Applied Research in Mental Retardation, Vol. 2, pp. 247–256, 1981
Printed in the USA.

0270–3092/81/030247–10$02.00/0

A Comparison of Punishment and DRO Procedures for Treating Stereotypic Behavior of Mentally Retarded Children

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In the present study, two mentally retarded children with high rate stereotypic responding were hospitalized in a university medical school setting and treated with punishment and differential reinforcement of other behavior (DRO). Differential impact of the two treatment conditions was assessed using an alternating treatments design that incorporated the use of condition-specific discriminative stimuli. Experimental control was established through the use of a separate condition of no treatment. Results of the study indicated that for both subjects, all conditions were clearly discriminated and that punishment procedures were more effective for suppressing stereotypies than DRO. Six-month follow-up data were reported. Implications for future research utilizing the alternating treatments design were also discussed.

Stereotypic behaviors have been frequently discussed in the behavioral literature over the past few years, particularly with regard to mentally retarded and/or autistic children. The modification of such responses has been advocated on the

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basis of their maladaptive nature (e.g., Koegel, Firestone, Kramme, & Dunlap, 1974), self-injurious properties (e.g., Baumeister & Rollings, 1976), and the bizarre, unsocialized appearance that results (Baumeister & Forehand, 1973). Two methods have been frequently used in the treatment of this response class: punishment and differential reinforcement of other behavior (DRO). Both of these methods have proven effective for treating a wide range of stereotyped acts (Forehand & Baumeister, 1976; Harris & Ersner-Hershfield, 1978; Homer & Peterson, 1980).

Although recent studies (e.g., Ollendick, Shapiro, & Barrett, in press; Shapiro, Barrett, & Ollendick, 1980) have reported on direct comparisons of mild punishment procedures such as physical restraint and overcorrection in the treatment of stereotypic responding, no research has directly examined the comparative efficacy of punishment and DRO procedures, despite the reported success of both methods in treating this response class. Given the growing emphasis on the use of the least aversive procedure to effect treatment goals (Martin, 1977), considerable comparative research is needed.

The present study was designed to provide such a test by employing an alternating treatments design (Barlow & Hayes, 1979; Kazdin & Hartmann, 1978) across settings to assess the relative efficacy of punishment and DRO treatments in reducing the stereotypic responding of two mentally retarded children. Should differences in treatment effects occur this would be of considerable importance, since no such demonstration has been made in a within-subject comparison of these response elimination procedures.

METHOD

Subjects

Two mentally retarded, behaviorally disturbed children enrolled in a short-term residential psychiatric hospital program served as subjects. Both children were nonverbal, moderately mentally retarded based on AAMD criteria (Grossman, 1977), and exhibited high rates of stereotyped behavior. Julie (age 5) was frequently observed to suck her right index finger for extended periods of time, resulting in chronic suppuration and infection of her fingernail. Jack (age 9) frequently exhibited tongue protrusion which contributed to a bizarre, unsocialized appearance and a severe dermatologic condition (topical fissures) across the winter months. Medical staff expressed a great deal of concern for the self-injurious aspects of each child's behavior. In both cases, these behaviors were reported by parents to have occurred consistently for more than two years. Attempts by the children's parents to control these behaviors through the use of scoldings, spankings, and praise for good behavior were ineffective. Similarly, the efforts of ward personnel to decrease stereotypic responding through the use

of verbal redirection and later, systematic attention and ignoring, proved equally ineffective.

Setting

Treatment sessions for both subjects were conducted daily for 32 minutes. Julie's sessions were held during a group free-play period set in the recreation area of the unit, while Jack was treated in a laboratory setting with only the therapist present. The recreation area of the unit consisted of a partitioned 30m × 20m carpeted lounge with a color television, a large well-stocked toy bin, and several couches, tables, and chairs. The laboratory setting consisted of a 15m × 15m carpeted room with two large bay windows. The room was essentially barren with the exception of curtains, a table, and two chairs. In both settings, each subject was provided with standardized materials (Julie-toys; Jack-picture books) with which to interact, across all phases of the study.

Since primary reinforcers were used as one aspect of treatment (DRO), it is important to note that sessions were held at least two hours after standard meal times. Jack's sessions were conducted at 10 a.m. (two hours after breakfast); Julie's sessions were held at 3 p.m. (two hours after lunch).

Experimental Design

An alternating treatments design (Barlow & Hayes, 1979; Kazdin & Hartmann, 1978), which utilized three 10 min time periods within each 32 minute session, was used. The two separate conditions of treatment (punishment and DRO) plus a no treatment control condition were each assigned an individual 10 min period. All conditions were then rapidly alternated in counterbalanced order within each session. A 1 min pause occurred between time periods, in order to allow the therapist adequate time to prepare for the next experimental condition and to serve as a discriminative cue between conditions for the subjects. The same therapist for each subject administered the experimental conditions across all phases of the study.

