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A REINFORCEMENT PLUS INTERRUPTION METHOD
OF ELIMINATING BEHAVIORAL STEREOTYPY
OF PROFOUNDLY RETARDED PERSONS

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Summary—Stereotyped responses have been shown to be eliminated by an overcorrection-reinforcement program. The present study evaluated response-interruption as an alternative to the overcorrection component with seven profoundly retarded adults. During the baseline praise condition, stereotypy occurred during 66% of the observations for the seven profoundly retarded adults but decreased to less than one response per half hour in a mean of two sessions of individual training. In the subsequent class situation, stereotypy was reduced to less than 5% on the first day of class, to less than 1% by the fourth day and less than one stereotypy per hour after the third day. The interruption method seems preferable to postural overcorrection because of its apparent and relative nonaversiveness.

Nonfunctional, repetitive movement is a behavioral disturbance found in about two-thirds of institutionalized severely retarded persons (Berkson and Davenport, 1962; Kaufman and Levitt, 1965), is characteristic of autistic children (Rincover and Koegel, 1977), and has been variously designated as self-stimulation, behavioral stereotypy, or autisms. In its extreme form, self-injury results. Simply providing competing activities and reinforcers has been found to decrease the average frequency of stereotypy by about two-thirds; and to reduce it to near-zero for some persons (Azrin *et al.*, 1973). Many theories regarding the origin of this problem have been proposed (see review of several of these theories by Carr, 1977), but none have been generally accepted. Many behavioral laboratory studies have been conducted as well as behavioral treatment efforts (see reviews by Rincover and Koegel, 1977; Baumeister and Forehand, 1973; Lovaas and Newsom, 1976; Birnbrauer, 1976). These behavioral approaches have appeared very promising although almost all of the behavioral treatment studies have been within-subject studies of 1 or 2 persons and/or of very short durations of a few minutes.

In attempting to design an effective program for stereotypy (Azrin *et al.*, 1973; Foxx and Azrin, 1973), the origin of the disturbance was conceptualized as being the failure of the environment to reinforce outward-directed behavior, thus increasing the frequency of reinforcing self-stimulatory responses. In accord with this theory, a background of reinforcement was provided for outward-directed functional behaviors while simultaneously applying an overcorrection procedure as a negative consequence to each stereotypic response of nine retarded adults (Azrin *et al.*, 1973), four autistic children (Foxx and Azrin, 1973) and to each self-injurious action of 10 retarded and one schizophrenic adult (Azrin *et al.*, 1975). The combined reinforcement and overcorrection training was effective in eliminating or reducing the stereotypic and self-injurious behaviors in all three studies during the period of study of several hours each day, or, in the case of self-injury, throughout the day. The overcorrection procedure consisted of a postural overcorrection in which the trainee was required to engage in movements opposite to the stereotypic response for about 20 min following each such response. The effectiveness of this postural overcorrection with stereotypy has been replicated and confirmed by several subsequent

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studies (Freeman *et al.* 1977; Harris and Romanczyk, 1976; Epstein *et al.*, 1974; Doke and Epstein, 1975; deCatanzaro and Baldwin, 1978; and see review by Judkins, 1976).

The present study evaluated a new procedure for eliminating the need for the extensive manual guidance of the trainee. This guidance sometimes was aversive to some trainees who accordingly attempted to avoid or resist as has also been found in laboratory studies of aversive stimulation (Ulrich and Azrin, 1962; Azrin *et al.*, 1965). For the problem of self-injurious behaviors, some degree of aversiveness is often warranted as a means of inhibiting a life-threatening behavior, but non-injurious self-stimulation, by definition, harms neither the individual or others, except in the sense of being unaesthetic or preventing positive learning (as seen by Koegel *et al.*, 1974, and Epstein *et al.*, 1974). Every effort should be made, therefore, to reduce the aversiveness of training methods for reducing self-stimulation.

