

EFFECTS AND SIDE EFFECTS OF DRO AS TREATMENT FOR SELF-INJURIOUS BEHAVIOR

GLYNNIS EDWARDS COWDERY

SPECTRUM CENTER, BERKELEY, CALIFORNIA

BRIAN A. IWATA

UNIVERSITY OF FLORIDA

AND

GARY M. PACE

NEW MEDICO REHABILITATION CENTER OF FLORIDA

A three-part controlled case study is presented in which severe and longstanding self-injurious behavior exhibited by a 9-year-old-boy was treated successfully with differential reinforcement of other behavior. In Phase 1, an experimental analysis demonstrated that the boy's scratching was not maintained by environmental contingencies; instead, it appeared that the self-injurious behavior was a stereotypic (automatically reinforced) response. In Phase 2, the effects of an escalating differential-reinforcement-of-other-behavior schedule mediated through token reinforcement (pennies) were evaluated in a reversal design. Results showed that differential-reinforcement-of-other-behavior eliminated self-injurious behavior very quickly and for periods of time as long as 30 min. A noteworthy side effect observed during Phase 2 was the occurrence of crying behavior following the nondelivery of reinforcement. In Phase 3, the token program was gradually extended in 30-min increments throughout the day. Additionally, results of a brief multielement manipulation showed that the effects of token reinforcement were superior to those of a more easily administered differential reinforcement of other behavior based on social reinforcement, which differed little from baseline.

DESCRIPTORS: differential reinforcement, DRO, functional analysis, self-injurious behavior, side effects, stereotypic behavior

Differential reinforcement in its various forms (differential reinforcement of other behavior [DRO], differential reinforcement of alternative or incompatible behavior [DRA/DRI], and differential reinforcement of low rates of behavior [DRL]) is one of the most basic, widely known, and commonly used techniques to suppress undesirable behavior. Although appropriate implementation requires the creation of a deprivation state—limited access to the reinforcer—as well as extinction, differential reinforcement does not involve extended interruption of ongoing activities (e.g., time-out), contingent removal of positive reinforcers (e.g., response cost), or presentation of aversive stimuli (e.g., pun-

ishment). These characteristics of differential reinforcement make it the least intrusive of all behavioral interventions and probably account for its widespread popularity. Yet in spite of its many positive features, it is not clear that differential reinforcement is a highly effective intervention, particularly as a treatment for severe and longstanding behavior disorders.

One such disorder is self-injurious behavior (SIB), a chronic and intractable problem that takes multiple forms and poses serious health risks. Reviews of the literature (e.g., Favell, Azrin, et al., 1982; Romanczyk, 1986) are generally consistent in concluding that differential reinforcement alone is not very effective compared to most other behavioral treatments for SIB. In fact, out of the hundreds of research articles and case studies published, only a handful reported positive results when differential reinforcement was the only form of intervention (Allen & Harris, 1966; Favell, McGimsey, & Jones,

This research was supported by Grant HD 16052 from the National Institute of Child Health and Human Development. We thank Michael Kalsher, Kay McCosh, and Jay Quinn for assisting with various aspects of the research.

Reprints may be obtained from Brian Iwata, Psychology Department, University of Florida, Gainesville, Florida 32611.

1978; Favell, McGimsey, & Schell, 1982; Frankel, Moss, Schofield, & Simmons, 1976; Steege, Wacker, Berg, Cigrand, & Cooper, 1989; Weihar & Harman, 1975).

In light of the paucity of research supporting the use of differential reinforcement as a treatment for SIB, additional investigations are needed to document its effectiveness and to establish its legitimacy on empirical rather than philosophical grounds. During the course of treating an unusual and severe case of SIB, we had the opportunity to conduct such an investigation. The results of our behavioral assessment, and subsequent evaluation of DRO as a sole means of treating SIB, are reported in the present study.

