that are present in some applied

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settings. In these cases, utilizing hypothesis-based stimulus preference assessments might be an effective alternative strategy.

Piazza, Adelinis, Hanley, Goh, and Delia (2000) conducted hypothesis-based stimulus preference assessments, using a single item presentation format similar, with three participants who displayed automatically reinforced stereotypy. Then, they compared the effects of continuous access to sensory stimuli that were matched to the hypothesized sensory consequences of the stereotypy with sensory stimuli that were not matched. In the Piazza et al. study, matched stimuli were associated with lower levels of problem behavior than unmatched stimuli. The authors suggested that providing access to items that matched the hypothesized sensory consequences of problem behavior may be more effective than simply selecting stimuli either arbitrarily or based on the results of preference assessments alone.

The purpose of the present study was to determine whether the results obtained in the study by Piazza et al. (2000) could be replicated using a less complex and time-consuming preference assessment method. Specifically, the present investigation involved the administration of a brief multiple-stimulus preference assessment to identify highly preferred sensory stimuli matched to the specific sensory consequences hypothesized to be maintaining the stereotypic behavior of an individual with developmental disabilities. The matched sensory stimulus identified as highly preferred by the brief multiple-stimulus preference assessment was then provided noncontingently to the participant within a reversal design and levels of behavior were compared with baseline conditions and a control condition where a highly preferred edible stimulus was provided noncontingently.

METHOD

Participant and Setting

The participant was a 12-year-old male diagnosed with severe mental retardation. He was ambulatory and nonverbal, and typically did not respond to simple two-step instructions. He could communicate using a few modified ASL signs. All sessions were conducted in the living room of the participant's home which contained a TV set, a sofa, a couch, and a table. While the relevant stimuli for treatment session were placed on the table, the participant was free to move about the room during all sessions.

Response Definition and Measurement

Stereotypy was defined as the movement of the right hand back and forth in front of the participant's face either with or without an object in his hand. All sessions were

5 min in duration and were conducted two to six times per day, two to six days per week. The number of sessions did not vary systematically from day to day except during the phase in the treatment evaluation where noncontingent access to edible stimuli was provided. No more than two sessions per day were provided during this phase to control for possible satiation effects. Sessions were videotaped and later scored using a 10 s partial-interval recording system. The percentage of intervals with target behavior was then calculated for each session.

Interobserver agreement (IOA) was obtained by having a second person independently observe a videotape of sessions and record the participant's stereotypy. Agreements were defined as intervals where both observers scored behavior as either occurring or not occurring. IOA was calculated by dividing the total number of agreements by the number of agreements plus disagreements and multiplying by 100%. Interobserver agreement (IOA) was calculated for 33% (functional analysis), 100% (stimulus preference assessment), and 37% (treatment evaluation) of sessions and averaged 100, 100, and 92% (range 80–100%), respectively.

Procedures

Functional Analysis

To determine the maintaining variables of the participant's target behavior, a functional analysis similar to that described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) was conducted. Functional analysis sessions were 5 min in duration. Conditions were alternated in a multielement design until stable patterns were observed in the data.

Stimulus Preference Assessment of Matched and Unmatched Stimuli

Based on observation of the participant's stereotypic behavior, it was hypothesized that it could be maintained by at least two potential sensory consequences: visual consequences and/or tactile/kinesthetic consequences. As the target behavior did not produce any sound, auditory consequences were ruled out as a potential source of reinforcement. Based on these potential sources of automatic sensory reinforcement, a stimulus preference assessment was conducted with stimuli hypothesized to match these sensory consequences. The procedure was utilized because of the inability to block the potentially reinforcing properties of the target behavior, namely the kinesthetic properties, without blocking the target behavior itself. A brief multiple-stimulus without replacement (MSWO) procedure similar to that described by Carr, Nicolson, and Higbee (2000) was used to assess the participant's preference for the sensory items. Four sensory stimuli that provided visual and/or tactile/kinesthetic

stimulation were incorporated into the stimulus array. In an attempt to evaluate the role of preference relative to sensory match, a stimulus preference assessment with edible reinforcers was also conducted. Procedures were identical to those used in the preference assessment of sensory items except that edible stimuli were used instead of sensory stimuli. Items included in the edibles preference assessment were selected based on information about preferred edible stimuli that was provided by the participant's caregiver. The most-preferred stimulus from each preference assessment was subsequently used during the treatment evaluation phase. The most preferred stimulus in the sensory preference assessment was a battery operated toy with wings that flapped up and down while the most preferred edible stimuli were pretzels.

