MOVEMENT SUPPRESSION TIME-OUT FOR UNDESIRABLE BEHAVIOR IN PSYCHOTIC AND SEVERELY DEVELOPMENTALLY DELAYED CHILDREN

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The effects of a movement suppression time-out, which involved punishing any movement or verbalization while a client is in the time-out area, were evaluated in four experiments. The first experiment examined the effects of a DRO procedure and movement suppression plus DRO in suppressing self-injurious behavior in a psychotic child in three different situations. In Experiment 2, the results of the previous experiment were replicated with two dangerous behaviors in a second psychotic child. In a third experiment, movement suppression plus DRO was compared with contingent restraint in reducing inappropriate poking behavior in two settings. The movement suppression procedure eliminated poking whereas contingent restraint had little effect. In the final experiment, movement suppression time-out alone was compared with exclusionary time-out alone and simple corner time-out alone. Self-stimulation occurred at high levels during the exclusionary and simple corner time-out procedures. Self-stimulation was either suppressed or reduced during movement suppression time-out. The movement suppression time-out procedure produced a larger reduction in the target behavior in all three children. The effectiveness of the movement suppression procedure was explained in terms of the suppression of self-stimulation while the time-out procedure was being applied.

DESCRIPTORS: movement suppression procedure, time-out, self-injury, self-stimulation, psychotic children, developmentally delayed children

Time-out is a procedure by which access to specific sources of reinforcement is removed for a particular period of time, contingent on the emission of a response (Sulzer-Azaroff & Mayer, 1977). Time-out from reinforcement is one of the most frequently reported punishment techniques in the behavioral literature (Barton, Guess, Garcia, & Baer, 1970; Bostow & Bailey, 1970; Foxx & Shapiro, 1978; Nau, Van Houten, & O'Neil, 1981; Porterfield, Herbert-Jackson, & Risley, 1976).

Time-out is a broadly defined technique that can be applied in a variety of ways. For example, in many experiments an individual is isolated from specific sources of reinforcement in a special room

termed the time-out room contingent on misbehavior (Tyler & Brown, 1967; Wolf, Risley, & Mees, 1964). A variation of this procedure involves having a person sit or stand in a corner or behind a screen (Webster & Azrin, 1973). In other experiments the individual is not removed from the setting but loses a stimulus associated with the availability of specific sources of reinforcement (Foxx & Shapiro, 1978). Another variation of time-out, termed contingent observation (Porterfield et al., 1976), involves removing an individual from a reinforcing activity and requiring him or her to watch others engage in that activity.

One feature that all time-out procedures have in common is an attempt to reduce the amount of reinforcement received during the time-out interval. Indeed, research has demonstrated that the efficiency of time-out is directly related to the net reduction in reinforcement between the "time-in" and time-out periods (Solnick, Rincover, & Peterson, 1977). Solnick et al. found that time-out could be made more effective by increasing the amount of reinforcement that could be removed during the time-out period.

This research was partially supported by a grant from the School of Education at the University of Haifa and by grant 410-82-0570-XZ from the Social Sciences and Humanities Research Council of Canada.

Special appreciation is expressed to Mrs. Elenor, school principal, Dr. Roneen, superintendent of Special Education, the staff of Sackville School, and Christopher Houlihan for their cooperation and assistance.

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Another factor that seems to influence the efficacy of time-out is whether the subject engages in self-stimulatory behavior during the time-out interval. Solnick et al. (1977) found that time-out was ineffective with an autistic child when the child had the opportunity to engage in self-stimulatory behavior during time-out. However, when the trainer prevented self-stimulation by holding the parts of the child's body used in self-stimulation, time-out was effective. This study illustrates the importance of removing all important sources of reinforcement during time-out periods. In several other studies, contingent restraint was used to punish self-stimulatory behavior (Bucher, Reykdal, & Albin, 1976; Dorsey, Iwata, Reid, & Davis, 1982; Hanley, Perelman, & Homan, 1979; Shapiro, Barrett, & Ollendick, 1980). For example, Hanley et al. reduced the frequency of self-stimulatory arm waving in a boy labeled autistic by using DRO and a time-out procedure that involved having him sit on his hands. Shapiro et al. reduced the occurrence of hand mouthing in three children by delivering a reprimand followed by manually restraining the children's hands on a table for 30 seconds.