GENERAL METHOD

Subject and Settings

Jerry was a 9-year-old boy whose SIB consisted of self-excoriation through either scratching or rubbing. The problem dated back at least 6 years. Although he tested within the low-normal range of intelligence, he had never attended school due to the severity of his SIB. For the 2 years prior to his participation in this study, Jerry spent almost all of his time in hospitals, where he was examined and treated by a variety of specialists, including dermatologists, neurologists, pediatricians, psychiatrists, and psychologists. During his most recent hospitalization, the use of punishment (brief application of a cold pack to his skin contingent on scratching) had reduced SIB to approximately 30% of observed intervals. Neither this nor any of the other interventions tried in the past were judged to be "clinically adequate." At the time of his entry into the study, he wore bandage wraps on his head, neck, arms, legs, and feet, and he had open but unbandaged lesions on his face, shoulders, hands, chest, back, buttocks, and penis. Jerry underwent additional medical tests throughout his participation in this study to determine if the scratching might be the result of an allergic or dermatologic condition. All of these tests were negative.

Sessions were conducted in a hospital inpatient unit in areas equipped with one-way observation

windows. Phases 1 and 2 were conducted privately in treatment rooms, whereas Phase 3 was conducted in a group activity area where 2 to 6 other clients were present at any given time.

Response Measurement and Reliability

Jerry's SIB was defined as scratching or rubbing one body part against another, or rubbing a body part against a stationary object (e.g., furniture). During Phases 1 and 2, in which sessions lasted a maximum of 30 min, data were recorded during continuous 10-s intervals on a hand-held computer (Panasonic Model RL-H1800). Session length in Phase 3 sometimes exceeded 5 hr and rendered the use of 10-s intervals unfeasible. Therefore, data during Phase 3 were collected during continuous 5-min intervals. Although inaccurate with respect to the actual frequency of Jerry's SIB, the 5-min intervals provided an extremely conservative measure in that any response during the interval resulted in a positive score. All data were converted to percentage of intervals during which one or more SIBs occurred. During Phases 1 and 2 of the study, crying behavior (defined as any audible sobbing, whining, or complaining) also was recorded during continuous 10-s intervals on the computer.

Reliability was assessed by having a second observer simultaneously but independently record data with the primary observer. Percentage agreement scores (overall, occurrence, and nonoccurrence) were calculated based on interval-by-interval comparisons of observers' records. Reliability was assessed during 65% of sessions in Phases 1 and 2, and overall agreement for SIB and crying averaged 96% and 92%, respectively. Reliability was assessed during 82% of the sessions (22% of all intervals) in Phase 3, and overall agreement for SIB averaged 91%.

PHASE 1: FUNCTIONAL ANALYSIS BASELINE

Procedures

Prior to treatment, an attempt was made to identify the functional properties of Jerry's SIB. A series of conditions based on the research of Iwata,

Dorsey, Slifer, Bauman, and Richman (1982) was presented in a multielement format. Briefly, these were (a) *attention*—toys were available for Jerry's use, and the experimenter ignored Jerry except to deliver reprimands and/or statements of concern contingent on SIB; (b) *demand*—the experimenter presented learning trials to Jerry with a brief timeout contingent on SIB; (c) *alone*—Jerry was observed while alone in a room without access to materials; and (d) *play*—the experimenter provided opportunities for toy play and attention contingent on the absence of SIB. Based on informal observations conducted at the time of Jerry's admission, a fifth condition, *alone with toys*, was added to his assessment in order to separate the potential influences of social versus nonsocial stimulation, both of which were present in the play condition. During alone with toys, Jerry had access to a video game and several other play materials.

All sessions were scheduled to last 15 min, but one was terminated after 2 min because Jerry's scratching focused on an open wound that was judged to be extensive by his physician.

Results and Discussion

Figure 1, during the initial baseline, shows data obtained across the five assessment conditions. Crying (lower panel) was not observed during any of the sessions. The results for SIB (upper panel) were quite clear, in that scratching was almost continuous when Jerry was left completely alone; by contrast, no SIB occurred during the other conditions. These results suggest that (a) neither contingent attention (attention condition) nor contingent escape (demand condition) were reinforcers for Jerry's SIB; (b) numerous forms of stimulation (e.g., social, nonsocial, or even academic tasks) served as effective distractors for SIB by providing opportunities for competing behavior; and (c) SIB occurred only when these sources of stimulation were unavailable. By default, then, Jerry's SIB was considered a form of self-stimulation, which usually implies some unidentified source of positive reinforcement associated with the behavior itself. It was equally possible, however, that the scratching was negatively reinforced through temporary alleviation of some un-

known, physiologically irritating condition. *Automatic reinforcement* or *stereotypic SIB* are therefore more accurate functional descriptions of his SIB (see Iwata, Vollmer, & Zarcone, 1990, for further clarification).