To reduce the effortfulness, and presumed aversiveness, of the extensive manual guidance of postural overcorrection, the procedure simply required the seated trainees to rest their hands on their lap or on a table and only for 2 min or less rather than moving the hands and arms in different positions over a 10–20 min period and while standing. This hand-on-lap posture was fairly incompatible with finger, hand, arm, and body movements, and mouthing. This response-contingent interruption served several of the same purposes that guided the rationale for the extended and varied postural overcorrection: the reinforcement from self-stimulation was interrupted, a new and incompatible response form was being practiced, and reinforcement from other sources were also interrupted and postponed. Aversiveness of the procedure should be minimal because of the minimal effort and manual guidance needed. Since a heightened state of tension has been found to be associated with periods of self-stimulation (Steen and Zuriff, 1977), this required period of calmness should be somewhat incompatible with, or opposite in direction to, the self-stimulating state. The general rationale for this response-interruption is similar to that used in the required-relaxation method of treating agitative-disruptive behavior (Webster and Azrin, 1973), and self-injurious behavior (Azrin *et al.*, 1975) by a contingent period of required bed rest. As in all of the original studies of overcorrection, the postural overcorrective procedure was imposed only in the context of ongoing reinforcement for alternative functional behaviors since laboratory studies have demonstrated greater response suppression by mild aversive consequence when alternative reinforced responses are available (Holz *et al.*, 1963; Herman and Azrin, 1964). To insure comparability with the previous study of postural over-correction (Azrin *et al.*, 1973), the trainees were introduced consecutively into the classroom situation in the present method.

METHOD

Subjects

To avoid treatment for those persons not in need, the study excluded those who showed little stereotypy during a normal classroom instruction situation. Consequently, records were taken of the persistent stereotyped actions in a small ongoing class of about 10 students, this class being conducted by an institutional staff member and devoted to intensive instruction in motor skills. This ongoing class met three times each day. Those seven students were selected, of the 30 students observed, who exhibited stereotypy during 40% or more of the recording intervals during this class. (See method of recording below for details.) Table 1 presents a brief description of each trainee. Four were female and three were male. Their Vineland Social Maturity Test (1965) scores ranged from 0.8 to 1.9 yr age equivalency with a mean of 1.17 yr. All lacked speech and social interaction skills. Their chronological age ranged from 19 to 45 yr with a mean of 26 yr. The duration of institutionalization ranged from 7 to 44 yr with an average of 22 yr. Thus, all trainees were functioning at less than the level of a 2 yr old child although all were over 18 yr of age and all but one had been institutionalized before the age of six. All exhibited several types of stereotypy, most commonly, body rocking, head moving, and hand or finger movements.

Table 1. Characteristics of the trainees

Sex	Age (yr)	Age Equivalent (yr)	Years Institutionalized	Stereotypy
Male	19	1.24	14	Gross body, head, hand and arm movements, finger-flicking in front of eyes
Male	45	0.9	44	Body-rocking, rubbing legs with hands
Female	26	1.0	25	Head weaving, mouthing, tapping blocks on table
Male	34	0.8	33	Body-rocking, head, finger and hand movements
Female	21	0.9	7	Body-rocking, head, finger and hand movements
Female	23	1.5	15	Body-rocking, mouthing, hand and finger movements
Female	19	1.9	18	Tapping on table, body-rocking
\bar{X}	26	1.17	22	

Response recording and reliability

A stereotyped response was defined as a movement which was constant in its manner of execution, repetitive, and non-functional. Two observers independently recorded the stereotypic responses, one of the observers having no knowledge of the experimental design or purpose. A timing device sounded a momentary tone every 10 sec. The observers recorded whether or not a trainee was engaging in a stereotypic response during the 10-sec interval. The observers watched one trainee for 10 min, then another for 10 min etc., in a random sequence specified beforehand until all trainees had been observed, then started another sequence, if time permitted. The second observer was used during each session of the baseline sessions and the individual training sessions, and during at least two of every five group sessions. The same recording procedure was used during the pre-experimental observation of the ongoing class conducted for the purpose of subject selection described above.

The experimental design was a within subjects comparison in which five days of baseline were obtained prior to instituting the training.

Baseline. During the baseline period in the class situation, the seven trainees were instructed in various simple motor tasks such as putting blocks in a bucket and inserting pegs into holes as well as some simple social actions such as making eye contact, shaking hands with others, sharing treats, waving 'hello' or 'good-bye', applauding on task completion, passing game objects to others, and helping each other in the motor tasks and in games. The instructor proceeded in a sequence from one trainee to another spending about 1 min with each. The instructor gave verbal instructions accompanied by pointing, modelled occasionally, and gave manual guidance when necessary. The instructor praised the student when the task was performed correctly. During this baseline period, the instructor did not provide a snack reinforcer or react to the stereotypic response.