Although the contingent restraint procedure appears to have some promise, one should note that other researchers have demonstrated that restraint can sometimes function as a reinforcer (Apsche, Bacevich, Axelrod, & Keach, 1977; Favell, McGimsey, & Jones, 1978). Hence, it may be important to develop time-out procedures that prevent the occurrence of self-stimulatory sources of reinforcement without the use of continuous restraint. One alternative to the use of continuous restraint is to teach the child to self-restrain during the time-out period. This can be accomplished by positioning the child in such a manner as to decrease the opportunity for movement and then punishing any movement observed with a reprimand and brief restraint (lasting less than a second). The purpose of the first experiment was to evaluate the effectiveness of such a movement suppression time-out procedure in reducing the self-injurious behavior of a psychotic child in three settings.

EXPERIMENT 1

METHOD

Child and Setting

Michael was a 10-year-old boy who had been labeled psychotic at the age of 5. Preliminary observation indicated that he spent a good deal of time rocking. He also engaged in frequent and severe tantrums, which involved hitting his head against a wall, scratching his face, and throwing himself against the floor, all accompanied by loud screaming. Michael's tantrums often resulted in tissue swelling, bruising, and scratching. Michael spent 2 years prior to the study on a ward of a residential treatment center. At the start of the study, Michael returned to his home and was enrolled in a special program for mentally disturbed children.

The experiment was conducted in three settings: the parents' apartment, the boy's classroom, and an after-school program for disturbed children. The parents were the primary change agents in the home. The teachers and counselors were the primary change agents in the school and after-school programs.

Procedure

The target behavior was self-injurious behavior. Each day self-injurious episodes were measured in all three settings. In the home, the mother served as the primary observer. In the school, the guidance counselor recorded self-injurious episodes and in the after-school program a counselor's aide recorded self-injurious episodes. A self-injurious episode was defined as a tantrum that involved Michael hitting his head against the wall or floor, scratching at his face, or hitting himself in the head or upper chest with clenched fists. Each time Michael engaged in any of these behaviors the time was noted to the nearest minute by the observer on an observation sheet containing spaces for the date and the time that the observer started and terminated recording (Hall & Van Houten, 1983). Data were collected on school days during all waking hours at home, throughout the school day and during the after-school program. All totals were

Figure 1. Michael's self-injurious episodes at home, in school, and during the after-school program during each condition of Experiment 1.

converted to the number of self-injurious episodes per hour by dividing the total number of episodes by the number of hours the boy was observed. In all cases, self-injurious episodes followed a stereotyped pattern. First, Michael engaged in one of the stereotyped behaviors and began to yell. Next, he terminated self-injurious behavior abruptly and engaged in self-recriminating verbal statements such as "I shouldn't do that," "I am afraid. This is not the right thing to do." Finally, he approached adults and attempted to establish body contact.

Interobserver agreement was obtained in the home during a 3-hour period by the first author. In the school, interobserver agreement was obtained by either the regular teacher or the first author over a 3-hour period. In the after-school program interobserver agreement was obtained by the program director for the duration of the period. An agreement on the occurrence of a self-injurious episode was scored whenever the times recorded

by the primary observer and the second observer did not differ by more than 1 minute. A 1-minute tolerance was justified because of the low rate of self-injurious behavior. The use of a 1-minute tolerance prevented problems arising when a behavior occurred near the beginning or end of a minute. Any time noted by either observer that did not correspond within one minute with a time noted by the other observer was scored as a disagreement on the occurrence of the behavior. Interobserver agreement was calculated by dividing the number of agreements on the occurrence of the behavior by the number of agreements on the occurrence of the behavior plus the number of disagreements and multiplying by 100. A measure of interobserver agreement was obtained on at least three occasions during each experimental condition and twice during follow-up.