Two approaches for treating stereotypic SIB have been described in the literature. One—sensory extinction—involves attenuation of response-produced stimulation (Dorsey, Iwata, Reid, & Davis, 1982; Rincover & Devaney, 1982). This intervention was impossible to implement procedurally due to the extent and nature of Jerry's SIB. His body was covered with open lesions, some of which were quite large (e.g., one extended across the entire back of his neck from his hairline to his shoulders). The number and severity of these injuries precluded the possibility of "attenuating" stimulation due to scratching and rubbing at all potential locations. Even if it were possible to do so, it is unlikely that the procedure would have suppressed Jerry's SIB, because he was frequently observed to rub two heavily bandaged-wrapped parts of his body against each other (e.g., his arm against the back of his neck).

A second approach, the development of alternative play behaviors that provide stimulation similar to that derived from the SIB (Favell et al., 1982), apparently was neither necessary nor sufficient for Jerry because the assessment data already suggested that almost *any* alternative behavior (not just those providing similar types of stimulation) might successfully compete with Jerry's SIB. Thus, the mere availability of competing activities (e.g., toys) would be an effective intervention in a controlled demonstration of short duration (as it was during assessment), but continuous access to materials that would maintain their reinforcing value indefinitely could not be guaranteed. Jerry's previous caretakers reported that they had tried this approach in the past with some success, but that it was impossible to ensure his continued participation in an activity without continuous one-on-one supervision. Thus, the criterion for successful treatment was elimination of SIB at times when he would be left unattended with relatively little to do.

