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# Treatment of Self-Injury by a Reinforcement Plus Interruption Procedure

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*A minimally intrusive training procedure was evaluated with two severely self-injurious retarded persons. The procedure consisted of brief response-contingent interruptions of self-injury, and differential reinforcement of incompatible functional behaviors (DRI). The program was found to be more effective for both participants than differential reinforcement for non-self-injury (DRO), DRI alone, instructional prompting, and for one subject, more effective than interruption alone. When the training was extended from the classroom setting to the ward situation, self-injury occurred at a near-zero level during follow-up conducted by the ward staff. The reinforcement plus interruption procedure holds promise as a relatively nonaversive and effective method for eliminating self-injury.*

A reinforcement-interruption program recently was found to be an effective and relatively non-intrusive treatment for self-stimulatory behaviors (Azrin & Wesolowski, 1980). That procedure consisted primarily of interrupting each self-stimulatory behavior by brief (2 min) and gentle manual restraint, while providing a high frequency of reinforcement for non-stimulating behaviors.

The present study evaluated the effect of the reinforcement-interruption procedure on self-injurious behavior. The study also attempted a comparison of that method with several alternative training methods which have been used for

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treating self-injury: social extinction (Lovaas, Freitag, Gold, & Kassorla, 1965), differential reinforcement for non-injury or "DRO" (Peterson & Peterson, 1968), differential reinforcement for incompatible behavior or "DRI" (Tarpley & Schroeder, 1979), and manual interruption (Schroeder, Peterson, Solomon, & Artley, 1977). The results of this study would provide useful information about the comparative effectiveness of these previously used behavior procedures as well as about the reinforcement plus interruption procedure as a possible alternative.

The reinforcement component of this procedure was designed to strengthen alternative behaviors which were incompatible with self-injury and "functional" in the sense that natural reinforcers could be expected to follow from the behavior once they were established. The interruption component was designed to: (a) prevent injury by limiting the duration of each episode, (b) limit intrinsic reinforcement which might be associated with the self-injury, (c) provide a timeout from the programmed reinforcement being delivered as well as from reinforcement which might be associated with other ongoing activities, and (d) provide a period of relaxation and inactivity to reverse the agitated emotional state usually associated with the self-injurious episodes.

## EXPERIMENT 1

### *Method*

*Subject.* The subject, "Helen", was a 35-year-old woman diagnosed as severely retarded with a Vineland Social Age Equivalence of 3.8 years, and a recorded Stanford Binet of 30. She had been institutionalized for 30 years. Her language consisted primarily of brief curses, threats or demands. Except for the first six months of life, she had been in foster homes or in institutions. She slapped her face and bit her arms, each episode being accompanied by loud slapping sounds which permitted relatively easy response detection and observer reliability. The behavior resulted in visible swelling, bruises, redness and lacerations.

*Recording.* A trained observer recorded on a recording sheet whether face slapping or arm biting occurred during consecutive 15-sec intervals. During conditions in which manual interruption was employed for self-injury, these interruption periods were deleted from the observations and data calculations. A second trained observer was used during approximately 20% of the observation periods. Observer reliability was always 90% or greater because of the clear nature of the behavior.

*Classroom setting.* Part of the study occurred in a classroom-type situation in which the participant was seated alone at a table displaying various toys, games,

and objects with which she could play. These sessions lasted approximately two hours during a day.

*Ward situation.* When the participant was not in class, she was observed in her ward living situation for about four hours per day. As is common in such situations, she had the opportunity to watch TV and interact with residents and staff, but organized activities were not the rule.

### *Treatment Procedures*

*Baseline or instructional prompting* consisted of no general interaction by the trainer, with the exception that a verbal or manual prompt to play with the table materials was given about once every minute in order to simulate a common type of instructional situation.

*Social Extinction* consisted of not interacting with the participant in any way, especially during self-injury, in an effort to avoid unintended reinforcement of the self-injury. The trainer interacted only by leading her back to her seat if she left the classroom table.

The *Interruption* procedure consisted of interacting with the participant only by interrupting each self-injurious episode for two minutes. As soon as she struck herself, the trainer immediately told her to stop and gently guided her hands to a resting position in her lap or on the table. The trainer remained standing behind her for the two minutes assuring that the hands remained in a fairly still position. The trainer applied only touch contact, or merely shadowed the hands as long as the hands were not moving. No praise or conversation was provided except to tell her initially to keep her hands in her lap and away from her head. If the hands were moving at the end of the scheduled two minute period, the duration was extended until five seconds elapsed without hand movement.