Interobserver agreement on the occurrence of tantrums averaged 94% (range of 86% to 100%)

in the home, 95% (76% to 100%) in the school, and 92% (86% to 100%) in the after-school program.

Experimental Design

A multiple baseline across settings design was used. Following the baseline condition a DRO alone procedure was applied to self-injurious episodes in the home for a four day period. Next, movement suppression time-out was applied along with the DRO across all three settings according to a multiple baseline strategy.

Baseline. During the baseline condition, the parents and teachers were not given any specific instructions on how to deal with Michael's tantrum behaviors. Typically, the parents tried to prevent tantrums by giving him whatever he wanted. In the school and after-school programs they tried to calm him down by asking what he wanted and restraining him.

DRO alone. The parents were instructed to praise Michael and give him one M&M candy approximately every 15 minutes that he was tantrum free. The use of M&M candies was suggested by the parents, who indicated that Michael frequently sought them out. During the four sessions that this condition was in effect the parents gave Michael 90 candies.

DRO plus movement suppression time-out. During this condition the parents gave the child M&M candies and praise every 15 minutes that the behavior did not occur. In addition, whenever Michael engaged in self-injurious behavior, the movement suppression procedure was immediately used.

Movement suppression consisted of telling the child to go immediately to the corner while guiding or forcing him into the corner as quickly as possible. Michael was positioned with his chin against the corner, both hands behind his back with one hand on top of the other and both feet close together touching the wall. Whenever the child moved or made a verbalization the parents said "Don't move" or "Don't talk" in a very firm, loud voice while pressing the child into the corner by placing one hand against the child's upper back

between the shoulder blades. If the child turned his head or bent his knees the parent would say either "Put your head back and don't move" or "Straighten up and don't move," while turning his head or pressing his back into the corner. This procedure was applied even if the child only moved a small amount such as wiggling a finger or shifting weight from one leg to the other. The parent stood behind the child very closely so the procedure could be implemented immediately following any movement or verbalization. This procedure lasted approximately 3 minutes, and the child was then told he could leave the corner.

The parents were trained to carry out the movement suppression procedure by the first author, who demonstrated the procedure on one parent at a time. Next, the parents practiced using the procedure on the first author, who provided immediate and specific feedback. The first author also applied the procedure to the child following the first two occurrences of self-injurious behavior and monitored the parents as they carried out the procedure for the remainder of the first session and for the second and third sessions.

The school teacher and the counselors in the after-school program were also taught how to apply the procedure by the first author. When Michael was calm the first author demonstrated the procedure by using Michael as a model. Next, the teacher and counselor practiced carrying out the procedure with feedback until they could do it correctly.

Follow-up. During follow-up, movement suppression was still in effect but the DRO procedure was gradually faded out by increasing the time in the following steps: 30 minutes, 45 minutes, 1 hour, 1.5 hours, and 2 hours. After the 2-hour DRO was in effect for four days it was completely removed.

RESULTS AND DISCUSSION

The results of this experiment are presented in Figure 1. During baseline, Michael engaged in self-injurious episodes 1.07, 0.77, and 0.95 times per hour in the home, school, and after-school settings respectively. Introduction of DRO alone in the

home produced no change in the frequency of self-injurious behavior. Michael earned 2.9 rewards per hour in the home.

Introduction of DRO plus movement suppression led to a marked decline in the self-injurious behavior to 0.004, 0.003, and 0.002 in the home, school, and after-school settings, respectively. The DRO plus movement suppression procedure rapidly eliminated the behavior, and it did not occur at all in any of the settings during follow-up. During this condition, Michael obtained almost all scheduled praise and candy on the DRO schedule.

The movement suppression procedure was only applied eight times in the home setting, five times in the classroom setting, and two times in the after-school setting. It should be noted that movement suppression was so effective that it only had to be applied several times before it eliminated self-injurious episodes. The first time movement suppression was used, Michael moved approximately 10 to 15 times. Most of these movements involved trying to bend the knees, wiggling fingers, and turning the head. After the seventh or eighth time the procedure was used, Michael rarely moved while in the corner. This reduction in movement appeared to be related to the punishment of movement with a forcefully delivered reprimand while pressing him back into the corner.