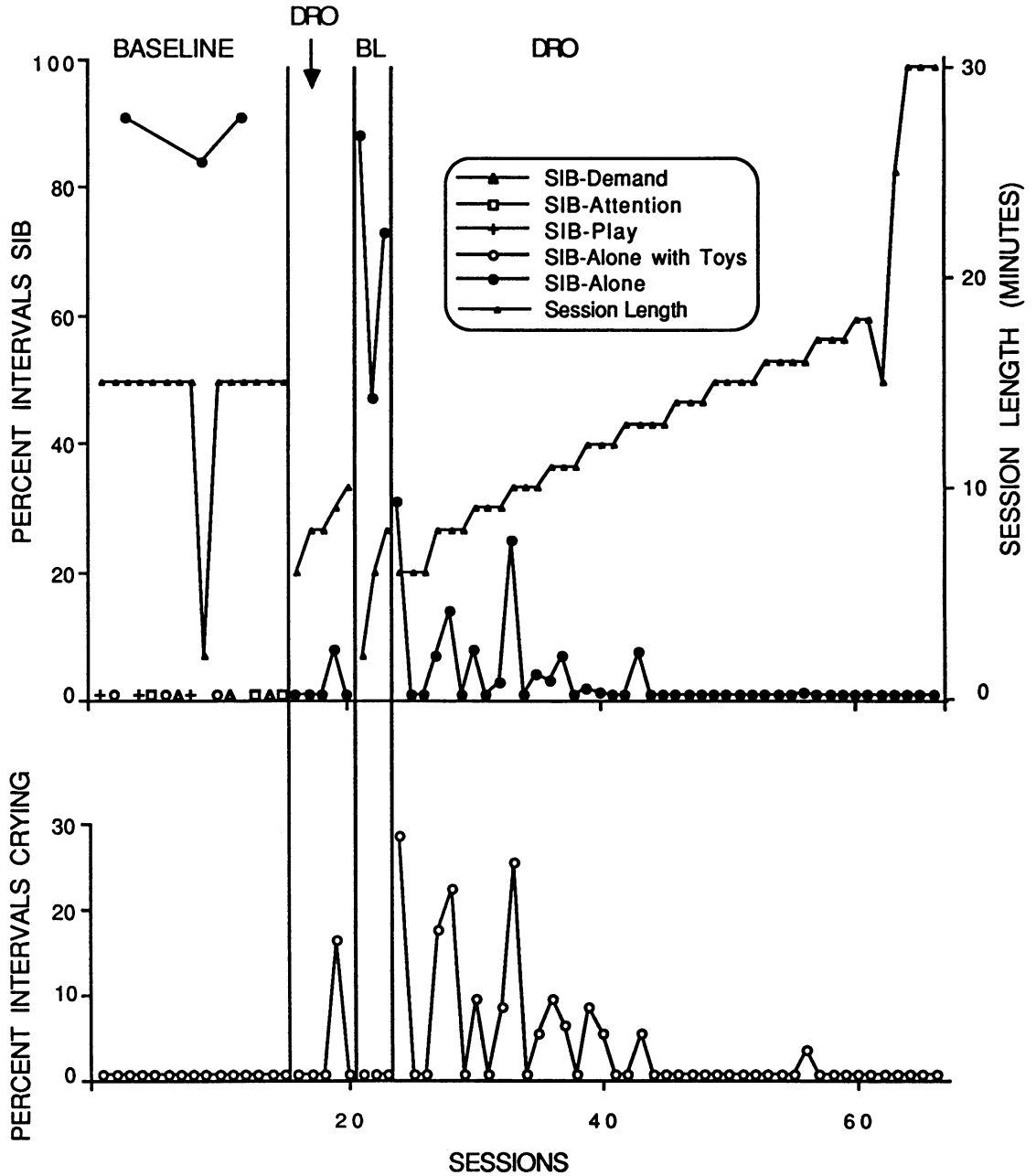


Figure 1. Session length and percentage 10-s intervals of SIB (upper panel), and percentage 10-s intervals of crying (lower panel) across experimental conditions during Phase 1 (assessment) and Phase 2 (initial treatment).

As an alternative to the above strategies, we evaluated the effects of differential reinforcement of other behavior (DRO) as treatment for Jerry's SIB. If successful, the DRO could be used to bridge time gaps between activities and in situations in

which activities were unavailable or had lost their inherent reinforcing value. Because Jerry had good verbal skills, responded well to a wide range of potential reinforcers, and could describe the passage of time, we designed a treatment program based

on an escalating DRO schedule, which was mediated with token reinforcement.

PHASE 2: EFFECTS OF TOKEN REINFORCEMENT ON A DRO SCHEDULE

Procedures

Treatment effects were elevated in a reversal design. All sessions were conducted during the alone condition, while Jerry sat in a therapy room unattended and without access to any play materials. At the beginning of each session, the experimenter told Jerry that she "had to leave the room for a while," and asked him not to scratch while she was gone. During baseline sessions, the experimenter then left the room, returned at the end of the session, and brought Jerry to his next scheduled activity. Data obtained during the alone condition of Phase 1 served as the initial baseline.

At the beginning of the first treatment session, the experimenter gave the same instruction that she had during baseline. She also noted that she would give Jerry a penny upon returning if he did not scratch. The experimenter then left the room and watched him through the observation window. She returned at the end of the interval, briefly examined Jerry to "see if he had scratched," and praised him and gave him a penny if no SIB had occurred. If SIB had occurred, the experimenter indicated in a nonpunitive manner that Jerry had scratched while she was gone (it was possible to identify the area because it had been observed directly), regretted that he had not earned the penny, and asked him to try again. This sequence was repeated two more times, resulting in three back-to-back DRO intervals per session. At the completion of each session, Jerry was allowed to exchange earned pennies for access to TV, snacks, video games, and other play materials. The DRO interval was set initially at 2 min (the longest amount of time we had previously seen Jerry refrain from scratching while left alone) and was expanded to 4 min by the end of the first treatment condition by adding 1 min to one or more intervals, resulting in session lengths ranging

from 6 min (three 2-min intervals) to 12 min (three 4-min intervals).

At the beginning of sessions during the reversal condition, the experimenter explained that she did not have any pennies but asked Jerry to refrain from scratching nonetheless. Because Jerry's previous scratching had done extensive damage and because session length had not been held constant, the duration of sessions during this condition was limited to 2, 6, and 8 min.

When treatment was reinstated, session length was gradually increased from 6 to 18 min, generally in 1-min increments. During this time, the number of pennies Jerry could earn increased to five per session (one penny for each of five successfully completed DRO intervals), where it remained constant. Also, to increase the likelihood that Jerry would refrain from SIB during all intervals, he was given a bonus nickel if he earned all five pennies during a session. When session length reached 18 min (consisting of three 4-min intervals and two 3-min intervals), a probe was conducted to determine the necessity of continuing to increase interval length in 1-min increments and of delivering pennies at the end of each interval. Session 61 consisted of a single 15-min DRO interval in which Jerry could earn 10¢ (five pennies plus the bonus nickel). During subsequent sessions, the interval was increased to 25 and then to 30 min.