Treatment Evaluation

A treatment evaluation was conducted using an A–B–A–C–B reversal design. In addition to the matched stimulus NCR condition, a condition was included where a highly preferred edible stimulus was provided noncontingently. This control condition was included in an attempt to evaluate the relative impact of preference versus sensory match on rates of stereotypy. Baseline and reversal sessions were identical to the no interaction sessions of the functional analysis in that no programmed consequences were provided contingent on the target behavior and the experimenter did not interact with the participant in any way. Matched sensory and edible NCR sessions were identical to baseline sessions except that the participant was given continuous access to either the matched sensory stimulus or the edible stimulus during the session. Access was provided by placing in front of the participant the activated sensory toy or a bowl of pretzels that was refreshed as needed. No programmed social consequences were provided contingent on the participant's stereotypy in any session during the treatment evaluation.

RESULTS

Results of the functional analysis are presented in Figure 1. Response levels obtained in the functional analysis were consistent with the hypothesis that the participant's stereotypy was maintained by automatic reinforcement. Five to seven sessions of each functional analysis condition were conducted. Mean percentages of occurrence of the target behavior for each test condition were as follows: demand, 0%; control, 0%; attention, 0.6% (range 0–3%); and no interaction, 78% (range, 37–97%).

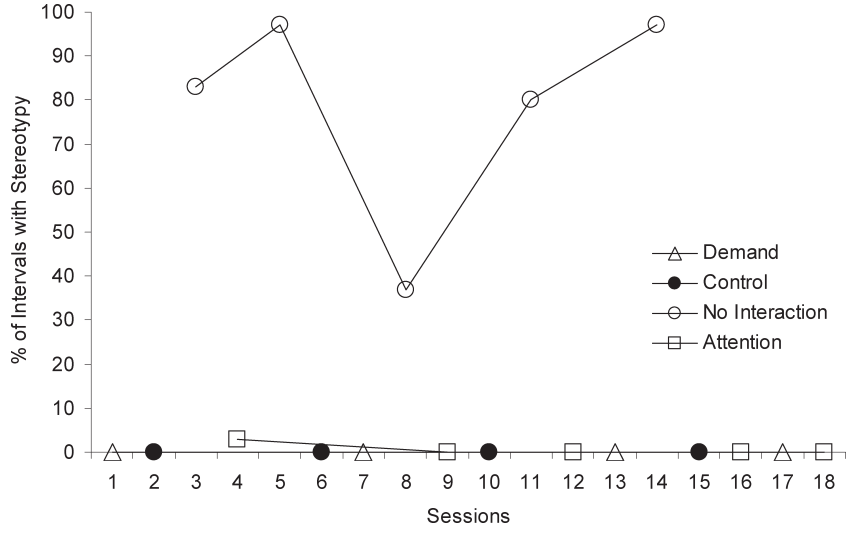

Figure 1. The results of the functional analysis. Data are expressed as the percentage of intervals with stereotypy.

The treatment evaluation data are presented in Figure 2. During the initial baseline, the participant's stereotypy averaged 74.5% of intervals (range 47–93%). In the first matched sensory NCR phase, stereotypy gradually decreased over the course of the first six sessions before leveling off at approximately 20% of intervals (mean, 23.4%; range 0–60%). During the return to baseline, stereotypy immediately returned to baseline levels with a mean of 72.6% (range 30–88%). In the next phase, edible NCR produced a brief initial reduction in stereotypy followed by a return of responding to levels at and above those seen in baseline and reversal phases with an increasing trend across the phase (mean, 63.8%; range, 0–100%). Matched sensory NCR was then reintroduced and stereotypy immediately returned to levels seen in the previous matched sensory NCR phase averaging 25.8% of intervals (range 17–43%), replicating the effect observed during the first application of this treatment.

DISCUSSION

These data are consistent with the results obtained by Piazza et al. (2000) in that continuous access to a sensory stimulus that was matched to the hypothesized source of sensory reinforcement successfully reduced levels of automatically reinforced stereotypy in comparison to baseline and a nonmatched control phase. Even though the edible stimulus utilized in the control phase was a highly preferred edible, it did