An attempt to further increase discrimination between conditions was made by providing condition-specific nonverbal cues. The cues consisted of 8-inch × 10-inch black-and-white glossy photographs depicting the subject receiving punishment or DRO. Cues were presented to the subjects immediately preceding the appropriate condition for a standardized examination period of 10 sec before being conspicuously placed in full view for the remainder of the treatment condition. No picture served as the discriminative cue during the no treatment condition.

After baseline conditions were established for all three time periods, the effects of the nonverbal cues alone on stereotypic behavior were assessed. Pun-

ishment and DRO treatments were then alternated, along with the no treatment condition, and employed with each problem behavior.

Target Behaviors, Procedure, and Treatment Interventions

For Julie, stereotyped finger sucking was operationally defined as the placement of her right index finger (alone or in combination with other fingers) in her mouth, such that the fingernail was either not visible (fully covered by her lips) or clearly engaged by her teeth (observable contact between teeth and fingernail). For Jack, stereotyped tongue protrusion was identified as the target response. Although Jack's tongue was frequently observed to protrude several inches to the base of his chin, the target response was operationally defined as any observable protrusion of the tip of the tongue beyond the teeth.

For both subjects, DRO consisted of dispensing a primary reinforcer (a single "Froot Loop") contingent upon 10 consecutive sec of non-occurrence of the target behaviors. (Note: The 10 sec DRO value was selected on the basis of data obtained in a pre-baseline stimulus assessment. The data indicated that both subjects rarely exceeded 20–30 sec without presenting the target response. The 10 sec DRO value was installed to insure each subject's capacity for earning the reward.) Whenever the non-occurrence criterion was met, the therapist immediately handed the subject a "Froot Loop." The therapist was also instructed to smile and say, "Good." Behavioral observation and recording was discontinued until the subject had swallowed the reinforcer. "Froot Loops" were chosen as reinforcers based on pre-baseline observations conducted at breakfast time. Both subjects preferred this cereal exclusively when given a choice between several brands. "Froot Loops" were restricted for both subjects during breakfast times throughout the course of the study.

In Julie's case, punishment involved the contingent use of a visual screening procedure (e.g., Zegiob, Alford, & House, 1978; McGonigle & Duncan, Note 1) for each observed instance of the targeted response. Whenever Julie was observed to place her right index finger in her mouth, the therapist immediately consequated the behavior by placing his hand over her eyes in such a way as to completely shield her vision. Behavioral observation and recording was suspended until Julie had met the criterion for termination of visual screening. Release from visual screening was contingent upon 10 consecutive sec of non-finger sucking and non-disruptive behavior (e.g., squirming, general resistance aimed at escape). After meeting these criteria, the therapist gestured (by pointing at a toy) for Julie to resume her routine play activities. No comment was made by the therapist on her behavior.

The punishment procedure for Jack was also of 10 sec duration contingent upon each observed instance of the target response. When Jack presented tongue protrusion the therapist immediately consequated the behavior by lightly placing

a sterile wooden blade (manufactured for oral-medical use) against his tongue (e.g., Thompson, Iwata, & Poynter, 1979). The wooden blade remained in contact with Jack's tongue for a brief period following its retraction into the mouth. Behavioral observation and recording was suspended until Jack had met the criterion for release from tongue depression. Termination of a single punishment trial was contingent upon 10 consecutive sec of complete tongue retraction. After receiving the treatment, the therapist gestured (by pointing at the materials) for Jack to resume his routine picture book activity. No comment was made by the therapist on his behavior.

The no treatment control condition, for both subjects, consisted only of the opportunity to use standardized materials. Although the therapist would periodically encourage the subjects to use the toys and reading materials provided (approximately every two minutes), potentially reinforcing comments (e.g., "That's good") were not made. In addition, no consequences for stereotyped behavior were in effect during the no treatment condition.

For both subjects, the alternating treatment condition was divided into three phases. The most effective intervention in Phase I was selected and implemented in place of the remaining treatment in Phase II, and finally, in place of no treatment during Phase III. Following Phase III, in Jack's case only, the most effective treatment was extended in multiple baseline fashion to a classroom setting where daily 15 min generalization probes had been obtained under baseline conditions throughout the study.

Following the 27th and 44th sessions, for Julie and Jack respectively, the most effective treatment was implemented on a unit-wide basis. Data were then collected for six months following the conclusion of active treatment. Follow-up data were obtained and reported in the form of monthly post-checks. Each monthly post-check was conducted under baseline conditions for five consecutive days and subject to periodic reliability checks.

Recording and Reliability

Data were collected on both stereotyped finger sucking and tongue protrusion using a 10 sec continuous interval recording procedure. Target behaviors were recorded by the therapist as having occurred or not occurred within each interval of observation. For both subjects, time spent receiving punishment or DRO treatments was not included in the total time for each session. This procedure was used to insure that free response time was equivalent across all sessions.