Results and Discussion

Figure 1 (upper panel) shows data on Jerry's SIB, as well as on session length, during the two DRO conditions and brief baseline reversal. During the first treatment condition, SIB immediately decreased to zero from a baseline (alone condition) average of 78% and remained generally low as session length was extended from 6 to 12 min. Jerry's scratching quickly returned to near-baseline levels during the brief reversal and decreased again when treatment was reinstated. Across subsequent treatment sessions, there were periodic occurrences of SIB, but the behavior gradually decreased to zero as session length and the duration of DRO intervals were extended. Jerry exhibited no SIB during the 15-min DRO interval in Session 61. A

few sessions later, we concluded Phase 2 at the 30-min interval length, which far exceeded the amount of time we considered reasonable for parents or caretakers to leave Jerry unattended.

The lower panel of Figure 1 presents data on Jerry's crying and related disruptive behaviors. By comparing the upper and lower panels, it can be seen that crying was not a correlate of SIB, because crying was not observed during either baseline condition. Crying or disruption also was not observed during the first three sessions of the initial DRO condition (Sessions 16–18). During the next session (19), scratching first occurred during the DRO condition (upper panel). When told at the end of the DRO interval that he would not receive a penny, Jerry became visibly upset and began crying (lower panel). In subsequent sessions, crying was observed only when SIB occurred during a treatment condition. These results indicate that crying was a function of nondelivery of reinforcement—only when Jerry scratched and failed to earn a penny did he exhibit any negative “emotional” behaviors.

The other behaviors that Jerry exhibited during treatment sessions were quite varied, and we did not take any systematic data on their occurrence. Some of the more frequent behaviors included singing, humming, walking around the therapy room, rocking slowly while in a kneeling position with his hands folded between his knees, and sitting quietly either watching the therapy room door or with his eyes closed.

PHASE 3: EXTENSION OF INITIAL TREATMENT EFFECTS

Procedures

By the end of Phase 2, Jerry's SIB was under very good control during treatment sessions but remained generally high throughout the day. Much of his time was spent in a group activity area, where 2 to 6 clients and 1 to 4 staff participated in a variety of leisure activities, instructional sessions, or free time. Baseline observations were begun, using the 5-min interval procedure described previously, and lasted the entire time that Jerry was present in

the area. After seven sessions, the token reinforcement procedure was initiated in the activity area, beginning with a single 30-min DRO interval, which was measured with a timer. If, when the timer went off, no SIB had occurred during the previous half hour, a staff member praised Jerry for not scratching and gave him a penny. The occurrence of SIB during an interval resulted in resetting the timer. During subsequent sessions, the amount of time in treatment was increased (and, consequently, the amount of time in baseline was decreased) by introducing additional 30-min DRO intervals in an alternating manner during the morning and afternoon. When the program was in effect for an hour each morning and afternoon (Session 16), the penny contingency was supplemented by giving Jerry a nickel at the end of each morning and afternoon session if no SIB had occurred. By Session 25, the program was in effect during the entire time Jerry was present in the activity area. The money he earned could be exchanged immediately for access to the same reinforcers that were available in Phase 2 of the study, or it could be saved for special outings (e.g., to a restaurant).

During Phase 3, we also attempted to determine whether token reinforcement was a necessary component of the DRO program. Such procedures are generally complicated to implement and maintain; if Jerry's SIB could be managed at a low level with social reinforcement alone, transfer of the program to his home environment might be achieved more easily. During Sessions 10 through 14, at designated times when neither baseline nor the token reinforcement program was in effect, social reinforcement (e.g., praise, hugs, etc.) was provided for the absence of SIB on a DRO 5-min schedule.

In summary, Phase 3 involved the presentation of one, two, or three conditions daily for varying amounts of time in a multielement design.