The *DRO (Differential Reinforcement of Non-injury)* procedure consisted of reinforcing the participant following periods in which self-injury did not occur. The DRO interval was initially 5 sec, i.e., a reinforcer was given every 5 sec, so long as self-injury had not occurred. If self-injury occurred, the next reinforcer was given 5 sec from the time of the self-injury. The time between reinforcements was doubled successively whenever five consecutive reinforcers had been given without an intervening self-injurious response. The DRO duration was halved when self-injury was so frequent as to cause a period equal to five DRO intervals to elapse without a reinforcer delivery. The minimum duration was 5 sec under this "titrating" schedule; the maximum was set at 2 min.

The reinforcers used had been identified earlier and included stroking, praise and various snack items. The stroking and snacks were accompanied by a statement as to why it was given, "Good, you are not hurting yourself," and were given at the scheduled time even if she were only sitting quietly.

The *DRI (Differential Reinforcement of Incompatible Behavior)* procedure was identical to the DRO except that reinforcement was delivered for the first play, social, or other appropriate behavior which occurred after the DRI interval had elapsed. (In contrast, the DRO schedule provided a reinforcer delivery at the moment the interval elapsed so long as no self-injury was emitted). Again, the participant was given an explanation at the time of reinforcement: "Good, you are playing with the puzzle and are not hitting yourself."

The *DRI Plus Interruption* procedure was a combination of the interruption procedure and the DRI procedure. Whenever a self-injurious response occurred, the trainer imposed the two minute period of interruption; a reinforcer was given for any appropriate behavior at the time specified by the DRI schedule described above.

### *Experimental Design and Procedure*

Five sessions were conducted under the baseline (instructional prompting) procedure after which the five training procedures were introduced for one day each in the class setting in the following random sequence: (1) DRO, (2) social extinction, (3) DRI, (4) interruption, (5) DRI plus interruption, and (6) baseline (three sessions). Each session was approximately six hours in duration.

Three sessions of baseline were then conducted both in the class and in the ward. Since the ward situation provided natural opportunities for interaction, the extra instructional prompts were not scheduled there. The DRI plus interruption procedure was then initiated in the classroom but not on the ward, thereby providing a multiple baseline control. The procedure was then initiated on the ward; after several days, the class situation was discontinued. The ward staff were instructed and encouraged to carry out the procedure. In the class, the appropriate behavior designated for reinforcement was play activity; on the ward, reinforced behavior included social interaction, self-care skills and incompatible postures such as folding the arms together. The duration of the interruption was gradually reduced such that eventually a momentary interruption of a few seconds was used.

TABLE 1  
Percentage of Intervals in which Self-injury Occurred for Helen in a Classroom-type Situation for Baseline, Differential Reinforcement of Other Behavior (DRO), Social Extinction, Differential Reinforcement of Incompatible Behavior (DRI), Interruption, and Combined DRI plus Interruption, and Baseline.

	Baseline Pre (5 days)	DRO	Social Extinction	DRI	Interruption	DRI plus Interruption	Baseline Post (3 days)
Percent of intervals with self-injury	53%	30%	53%	60%	25%	15%	56%

## Results

Table 1 shows the percentage of intervals in which a self-injurious response occurred during the several procedures. The results show that the Social Extinction and DRI procedures had little effect; the DRO and Interruption procedure reduced self-injury by about 50% from baseline and the DRI plus interruption reduced self-injury by approximately 70%.

Figure 1 shows the course of the changes in self-injury. When the DRI plus interruption procedure was initiated in the class, self-injury decreased to 8% on the first day, 4% on the fifth day and averaged 1.0% during the remaining 14 sessions. On the ward during baseline, self-injury occurred during 32% of the intervals during the same seven days on which it was averaging 3.7% under the DRI plus interruption procedure in the class situation. When the procedure was begun in the ward situation, self-injury decreased to 0.63% on the first day and averaged 2.0% during the next 11 sessions.

Visual observation indicated that after treatment the self-injurious responses were greatly reduced in severity, generally consisting of a slight touch of the face.