Reliability was assessed by having an independent rater simultaneously record the occurrence of the stereotyped behaviors. Both the therapist and the independent rater used pocket tape recorders equipped with earplugs to cue the intervals of observation. During sessions used for reliability checks, tapes were synchronized during the standard 1 min pause between experimental conditions.

The nature of the settings plus the need to synchronize tapes necessitated that the independent rater be present in the room along with the therapist and the subject.

Data recorded by the therapist and the independent rater were computed using the percent agreement formula (Bijou, Petersen, & Ault, 1968). Reliability was calculated on an interval-by-interval basis for occurrence only within the given session. The number of agreements were divided by the number of agreements plus disagreements and multiplied by 100. Checks were made at least twice per phase for each client under each condition of treatment and no treatment. Reliability ranged from 94 to 100% (mean = 96%) for Julie and 83 to 100% (mean = 94%) for Jack. A total of 30 reliability checks were made for each client prior to the conclusion of active treatment.

RESULTS AND DISCUSSION

The effects of the separate conditions of treatment and no treatment on stereotyped behaviors are presented in Figures 1 and 2 for Julie and Jack, respectively. For both subjects, punishment was more effective than the nonverbal cues alone and DRO in reducing finger sucking and tongue protrusion. Experimental control was demonstrated through the use of a separate condition of no treatment. For Julie, a total of 57 treatments using visual screening were sufficient to reduce the target response to near-zero rates after seven sessions under Phase I conditions of the alternating treatments paradigm. A total of 152 DRO treat-

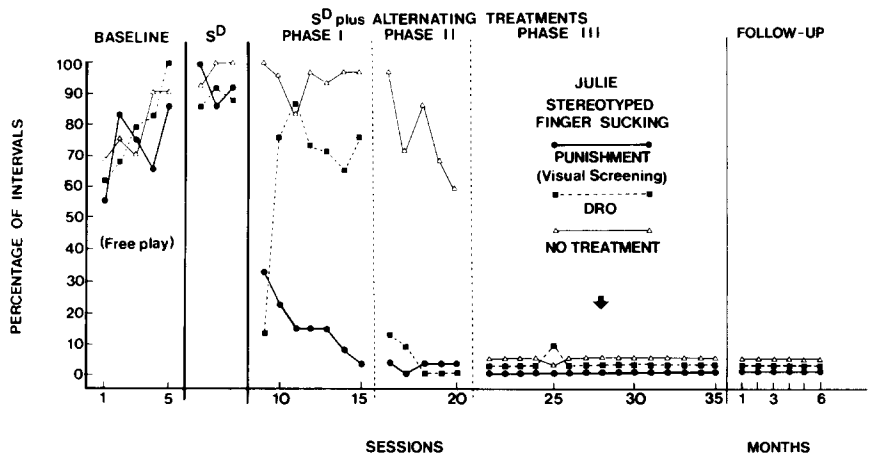

FIGURE 1. Percentage of intervals with stereotyped behavior for Julie across all experimental conditions. The arrow at session 28 indicates when the selected procedure (visual screening) was implemented unit-wide.