Results and Discussion

Figure 2 shows the percentage of 5-min intervals during which Jerry exhibited SIB, as well as the number of hours per day spent in each of the three conditions. Mean percentage intervals of SIB during baseline, DRO with social reinforcement, and DRO

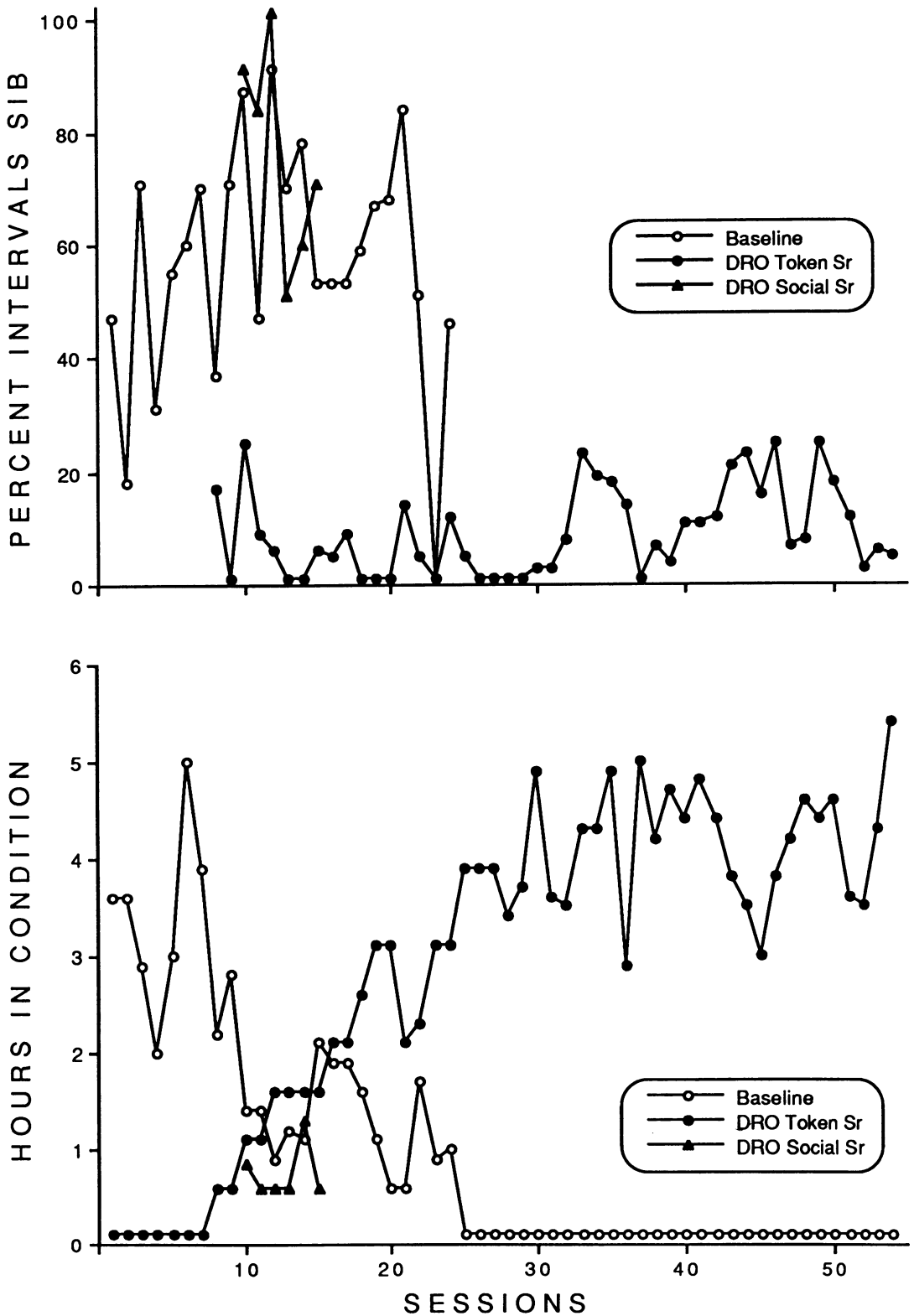


Figure 2. Percentage 5-min intervals of SIB (upper panel) and number of hours during which data were recorded (lower panel) across baseline and two DRO treatment conditions (token reinforcement vs. social reinforcement) during Phase 3 (extended treatment).

with token reinforcement, respectively, were 56%, 75.3%, and 8.4%. These data indicate that social reinforcement produced no improvement over baseline, whereas the token reinforcement procedure was effective in maintaining a low level of SIB when applied throughout the day.