The results of this experiment demonstrate that the movement suppression procedure can be effective in suppressing self-injurious behavior. The purpose of the second experiment was to demonstrate the efficacy of movement suppression with two other dangerous behaviors in an autistic child.

EXPERIMENT 2

METHOD

Child and Setting

Tom was a 9-year-old boy who had been labeled autistic at the age of 3 by a committee of physicians. His vocabulary consisted of 16 object names and he followed simple instructions such as "Come here" and "Bring me the plate." The

treatment took place in his home. He was in a school for autistic children in Haifa, Israel, for 8 hours per day.

Procedure

The target behaviors were biting himself and mouthing objects. A biting incident was defined as any occasion when Tom grasped his arm between his teeth. Biting frequently produced bruising and broke the skin. Mouthing objects was defined as placing any inappropriate objects such as rocks, napkins, cloth, part of toys, and dirt into his mouth. Tom sometimes swallowed these objects, leading to medical difficulties.

The mother served as primary observer, recording biting and mouthing objects in the home during a 2-hour free play period between 6:00 p.m. and 8:00 p.m. Each time Tom engaged in biting or mouthing, his mother recorded the time on an observation sheet.

Interobserver agreement was obtained by the first author on both behaviors during the entire 2-hour free play period. Interobserver agreement on the occurrence of self-biting and mouthing objects was scored in the same manner as described in Experiment 1. Interobserver agreement was assessed twice during each condition and averaged 95% (91% to 100%) for self-biting and 84% (78% to 95%) for mouthing.

Experimental Design

A multiple baseline across behaviors design was used. Following baseline, a DRO 10-minute condition was introduced for biting and mouthing. Next, movement suppression was added to the DRO condition, first for biting, and then for mouthing. Follow-up data were then collected over a 57-day period.

DRO 10 minutes. At the start of each session Tom's mother set a timer for 10 minutes. If Tom engaged in the target behavior the timer was reset. Whenever the timer reached 10 minutes, an alarm went off and the mother hugged Tom, praised him, and gave him small pieces of nuts. Prelimi-

nary observation indicated that Tom often sought out nuts. Nuts were not given to Tom at any other time. Tom earned 14 reinforcers during the 3 days that the DRO condition was in effect for biting alone. Tom earned 84 reinforcers during the 12 days that the DRO condition was in effect for mouthing.

Movement suppression. The movement suppression procedure was implemented for a 2-minute duration rather than 3 minutes as in the preceding experiment. In all other respects the procedure was carried out in the same manner as described in the previous experiment. The first author taught the parents how to carry out the movement suppression procedure in a proper and safe manner.

Follow-up. Movement suppression and DRO were both in effect at the start of this condition. The DRO procedure was removed after the first month of this condition but the movement suppression procedure remained in effect.

RESULTS AND DISCUSSION

The results of this experiment are presented in Figure 2. During baseline, Tom bit his arm an average of 8 times and mouthed objects an average of 11 times during the observation period. Introduction of DRO alone had no effect on either arm biting or mouthing objects. However, the addition of movement suppression led to the near complete elimination of both behaviors.

It should be noted that the movement suppression procedure only had to be implemented 14 times for arm biting before this behavior was nearly eliminated. Similarly, it only had to be applied eight times before mouthing behavior was almost completely suppressed. Arm biting and mouthing did not occur during the five follow-up sessions.

Experiments 1 and 2 demonstrate that the movement suppression procedure can effectively reduce dangerous behavior in autistic children. The purpose of Experiment 3 was to assess whether the movement suppression procedure could be effective in reducing aggressive behavior in a developmentally delayed youth and to compare it with a contingent restraint procedure.

EXPERIMENT 3

METHOD

Youth and Setting

Garth was a 17-year-old, moderately retarded youth. He lived with his parents and spent 8 hr per day working at a rehabilitation center. Garth tested 55 on the WISC, he could read and write at the 3rd-grade level, and he had good productive and receptive language. Preliminary observation indicated that Garth engaged in a high rate of poking other people while engaged in conversation.