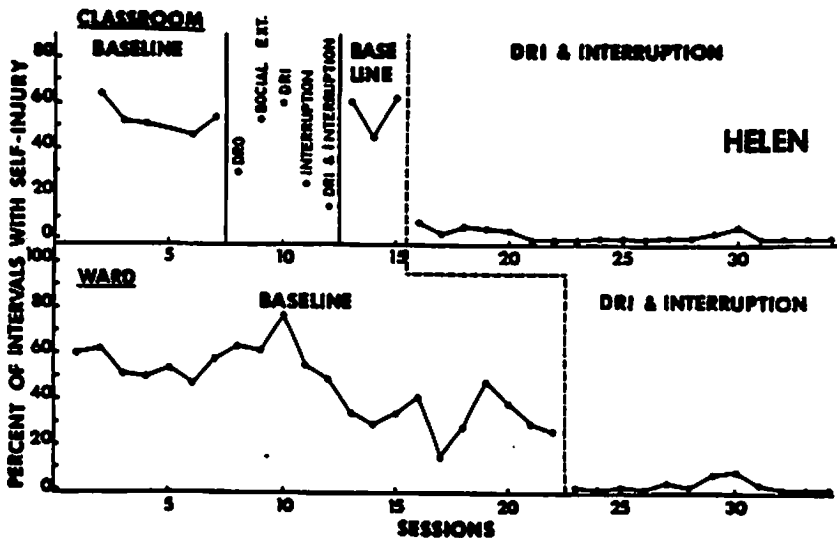


FIGURE 1. Treatment of self-injury of a severely retarded woman. The results are expressed in terms of the percentage of intervals in which one or more self-injurious responses occurred. The upper portion of the figure is for the classroom situation, the lower portion for the ward situation. Baseline consisted of instructional prompting. Social extinction consisted of no interaction. DRO represents differential reinforcement for the absence of self-injury. DRI designates differential reinforcement for incompatible, appropriate behaviors. The interruption procedure consisted of interrupting self-injurious responses. DRI & Interruption is a combination of the two procedures. The dotted line designates the time when the DRI & Interruption procedure was initiated and differs in time between the class and ward situation.

## EXPERIMENT 2

*Method*

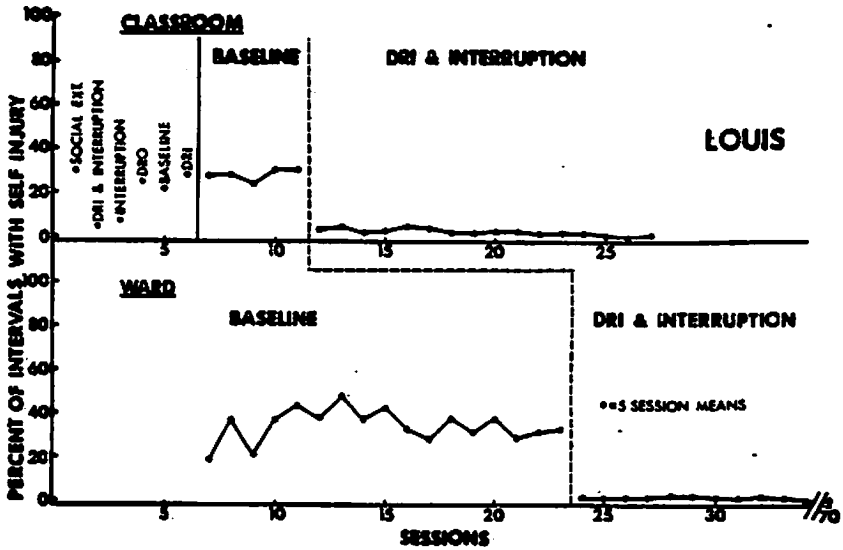
**Subject.** The subject of this experiment, "Louis," was a 20-year-old male diagnosed as cerebral palsied and profoundly retarded with a Vineland Social Age equivalent of 0.9 years. He was confined to a wheelchair, blind and non-verbal but responded appropriately to simple directives such as "Give me your hand." He resided in a private nursing home and had been institutionalized most of his life. His self-injurious behavior consisted of striking his nose, forehead and chin with great force such that his nose and face were swollen and lacerated. He also bit his hand resulting in visible teeth marks. Much of his self-injury seemed spontaneous, but some of it occurred when he was required to follow ward routines. He also exhibited aggression toward others, including hitting, biting and kicking, screaming (non-speech) and butting with his head.

*Treatment Procedures and Experimental Design*

The same training procedures were used in the classroom as in Experiment 1 but in a different random sequence: (1) social extinction, (2) DRI plus interruption, (3) interruption, (4) DRO, (5) baseline (instructional prompting), and (6) DRI. Each procedure was presented for one day in the individual class setting for approximately five hours per day. Next, five sessions of baseline were taken both in the classroom and in the ward situation for about three hours each, after which the DRI plus interruption procedure was instituted in the classroom only. The procedure was identical to that used in Experiment 1, with one exception. In this case, since the self-injury interfered seriously with the reinforcement procedure, the trainer also shadowed the subject's arms and blocked striking movements toward the head. Attempts at self-injury were considered as self-injurious responses for scoring and interruption purposes. After seven sessions of the modified DRI plus interruption, the blocking was discontinued. While the DRI plus interruption procedure was being conducted in class, continued baseline observations in the ward situation provided a multiple baseline control. The

TABLE 2  
Percentage of Intervals in which Self-injury Occurred for Louis in a Classroom-type Situation for Social Extinction, Differential Reinforcement of Incompatible Behavior (DRI) plus Interruption, Interruption, Differential Reinforcement of Other Behavior (DRO), Baseline, DRI, and Baseline.