On several occasions, Jerry refrained from scratching during an entire treatment session, which lasted as long as 5 hr. At other times, however, Jerry exhibited significant amounts of SIB. These "high points" were probably the result of two factors. First, the data collection system artificially inflated the recorded occurrences of SIB, because a single response produced a positive score for the entire 5-min interval. In spite of this inherent overestimation, we selected the system because it was one that could be implemented during sessions of relatively long duration, it provided a means of comparing observers' records on an interval-by-interval basis, and it represented a conservative measure of SIB by allowing detection of low rates of behavior. A time sampling procedure would have been more accurate, but it would have randomly missed some instances of SIB (Powell, Martindale, & Kulp, 1975).

A second factor that may have influenced the results was a increase in Jerry's access to reinforcement as session length increased. When the DRO procedure was initially implemented, sessions lasted for only one or two 30-min intervals, resulting in limited opportunities for reinforcement. As the number of DRO intervals increased, it was possible for Jerry to "miss" some intervals by engaging in SIB but still earn a reasonable number of pennies (although he forfeited the nickel). Thus, a preferable arrangement may have been to keep the number of intervals constant while increasing only their duration (as was done in Phase 2).

At the end of Phase 3, the DRO token system was extended to cover all of Jerry's waking hours. He was then discharged to home for the first time in 2 years. Jerry's parents were taught how to maintain the token system, with assistance from a home-hospital teacher who spent several hours in the home each day.

GENERAL DISCUSSION

Results of the present study provide empirical support for the selective use of DRO as a treatment for severe SIB and are noteworthy in several aspects. First, very little research has examined the effects of DRO as a single intervention for SIB, and the present study provides a highly controlled demonstration. Second, the level and rate of suppression obtained suggest that behavioral reduction through reinforcement is not necessarily less or slower than that found with punishment. Third, the effects of treatment were evaluated not only during brief experimental sessions but also during extended application throughout the day. Finally, DRO was associated with the occurrence of negative "emotional" behavior.

We must emphasize, however, that our results are not representative of what has been or might be obtained typically when DRO is applied. For example, Harris and Wolchik (1979) found DRO to be ineffective in reducing noninjurious stereotypic behavior in all 4 of their subjects. The generality of our findings is limited due to the inclusion of only 1 subject. Furthermore, the assessment data from Phase 1 indicated that Jerry's SIB was highly idiosyncratic. He engaged in SIB almost continuously when left alone, but the behavior was suppressed easily under a variety of arrangements and suggested several options for treatment, one being differential reinforcement. Thus, although our treatment results were somewhat unusual, data obtained prior to treatment provided clear evidence that DRO might be used effectively.

Additional data collected during Phases 1 and 2 raise questions about the relative intrusiveness of behavioral interventions and the commonly held belief that differential reinforcement occupies the position of "least restrictive" in the intervention hierarchy. This view apparently is based on the assumption that, with differential reinforcement, one does not observe the negative client reactions usually associated with either presentation or removal of certain types of stimuli (e.g., punishment, response cost, time-out). Instead, the delivery of

reinforcement when the target behavior has not occurred (or when an alternative behavior has occurred) creates the appearance of a situation that is highly desirable to the client and, hence, to therapists as well. However, suppression produced by differential reinforcement is entirely dependent on nonreinforcement (extinction) for one behavior concurrent with reinforcement for another behavior. Given such a contrasting situation, occasions when reinforcement is not delivered have the potential for generating behavior that typically is associated with deprivation states, reinforcement withdrawal, or aversive stimulation (for more extensive discussions of this topic, see Balsam & Bondy, 1983, and Wagner, 1969). We observed such behavior with Jerry when he failed to meet the DRO requirement. After being informed that he did not earn a penny, quite often he became noticeably upset, began crying or shouting, and temporarily withdrew from an ongoing activity. We did not view these incidents as particularly disruptive. Nevertheless, the fact that such "emotional" behavior did occur with regularity suggests that differential reinforcement may not be entirely free of negative side effects (a fact that is seldom acknowledged) and underscores the difficulty of defining the aversiveness of a procedure based on the observed reaction of the client.

A final point worth noting is that, although behavioral suppression with DRO was rapid, the process of extending its effects was a long one, and the behavior was never eliminated completely. Jerry's treatment involved over 4 months of intensive intervention. Upon discharge, his SIB was reduced to the point where it was judged to be of minimal risk, thereby allowing him to return home for the first time in years. He still, however, engaged in a sufficient amount of SIB to prevent complete healing of his wounds.