Procedure

The target behavior was poking, defined as jabbing at the arm or chest of another person with the index finger. Poking tended to occur most often when Garth was initiating conversation or wanted to place emphasis on something he was saying. In the home, Garth most often poked his father and occasionally poked his mother or guests; in the rehabilitation center, Garth usually poked the supervisor and one or two peers. Garth's mother served as the primary observer in the home, and a social worker served as the primary observer in the rehabilitation center. Each time Garth engaged in poking behavior the observer marked down the elapsed time using a stopwatch. Data were collected on weekdays at the home and at the rehabilitation center during 1-hr observation sessions.

Interobserver agreement was assessed by a second observer (the first author) at both sites on three occasions during each condition. An agreement was scored if both observers recorded the behavior within 30 seconds of each other. A disagreement was scored whenever either observer scored the behavior during a time that did not correspond within 30 seconds with a time recorded by the other observer. Interobserver agreement was calculated in the same manner as reported in the previous experiment and averaged 89% in the home (79% to 96%) and 96% in the rehabilitation center (89% to 100%).

Figure 2. Tom's arm biting and mouthing incidents for each 2-hour session during Experiment 2.

Experimental Design

A reversal design counterbalanced across settings was used to compare contingent restraint (condition C) with movement suppression time-out (condition B). The order of conditions was ABACB in setting 1 and ACAB in setting 2.

Baseline. In the home setting, Garth's parents typically attempted to push his arm away and instructed him to stop poking whenever he engaged in poking behavior. In the rehabilitation center, the supervisor reacted in the same manner as the parents, whereas Garth's peers usually walked away from him or attempted to avoid him.

Contingent restraint. In the home setting, one of Garth's parents would grasp Garth's hand whenever he poked or attempted to poke either of them. Next they would say "Don't poke! You can talk without poking" and held his hand next to his leg for 60 seconds. In the rehabilitation center, Garth's supervisor reacted in the same way as his parents whenever he was poked, and the social worker carried out the procedure whenever Garth poked one of his peers.

Movement suppression. The movement

suppression procedure was immediately used whenever Garth engaged in poking behavior. The father carried out the procedure in the home setting and the supervisor and social worker carried it out in the rehabilitation center setting. The movement suppression procedure was carried out for 2 minutes during this experiment.

Follow-up. Follow-up measures were obtained on Day 45, 60, 72, 85, and 95. The movement suppression procedure was in effect throughout the entire day during the follow-up condition.

RESULTS AND DISCUSSION

The results of this experiment are presented in Figure 3. During baseline, Garth engaged in poking behavior 22.5 times per hour in both settings. Introduction of the movement suppression procedure in the home led to the near complete suppression of poking behavior in this setting, whereas the contingent restraint condition produced only a small decline in poking behavior (to an average of 14 per hour) in the rehabilitation center setting.

The return to the baseline condition was associated with an increase in poking to 25 per hour

Figure 3. Garth's poking behavior at home and the rehabilitation center during each condition of Experiment 3.

in the home setting and 22 per hour in the rehabilitation center. Introduction of contingent restraint in the home led to a small reduction in poking to 17 per hour; introduction of movement suppression in the rehabilitation center led to the complete suppression of poking in this setting in a relatively brief period of time. Reintroduction of movement suppression in the home setting again resulted in the suppression of poking behavior. Poking continued to be suppressed during the follow-up condition.

Although it might be argued that the use of the movement suppression procedure might not be warranted for poking behavior, it should be noted that this behavior had persisted for many years and was found to be highly aversive by everyone who

came in contact with Garth. Hence, its maintenance interfered with Garth's adaptation within the community. However, it is possible that a response cost procedure may have been effective, provided powerful enough reinforcers were selected for removal.

The results of this experiment, along with those of the preceding two experiments, suggest that the movement suppression procedure can be effective in suppressing dangerous behavior in autistic and developmentally delayed individuals. The purpose of Experiment 4 was to determine whether the movement suppression procedure could be effective in reducing self-stimulatory behavior and to compare this procedure with more traditional time-out procedures.