	Social Extinction	DRI plus Interruption	Interruption	DRO	Baseline	DRI	Baseline (5 sessions)
Percent of intervals with self- injury	30%	5%	7%	25%	23%	27%	30%



**FIGURE 2.** Treatment of self-injury of a profoundly retarded, blind, nonambulatory man. The results are expressed in terms of the percentage of intervals in which one or more self-injurious responses occurred. The upper portion of the figure is for the classroom situation, the lower portion for the ward situation. Baseline consisted of instructional prompting. Social extinction consisted of no interaction. DRO represents differential reinforcement for the absence of self-injury. DRI designates differential reinforcement for incompatible, appropriate behaviors. The interruption procedure consisted of interrupting self-injurious responses. DRI & Interruption is a combination of the two procedures. The dotted line designates the time when the DRI & Interruption procedure was initiated and differs in time between the class and ward situation.

procedure was initiated in the ward after twelve sessions of its use in the class alone. The special class was then discontinued and the procedure conducted all day in the ward; about seven hours of observation were made each day. Since this subject was ambulatory, the range of reinforced activities on the ward also included ward care activities.

**Results**

Table 2 shows the percentage of intervals in which a self-injurious response occurred during each of the training procedures. Approximately the same percentage of self-injury was exhibited during the instructional prompted baseline, social extinction, DRI and DRO procedures. The interruption procedure and the DRI plus interruption both resulted in a level of self-injury equal to about one-fourth the level of the other procedures.

Figure 2 shows the temporal changes in self-injury. When the DRI plus interruption program was instituted in the classroom situation, self-injury was

decreased to approximately 4% and progressively decreased further to less than 1% of observed intervals. During the concurrent observations in the ward, self-injury remained at a high level until the DRI plus interruption procedure was instituted, at which time it decreased immediately to less than 2%.

The wounds and swelling were absent shortly after the DRI plus interruption procedure was introduced in both situations. In addition, the few recorded episodes of self-injury appeared to be greatly reduced in magnitude and/or primarily precipitated by the imposition of ward routine requirements.

## DISCUSSION

The DRI plus interruption procedure was effective in reducing the self-injury of both persons in the class situation as well as in the general living situation. In both cases, the self-injury was reduced to near zero levels. The duration of the interruption period was eventually reduced to a momentary event or to a gestural instruction for the person to sit still for a moment. The duration between reinforcers was eventually increased to the point where the ward and program staff provided little more than regularly scheduled recreational and instructional activities. The procedure seemed relatively nonaversive in that the minimal manual guidance during the interruption component produced relatively little emotional reaction. These results were in accord with those obtained with the same procedure applied to self-stimulation (Azrin & Wesolowski, 1980).

The DRI plus interruption procedure was found to be more effective than the other procedures tested. The least effective procedures were social extinction in which participants were provided with no interaction, and the baseline procedure in which only intermittent instructional prompting was provided. The DRO and DRI procedures which provided reinforcement in the interaction were intermediate in effectiveness. Surprisingly, the simple and seldom used interruption procedure was effective for both participants and may be the principal factor in the effectiveness of the DRI plus interruption combination. Interruption alone was very effective with Subject 2, perhaps because it immediately followed the DRI plus interruption procedure for that subject. Because of some differences in relative effectiveness between persons, a definitive rank ordering must await study with additional self-injurious persons.

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## REFERENCES

- Azrin, N. H., & Wesolowski, M. D. A reinforcement plus interruption method of eliminating behavioral stereotypy of profoundly retarded persons. *Behavior Research and Therapy*, 1980, 18, 113-119.



- Lovaas, O. I., Freitag, G., Gold, V. J., & Kassorla, I. C. Experimental studies in childhood schizophrenia: Analysis of self-destructive behavior. *Behavior Research and Therapy*, 1965, 2, 67-84.
- Peterson, R. F., & Peterson, L. R. The use of positive reinforcement in the control of self-destructive behavior in a retarded boy. *Journal of Experimental Child Psychology*, 1968, 6, 351-360.
- Schroeder, S. R., Peterson, C. R., Solomon, L. J., & Artley, J. J. EMG feedback and the contingent restraint of self-injurious behavior among the severely retarded: Two case illustrations. *Behavior Therapy*, 1977, 8, 738-741.
- Tarpley, H. D. & Schroeder, S. R. Comparison of DRO and DRI on rate of suppression of self-injurious behavior. *American Journal of Mental Deficiency*, 1979, 84, 188-194.