Much of the current emphasis on differential reinforcement as treatment for severe behavior disorders such as SIB is based on research conducted with minor problems and on the implicit assumption that reinforcement is a good thing to do. Careful examination of the research literature, however, indicates that few attempts to treat SIB with dif-

ferential reinforcement have been successful. The present study offers data indicating that DRO can be highly effective under certain conditions. At the same time, procedural implementation may be extremely complex, total suppression of the undesirable behavior may require the use of additional procedures, and the existence of undesirable side effects with DRO raises questions about criteria to be used when determining the relative intrusiveness of any intervention.

REFERENCES

- Allen, K. E., & Harris, F. R. (1966). Elimination of a child's excessive scratching by training the mother in reinforcement procedures. *Behaviour Research and Therapy*, 4, 79-84.
- Balsam, P. D., & Bondy, A. S. (1983). The negative side effects of reward. *Journal of Applied Behavior Analysis*, 16, 283-296.
- Dorsey, M. F., Iwata, B. A., Reid, D. H., & Davis, P. A. (1982). Protective equipment: Continuous and contingent application in the treatment of self-injurious behavior. *Journal of Applied Behavior Analysis*, 15, 217-230.
- Favell, J. E., Azrin, N. H., Baumeister, A. A., Carr, E. G., Dorsey, M. F., Forehand, R., Foxx, R. M., Lovaas, O. I., Rincover, A., Risley, T. R., Romanczyk, R. G., Russo, D. C., Schroeder, S. R., & Solnick, J. V. (1982). The treatment of self-injurious behavior. *Behavior Therapy*, 13, 529-554.
- Favell, J. E., McGimsey, J. F., & Jones, M. L. (1978). The use of physical restraint in the treatment of self-injury and as positive reinforcement. *Journal of Applied Behavior Analysis*, 11, 225-242.
- Favell, J. E., McGimsey, J. F., & Schell, R. M. (1982). Treatment of self-injury by providing alternate sensory activities. *Analysis and Intervention in Developmental Disabilities*, 2, 83-104.
- Frankel, F., Moss, D., Schofield, S., & Simmons, J. Q., III. (1976). Case study: Use of differential reinforcement to suppress self-injurious and aggressive behavior. *Psychological Reports*, 39, 843-849.
- Harris, S. L., & Wolchik, S. A. (1979). Suppression of self-stimulation: Three alternative strategies. *Journal of Applied Behavior Analysis*, 12, 185-198.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982). Toward a functional analysis of self-injury. *Analysis and Intervention in Developmental Disabilities*, 2, 3-20.
- Iwata, B. A., Vollmer, T. R., & Zarcone, J. R. (1990). The experimental (functional) analysis of behavior disorders: Methodology, applications, and limitations. In A. C. Repp & N. N. Singh (Eds.), *Perspectives on the use*

- of nonaversive and aversive interventions for persons with developmental disabilities* (pp. 301-330). Sycamore, IL: Sycamore Publishing Co.
- Powell, J., Martindale, A., & Kulp, S. (1975). A comparison of time sample measures of behavior. *Journal of Applied Behavior Analysis*, 8, 463-469.
- Rincover, A., & Devaney, J. (1982). The application of sensory extinction procedures to self-injury. *Analysis and Intervention in Developmental Disabilities*, 2, 67-81.
- Romanczyk, R. G. (1986). Self-injurious behavior: Conceptualization, assessment, and treatment. In K. D. Gadow (Ed.), *Advances in learning and behavior disabilities* (Vol. 5, pp. 29-56). Greenwich, CT: JAI Press.
- Steege, M. W., Wacker, D. P., Berg, W. K., Cigrand, K. K., & Cooper, L. J. (1989). The use of behavioral assessment to prescribe and evaluate treatments for severely handicapped children. *Journal of Applied Behavior Analysis*, 22, 23-33.
- Wagner, A. R. (1969). Frustrative nonreward: A variety of punishment. In B. A. Campbell & R. M. Church (Eds.), *Punishment and aversive behavior* (pp. 157-181). New York: Appleton-Century-Crofts.
- Weiher, R., & Harman, R. (1975). The use of omission training to reduce self-injurious behavior in a retarded child. *Behavior Therapy*, 6, 261-268.

Received March 5, 1990

Initial editorial decision April 25, 1990

Revision received June 11, 1990

Final acceptance July 20, 1990

Action Editor, David P. Wacker