EXPERIMENT 4

METHOD

Students and Setting

In this study, three severely retarded students attending a segregated public school for mentally handicapped individuals situated in Halifax County, Nova Scotia, participated.

Chuck was a 21-year-old male who was nonverbal and spent much of his time rocking back and forth. He also exhibited self-stimulating behavior that involved repetitive and nonfunctional hand and finger movements. Linda was a 17-year-old nonverbal female who engaged in almost continuous self-stimulatory hand and finger movements. Linda attended to very few external stimuli. Ernie was a 17-year-old male who spent much of his time rocking back and forth in his seat, often making loud hissing or grunting noises as he rocked. He frequently engaged in nonfunctional finger movements and was also nonverbal. None of the students had any other serious medical problems. All of them received a similar curriculum that focused on self-help skills.

Procedure

The target behaviors were verbal and nonverbal self-stimulation. Each student separately participated in a 20-minute session each day. Time spent in time-out was not counted as part of the total session time. Nonverbal self-stimulatory behavior was defined as any repetitive, nonfunctional movement of any body part or of the entire body, and self-stimulatory verbalizations were defined as any repetitive nonfunctional vocalizations, consisting of either words or noises.

Nonverbal and verbal self-stimulation behaviors were separately measured using a 10-second partial interval recording procedure. Eighty 10-second observation intervals, each followed by a 5-second recording interval, were recorded on two audio cassettes. One cassette was used by the first observer who measured self-stimulation in the classroom setting and the second cassette was used by the second observer who recorded self-stimulation while the time-out was being applied. Interobserver

agreement was obtained in both settings by a third observer, who recorded self-stimulation behaviors in the classroom and while the time-out procedure was being applied.

Interobserver agreement was separately calculated for nonverbal and verbal self-stimulatory behavior. An agreement was scored when both observers agreed that a target behavior either occurred or did not occur during a specific interval, and a disagreement was scored when one observer recorded a behavior in an interval and the other did not. Interobserver agreement for both target behaviors was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Interobserver agreement in the classroom was assessed during two sessions for each condition; agreement on self-stimulation while time-out was being applied was obtained twice during each time-out condition. Interobserver agreement on nonverbal self-stimulation averaged 96% (range, 93% to 100%); agreement on verbal self-stimulation averaged 95% (range, 92% to 100%).

Experimental Design

A multiple baseline design was used. Following baseline, isolation time-out was introduced for Chuck and then for Linda. Next, movement suppression time-out was introduced for Chuck whereas a corner time-out was first introduced for Linda and later for Ernie. After the effects of corner time-out had been determined, movement suppression time-out was first introduced for Linda and then for Ernie.

Baseline. During baseline, no consequences were applied to self-stimulatory behavior exhibited by any of the students.

Isolation time-out. When isolation time-out was in effect, the student, upon emission of the targeted behavior, was first verbally reprimanded. A 5-minute time-out was used. The time-out room was at the end of a short central hallway, with classrooms on each side, and measured 165 cm by 170 cm. The time-out room contained a chair.

The door of the time-out room had a window that was completely covered except for two small

Figure 4. Percentage of intervals that each student engaged in self-stimulation while at their seats during each condition of Experiment 4.

holes that allowed the observers to see the student. At the end of 5 minutes the student was allowed to leave only if he or she was quiet for 30 seconds. If he or she was not quiet for 30 seconds, time-out was extended until this condition was met.

Corner time-out. When corner time-out was in effect, the student, upon emission of the targeted behavior, was verbally reprimanded. The student was then required to stand facing the wall for 2 minutes, within a box marked on the floor of a corner of the classroom. Self-stimulatory behaviors were recorded in the same manner as used in the classroom.

Movement suppression time-out. This procedure was carried out in the same manner as reported in the preceding experiments. The duration of the movement suppression procedure was 2 minutes.