Individual training. Each trainee received intensive individual training designed to eliminate the stereotypy in a closely supervised one-to-one relation with an instructor. The sessions were 90 min in duration and were given each day. The trainee was seated at a table while the instructor guided, instructed, and reinforced the trainee in very simple tasks such as putting blocks in a bucket, pegs in holes, and establishing eye contact. Each correct movement was reinforced by praise and stroking, and each completed correct response by a snack treat in addition. Two trainers were also used initially as in Azrin *et al.* (1976). Graduated Manual Guidance (Azrin and Foxx, 1971; Foxx and Azrin, 1972; Azrin *et al.*, 1976; Azrin and Wesolowski, 1974, 1975) was used by the second trainer who stood behind the trainee and prevented any stereotypic movements by 'shadowing' the relevant part of the body involved in the movement and prevented any incipient movements from being completed. After 30 min of this combined intensive reinforce-

ment-response prevention experience, the trainer no longer prevented the stereotyped response, but instead instituted a response-interruption period when a stereotypic response occurred. The trainer pulled the trainee's chair back slightly from the table, gave a verbal reprimand, "No, don't..." and guided the trainee's hands lightly to the lap or edge of the table where they were to remain for 2 min. The trainer took great care to guide the hands very lightly and to avoid even touch contact if the hands remained in place, i.e. by shadowing the hands. If the trainee began moving about or attempting to engage in stereotypic actions during the last 10 sec of the 2-min period, the period was to be extended until 10 sec had elapsed without such actions, but such eventualities were rare. This contingent use of response-interruption continued until the trainee had spent 30 consecutive min without a single stereotypic action, at which time the individual training ended. The group class was begun for that trainee on the next session.

Group classroom training

After completing the intensive individual training, the trainee was included in the class situation where a snack reinforcer was given for correct responses and each stereotypic response received the verbal reprimand 'No, don't...', just as in the individual training. For every 30 min that elapsed without a stereotypic response, the initial 2 min duration of interruption was reduced to about half the previous duration, the successive durations being 2 min, 1 min, 30 sec, 15 sec, 7 sec, 3 sec and 1 sec. The final value of 1 sec consisted of placing the trainee's hands momentarily on the lap or table. If two stereotypic responses were made within a 30 min period, the duration of response-interruption was increased to 2 min. This procedure gradually decreased the duration of response-interruption to a momentary event so long as stereotypy was rare, but was 2 min long when stereotypy was frequent. The first stereotypic response emitted in a session was given only the verbal reprimand and momentary response-interruption. The snack treats for correct responses were given in addition to praise and stroking. As noted above, the trainees were added one at a time to the class situation such that only one trainee was present initially, but all seven were again present eventually as in the baseline period.

RESULTS

Figure 1 shows that during the five days of baseline when the instructor provided praise, stereotypy averaged 66%. After the intensive training, when praise and response-interruption were arranged, stereotypy of the first individual decreased to 3% on the first day of class and was zero on the fourth day. As each additional trainee was added to the class, the degree of stereotypy for the class remained at the near-zero level. When all seven trainees were in the class, stereotypy remained at the near-zero level for the entire 17 days from Day 24 to Day 40 when the class was terminated. During these 17 days all seven trainees were receiving only the verbal reminder and momentary interruption for the very rare instances of a stereotypy. To avoid distortion of the data collection because of the time taken in the response-interruption, Fig. 1 includes only those observational intervals in which the trainee was unrestrained and free to initiate a stereotyped response.

Analysis of the individual data showed that stereotypy was less than 1% for each subject by the fourth day in the class situation.

The intensive individual instruction averaged 167 min, required an average of 2 sessions, and varied from 60 min to 6 hr for different trainees.

The data in Fig. 1 were expressed in terms of the percentage of intervals during which stereotypy occurred which is a relative measure. A measure of the absolute number of stereotyped responses was not meaningful during the baseline praise condition since stereotypy was usually a continuous behavior, often lasting for 10 min or more. However, an absolute count was possible and meaningful after the response-interruption procedure was instituted. The data on absolute frequency showed that stereotypy had a mean frequency of less than two per hour during each of the first three days, and less than one per 2 hr thereafter. No stereotyped responses occurred by any trainee on the last five