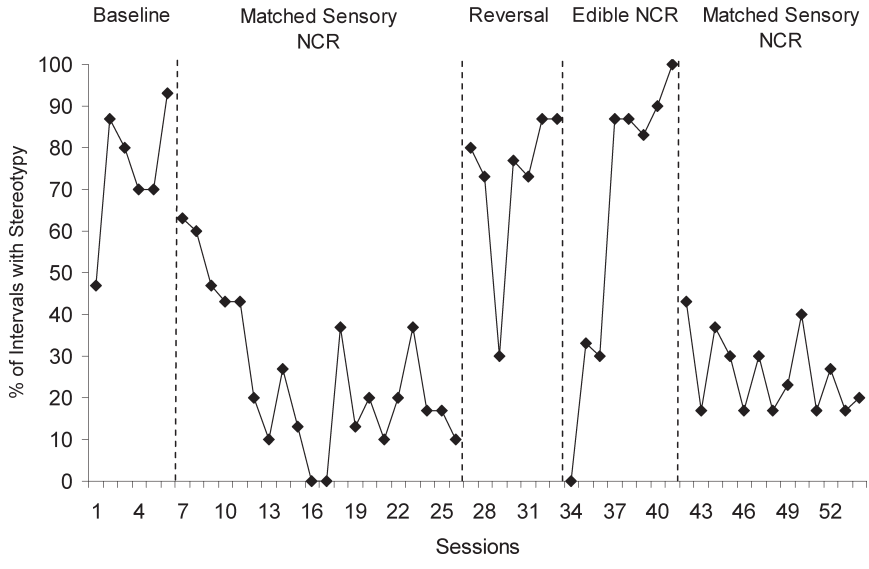

Figure 2. The results of the treatment analysis. Data are expressed as the percent of intervals with stereotypy in sessions where noncontingent access was provided to a stimulus that was matched to the sensory consequences hypothesized to be maintaining stereotypy or was a highly preferred edible.

not effectively reduce the participant's stereotypy when provided noncontingently. This confirms the importance of conducting preference assessments using stimuli that are not only thought to be preferred, but are also matched to the hypothesized sensory consequences of automatically reinforced stereotypy.

Results of the present study also suggest that less time-consuming preference assessments may be successfully employed to identify highly preferred sensory stimuli that can be utilized in interventions designed to reduce automatically reinforced stereotypy. Brief multiple-stimulus preference assessments like those used in the present study can be completed in 10 min or less (Carr et al., 2000) compared with the 2 hours that is typically required for preference assessments like the one used by Piazza et al. (2000) which employ the single-item presentation method (Pace, Ivancic, Edwards, Iwata, & Page, 1985).

An obvious limitation of the present study is that it was only conducted with one participant. Replications of the current procedures with additional participants could strengthen these findings. Additionally, because a selection-based stimulus preference assessment was used in the current study rather than a duration-based procedure (like that used by Piazza et al., 2000), rates of stereotypy with each of the stimuli assessed were not recorded. While this is a potential limitation to the present study, the fact that behavior was successfully reduced using stimuli identified through the procedures used may mitigate this concern.

In the present study, a highly preferred edible stimulus was included in the treatment analysis as a control condition in an attempt to evaluate the effects of preference relative to sensory match. As research has indicated that conducting multiple-stimulus preference assessments that include both edible and tangible stimuli can be problematic (DeLeon, Iwata, & Roscoe, 1997), the preference assessments were conducted separately for edible and sensory stimuli. While this procedural decision was well intentioned, it limits some of the conclusions that can be drawn from the study. Because the sensory and edible stimuli were not compared within the same preference assessment, it is not possible to determine the relative preference for the highly preferred sensory stimulus versus the highly preferred edible stimulus. That is, based on the present data, one cannot determine which of the two highly preferred stimuli was most preferred because they were never concurrently available. While we have hypothesized that the critical feature of the matched sensory stimulus was its sensory match to the participant's stereotypy, it is also possible that the matched stimulus was simply more preferred than the edible stimulus and this is why it produced more consistent decreases in stereotypy and why these decreases maintained over time while the initial decreases produced by the preferred edible stimulus did not maintain.

One way that this might be evaluated in future studies would be to conduct preference assessments with both stimuli that are matched and unmatched to the sensory consequences of the participant's stereotypy. If the results of this procedure indicate that some of the unmatched stimuli are more highly preferred than some matched stimuli, then the effectiveness of preferred unmatched stimuli could be compared with less preferred matched stimuli to determine the relative importance of preference in comparison of matched sensory stimulation.

Another limitation of the current study is that even though matched sensory NCR was successful in reducing stereotypy compared with levels seen in baseline and edible NCR phases, it did not produce a complete reduction in levels of stereotypy. Future researchers may examine other methods for producing greater behavior reductions and investigate whether these behavior changes can be maintained over time. Another issue that future researchers may consider is the use of socially acceptable stimuli in interventions of this type. If one of the goals of reducing stereotypy is to reduce the social stigma that it may produce, then it would seem important to either fade out the use of non-socially acceptable stimuli in treatments used to decrease stereotypy or to utilize socially acceptable stimuli from the beginning.

In summary, based on the preliminary data presented in the present study and those reported by Piazza et al. (2000), it appears that matching sensory stimuli to the hypothesized sources of sensory reinforcement is a critical feature of intervention plans designed to reduce stereotypy by providing noncontingent access to alternative

stimuli. While it could be argued that the relative impact of matching hypothesized sensory consequences versus general stimulus preference is still in question, from a practical point of view, the data from the present study and those conducted previously suggest that stimuli that are highly preferred *and* matched to the hypothesized source of sensory stimulation are most likely to be effective in reducing automatically reinforced stereotypy. As part of a continuum of assessment and intervention strategies, these results suggest that stimulus preference assessments that employ varied stimulus presentation strategies can be effectively employed to identify sensory stimuli that can be used to decrease automatically reinforced stereotypy. Future researchers may continue to develop additional strategies that practitioners can use to address aberrant behaviors that are not maintained by social consequences.

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