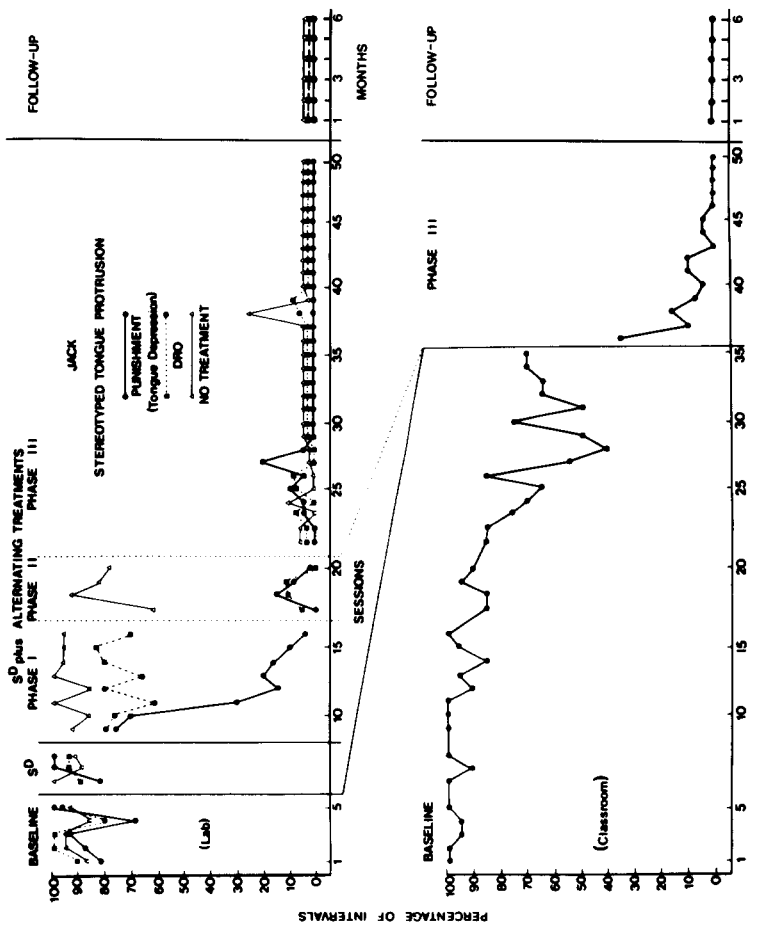

FIGURE 2. Percentage of intervals with stereotyped behavior for Jack across all experimental conditions. Interval data obtained in the classroom represent daily 15 min generalization probes of sterotyped behavior. The selected treatment (tongue depression) was extended to this setting, in multiple baseline fashion, at session 36. The arrow at session 45 indicates when the selected treatment was implemented unit-wide.

ments were effected during the same time period, and while similar near-zero rates of the target behavior were observed during the initial session, the DRO treatment used was not effective in maintaining the low rates of stereotypic responding. For Jack, a total of 140 treatments using tongue depression were sufficient to reduce stereotypic responding to near-zero rates after eight sessions under Phase I conditions of alternating treatments. A total of 131 DRO treatments across the same time period did not result in similar low rates of the target response. For both subjects, the effectiveness of the punishment procedures was also apparent in anecdotal reports by staff following unit-wide implementation. After only five days of contingent visual screening for finger-sucking and eight days of contingent tongue depression for tongue protrusion, zero rates of the target behaviors were observed for Julie and Jack, respectively. There were no reports of either subject developing topographically similar or dissimilar collateral behaviors (e.g., self-stimulation, self-abuse). The essentially zero rates of the target behaviors observed for both subjects upon six-month follow-up, indicated that the treatments were exceptionally durable considering the brief period of their employment.

In sum, the difference in treatment effects in the present study was sizeable for both subjects and supports previous research on the effectiveness of punishment techniques in the suppression of stereotypic responses (e.g., Forehand & Baumeister, 1976; Harris & Ersner-Hershfield, 1978; Ollendick & Matson, 1978). However, such a finding should not be construed to imply that DRO is ineffective in all cases where it is applied for stereotypic responding. First, such a statement would be contrary to a large body of literature on the effectiveness of DRO as a treatment for this response class (see Homer & Petersen, 1980); secondly, the DRO procedure used in the present study was a single value and not subjected to parametric manipulations designed to maximize schedule efficacy; and finally, the use of two subjects limits the generalizability of the findings. It may well be the case, however, that stereotypic behaviors with great response strength that are difficult to modify (such as those identified in the present study that were exhibited for two years prior to treatment), respond more favorably to aversive procedures. This was an anedcotal finding of a previous study by the authors (Ollendick et al., in press), in which two mildly aversive procedures (positive practice overcorrection and physical restraint) were compared using an alternating treatments design. In this study, the most aversive procedure, as defined by the subjects reactive behavior, was also the most effective in reducing the stereotyped response. Needless to say, this is an important issue to be addressed, along with the testing of various DRO schedules, in further empirical studies.

It is also worth noting that a problem which may be encountered with the alternating treatments design is the inability of the subject to discriminate between treatment conditions (Barlow & Hayes, 1979; Kazdin & Hartmann, 1978). In a previous study utilizing this design (Shapiro et al., 1980) we encountered such

a difficulty; however, this problem did not occur here. The use of concrete discriminative cues as a part of both the punishment and DRO treatment packages in the present study, but not in our earlier work, may be responsible for these differences. Although the discriminative stimuli were not tested as to their separate contribution to the effectiveness of the treatment package, several interesting anecdotal observations are worth reporting. In both cases, each subject made consistent responses to the presentation of the picture cues. Julie was frequently observed to pat her stomach and gesture the sign for "eat" upon receiving the cue depicting DRO. Additionally, she regularly placed her hands over her eyes whenever the cue for visual screening was presented. Jack's response was somewhat less sophisticated but nonetheless consistent. Upon presentation of the cue depicting tongue depression, Jack regularly threw the photograph across the room. When it was retrieved and placed in full view, Jack frequently turned away from the picture or reached forward and placed it face down on the table. Evaluating results such as these in a more rigorous fashion should prove valuable in determining how best the alternating treatments design can be employed without risking treatment interference across experimental conditions. Furthermore, the establishment of discriminative cues of this sort may prove useful in planning maintenance and generalization programs where the treatment procedure can be faded out in lieu of the cues alone.

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