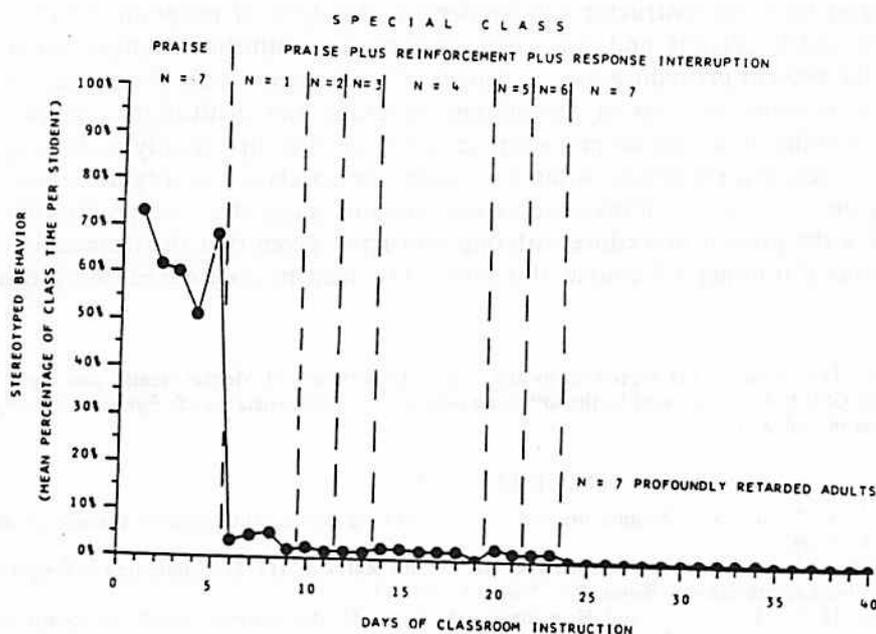


Fig. 1. Stereotyped behavior in a special class of seven profoundly retarded adults whose stereotypy was resistant to displacement. Each data point shows the mean percentage of 10-sec observation intervals during which stereotypy was exhibited per trainee. During the first 5 days, the instructor provided praise, instruction and manual guidance for correct behaviors in the class. Each of the seven trainees was given intensive individual instruction entailing reinforcement for correct responses and interruption of stereotypic behaviors during sessions occurring at the vertical dashed line. The data for those sessions do not appear in the figure (see text). The trainees were added one at a time to the class as indicated by the changing N size after each vertical broken line. After the intensive individual training, the class provided snack reinforcement for correct behavior and interruption of stereotyped responses in addition to the praise.

days of the class. The above calculations of the rate of response exclude the periods of interruption.

The reliability measurements taken in the classroom showed 98% agreement between the two observers.

The response-interruption procedure seemed to produce very little emotional distress. The trainees generally did not resist the procedure and showed little movement during the 2-min period while keeping their hands on their lap.

DISCUSSION

The combined interruption-reinforcement program was effective in decreasing stereotypy for trainees who had been preselected in terms of the persistence of their stereotypic behaviors. The principal purpose of the study was to evaluate whether response-interruption would be as effective as postural overcorrection had been found to be in earlier studies (Azrin *et al.*, 1973; Foxx and Azrin, 1973). Comparison with the results of those studies indicate a comparable degree of effectiveness in that both programs decreased stereotypy by more than 95% within a few days. Since the response-interruption procedure was less effortful, and presumably less aversive for the trainees, it seems more desirable for use than the postural overcorrection.

The reduction of the stereotypy by the combined interruption-reinforcement program seems attributable to the effects of the interruption-reinforcement program. The structured class activity experience and simple praise were not responsible for the reduction of stereotypy since these two components were present during the baseline condition. Evidence for the effectiveness of the systematic reinforcement component had been obtained previously in Azrin *et al.* (1973); accordingly, no further attempts were made in the present study to replicate this finding. The evidence from the present and previous study indicate that the observed reduction of stereotypy was attributable to the combined reinforcement-interruption program.

The class arrangement used in the present study required a trainer in addition to the usual instructor in order to provide the systematic reinforcement and extended response-interruption. The results obtained in the ongoing class that was used to select subjects for this study suggest that one instructor can implement this type of program. That class contained 10 retarded persons and was conducted by an institutional employee who desired to use the present procedure for the benefit of his trainees. After the subjects had received several training sessions in the present program, the institutional instructor began using a modified interruption procedure in which he interrupted only momentarily any observed stereotyped responses. After 30 sessions in his class, stereotypic responses were occurring on less than 1% of the observation intervals, suggesting the practicality of a modification of the present procedure with one instructor, given that the trainees had a history of individual training. Of course, this possibility must be considered only suggestive.

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