RESULTS AND DISCUSSION

Figure 4 depicts the percentage of self-stimulation for each student at his or her seat during all

phases of the experiment. Chuck's percentage of nonverbal self-stimulation averaged 86% during baseline. Isolation time-out had a moderate effect on nonverbal self-stimulation, reducing it to a mean of 36%. When movement suppression was introduced, however, nonverbal self-stimulation was reduced to a mean of 8%. Chuck's percentage of verbal self-stimulation remained negligible during all phases of the study.

Linda's percentage of nonverbal self-stimulation was 100% during baseline, isolation time-out, and corner time-out. When movement suppression time-out was introduced, her percentage of nonverbal self-stimulation immediately declined and then stabilized at 21%. Linda exhibited no verbal self-stimulation throughout the experiment.

Ernie's percentage of nonverbal self-stimulation had a mean of 47% during baseline. The introduction of corner time-out reduced nonverbal self-stimulation to a mean of 33%. When movement suppression time-out was introduced, nonverbal self-stimulation immediately fell to 16% and then

Figure 5. Percentage of intervals that each student engaged in self-stimulation while in the time-out room or the corner during each condition that punishment was applied in Experiment 4.

declined further until it was completely eliminated. Ernie's verbal self-stimulation closely paralleled his nonverbal self-stimulation.

Figure 5 depicts the percentage of self-stimulation for each student while he or she was in the time-out room, corner time-out, and in movement suppression time-out. Chuck's percentage of nonverbal self-stimulation while he was in the time-out room during isolation time-out averaged 33%. During movement suppression his nonverbal self-stimulation decreased to a mean of 3%. Chuck remained nonverbal while in the time-out room. During movement suppression, his verbal self-stimulation had a mean of less than 1%.

Linda's percentage of nonverbal self-stimulation was 100% while in the time-out room and in corner time-out. During movement suppression, Linda's percentage of nonverbal self-stimulation averaged 46%. Verbal self-stimulation remained at 0% throughout the study.

Ernie's percentage of nonverbal self-stimulation in corner time-out averaged 25%. During move-

ment suppression, Ernie's nonverbal self-stimulation had a mean of 0%. His percentage of verbal self-stimulation during corner time-out averaged 13%, whereas his verbal self-stimulation during movement suppression was 0%.

Visual examination of Figures 4 and 5 suggests a relationship between the percentage of self-stimulation behavior during the application of the punishment procedures and the magnitude of the reduction in the time-in setting. It appears that a punishment procedure that does not suppress self-stimulation while it is being applied has little chance of suppressing self-stimulation in the time-in setting.

In this study, movement suppression time-out was more effective than either isolation time-out or corner time-out in reducing self-stimulation in all three students. However, it should be noted that the failure to counterbalance the order of introduction precludes ruling out order effects.

Although not explicitly measured, it was noted that Chuck completed more work with a form-

board puzzle when the movement suppression time-out procedure was in effect than he did during any other phases of the experiment. A slight increase in Ernie's performance was noted as well. Linda was seen to complete puzzles on occasion during the movement suppression time-out condition, something that did not occur prior to the implementation of the movement suppression time-out condition.

Given that self-stimulation does not cause physical harm to the individual or others one might argue that movement suppression is too restrictive a procedure to use to reduce it. In each of the previous studies, the individuals receiving the movement suppression intervention engaged in behaviors dangerous to themselves (self-injurious behaviors or pica behaviors) or aggressive behavior (poking). On the other hand, one could also argue that because self-stimulation interferes with learning (Koegel & Covert, 1972; Koegel, Firestone, Kramme, & Dunlap, 1974) it is also harmful to the child. Perhaps the wise course to follow is to withhold the use of strong procedures when dealing with self-stimulation until all other reasonable attempts have failed. It should also be noted that in Linda's case the results produced by the movement suppression procedure did not justify its continued use.

GENERAL DISCUSSION

The results of these four experiments with six individuals demonstrate that movement suppression time-out plus DRO procedure can rapidly suppress maladaptive behavior in psychotic and retarded children and youths. Further, movement suppression time-out plus DRO was more effective than contingent restraint, 5-minute exclusionary time-out, and a traditional corner time-out procedure.

Movement suppression may have been superior to the other time-out procedures because it prevented the repeated occurrence of self-stimulatory behavior while it was being applied. This explanation is supported by results of the Solnick et al.

(1977) study, which indicated that time-out is not effective with psychotic children if they can engage in self-stimulatory behavior during the time-out period. Experiment 4 provided additional support for this hypothesis. While the exclusionary and simple corner time-out procedures were being carried out, all three children engaged in high levels of self-stimulatory behaviors that were similar to the baseline rates. However, when movement suppression time-out was being applied, self-stimulation either declined or was nearly suppressed. In addition, the effectiveness of movement suppression time-out with these three children appeared related to how much self-stimulation was reduced while it was being applied.

It is also interesting to note that the movement suppression procedure was more effective than the contingent restraint procedure. Movement suppression offers two advantages over contingent restraint. First, movement suppression teaches children how to self-restrain by standing motionless in the corner. Second, the children are taught to remain motionless for the duration of the time-out period with a minimum of direct physical restraint or contact, thus minimizing the possibility of inadvertent reinforcement. Other restraint procedures are often applied for prolonged periods and involve grasping or hugging. It is possible that reinforcing aspects of the contact involved in restraining Garth in Experiment 3 may have weakened the overall effectiveness of the restraint procedure. If one assumes that the suppression of self-stimulation during continuous restraint was a somewhat more powerful punisher than the contact was a reinforcer, one would predict that the overall effect would be a small reduction in the punished response. This would explain why restraint was somewhat effective in Experiment 3.

Another advantage of movement suppression time-out is that it increases the difference between the reinforcement available in the time-in and time-out environments by depriving the child of numerous sources of reinforcement. For example, a child placed in the corner with the chin against the corner cannot see anything going on in the room. The punishment of all movement by immediate

reprimands also eliminates movement as a source of reinforcement. Hence, the relative aversiveness of a brief time-out period is substantially increased.

Although the use of a time-out procedure that limits movement might be viewed as restrictive by some, it should be noted that the procedure was only applied for 2 or 3 minutes and was highly effective with five out of six students. Thus, the net result may be less restrictive than the use of alternative procedures, such as overcorrection, which frequently involves compelling a child to repeat a restricted series of movements, or isolation time-out, which often involves confining someone to a room for 5 or 10 minutes. In addition, we believe that none of the above procedures, if effective, is nearly as restrictive as taking no effective action and thereby allowing individuals to continue to engage in behaviors that restrict their integration into society.

All individuals applying the movement suppression procedure were carefully trained to carry it out in a safe and effective manner. This training involved having parents and staff practice the procedure under carefully supervised conditions. Similar training is also necessary with other punishment procedures such as overcorrection and the use of exclusionary time-out. It is always prudent to carefully supervise the application of any procedure that involves physical restraint. In each instance in this experiment, the children or youths rapidly learned to engage in self-restraint early in the study, while the parents and staff were under direct supervision. If a child does not learn self-restraint quickly or resists the application of the procedures, it would be unwise to allow staff or parents to apply the procedure on their own.

In general, it was relatively easy to control each of the client's behavior while the movement suppression procedure was being applied. The only physical contact used was an occasional press on the client's upper back or occasionally turning the client into the corner, each accompanied by a forcefully delivered reprimand. In most cases, the reprimands alone were effective in stopping movement. The procedure might be less effective or safe when applied to strong combative adults or ado-

lescents. Under these conditions the corner should be padded.

In two experiments, the DRO procedure failed to produce a reduction in the target behavior when it was applied alone. This finding is in accord with the results of previous studies, in which DRO produced little or no reduction in target behaviors when used alone (Harris & Wolchik, 1979; Luce & Hall, 1981; Repp, Barton, & Brulle, 1983; Rolider & Van Houten, 1984). It is doubtful, although possible, that a shorter DRO interval would have proven more effective, given the lack of effectiveness documented in the literature.

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Received December 27, 1984

Final acceptance August 28, 1985