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Reduction of Self-Injurious Behaviors in Retardates Using a Spray Mist

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REDUCTION OF SELF-INJURIOUS BEHAVIORS IN RETARDATES USING A SPRAY MIST

by

Michael F. Dorsey

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
August 1976
ACKNOWLEDGEMENTS

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Sincere appreciation goes to my wife, Meg, for her understanding and love during this period.

Michael F. Dorsey
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INTRODUCTION

A major problem often encountered in educating the severely and profoundly retarded is the elimination of self-injurious behaviors. The topographies of these behaviors include "head-banging", "arm-banging", beating with fists or knees, biting on the arm or hands, or tearing portions of flesh with fingernails (Lovaas and Simmons, 1969).

Physical restraints and heavy sedation, while effective means of controlling these behaviors, may interfere with the training of the individual (Koegel and Covert, 1972), and his or her production of more desirable behaviors. This approach can also lead to physical damage such as structural changes, demineralization, shortening of the tendons, and arrested motor development, secondary to disuse of the limbs (Lovaas and Simmons, 1969).

Behavioral methods for the elimination of self-injurious behaviors have been extensively studied and include: differential reinforcement of other behaviors (D.R.O.), reinforcement of specific competing behaviors, extinction, time-out, punishment, punishment combined with other procedures, and overcorrection.

The use of differential reinforcement of other behaviors (D.R.O.) has been investigated in a wide variety of settings, and on a large segment of the population as a means of eliminating behavior (Ferster, 1961; Peterson and Peterson, 1965; Vukelich and Hake, 1971; Mulhern and Baumeister, 1969; Repp and Deitz, 1974; Rubin, Griswald, Smith,
and DeLeonardo, 1972; and Dorsey, Barmeier, and Iwata, 1975). The procedure involved in the D.R.O. technique is to specify an undesired behavior and to deliver a reinforcer according to some time-based schedule contingent upon the non-occurrence of that targeted behavior. Repp and Deitz (1974) examined the effectiveness of D.R.O. as a singular treatment and in combination with other procedures, such as time-out, verbal reprimands and physical restraint, in the elimination of self-injurious and aggressive behaviors in a retarded child. They concluded the D.R.O. may be effective only when used in combination with some other procedure. In support of their findings, Dorsey et al. (1975) attempted to eliminate repetitive mouthing, a potentially injurious behavior in a profoundly retarded woman, using D.R.O. They found the procedure to be effective at short intervals (5 to 15 seconds), but that behavioral control gradually deteriorated as the interval was increased.

A procedure which is similar to D.R.O. is the reinforcement of a specific response that is incompatible with self-injurious behavior to be eliminated. The advantage of this procedure over D.R.O. lies in the specificity of the operant behavior to be reinforced, allowing a much simpler discrimination on the part of the subject. The effectiveness of this procedure was investigated by Lovaas, Freitag, and Gold (1965), and Weisberg, Passman, and Russell (1973). Lovaas et al. (1965) were able to reduce self-injurious behaviors in a schizophrenic girl by reinforcing a specific incompatible behavior. The study involved the reinforcement of behaviors selected as appropriate to
music while measuring the percentage of time involved in self-injurious behaviors. Weisberg et al. (1973) attempted to gain instructional control over two severely retarded individuals' stereotypic hand gestures by reinforcing an imitative response to "do this" (while the experimenter performed a specific response with his hands that was incompatible with the behavior the subject was emitting). The authors reported successfully gaining control over the subjects' undesirable behaviors.

Extinction is the removal of a potential reinforcer that may be maintaining an undesired behavior. The use of extinction has been investigated in the elimination of self-injurious behaviors as a single approach (Williams, 1959; Wolf, Birnbrauer, Lawler, and Williams, 1970; Adams, Klinge, and Keiser, 1973; Baumeister and Forehand, 1971) and in comparison studies with other treatments (Corte, Wolf, and Locke, 1971; Lovaas and Simmons, 1969; Adams, Klinge, and Keiser, 1973; Koegel and Covert, 1972). For example, Wolf et al. (1970) were able to demonstrate effective control over vomiting in a nine year old educable retarded girl with extinction procedures using a reversal design. The subject was noted to have a high rate of vomiting in a certain classroom. The baseline procedure followed by the teacher was to allow the girl to return to her own room following each occurrence of the behavior. Extinction was employed by removing the potentially reinforcing event of returning to her room after vomiting, and the vomiting decreased to zero. Potentially harmful effects to the subject are of concern when extinction is to be used. The danger involved in using extinction arises from the subject's reaction to the
schedule: an increase in the rate of responding is generally seen immediately following its application. If the subject's rate of self-injurious behavior was high during baseline, an increase could prove harmful even if it were only of a temporary nature. Also, even the most random or inadvertent reinforcement of the targeted behavior during or after the application of extinction would place the behavior on an intermittent schedule, making the response more resistant to treatment.

While extinction is the removal of a potential source of reinforcement, time-out is the removal of all external sources of reinforcement from a child by isolating that child in a sterile environment for a predetermined length of time. The major advantage of time-out over extinction is the elimination of any possible inadvertent reinforcement of the subject's responses. However, the problem with time-out as it applies to the profoundly retarded is that they are seldom in "time-in", thereby reducing the effectiveness of imposing a time-out period on them. That is, the amount of staff-patient social interaction that occurs on a typical institutional ward is limited, reducing the effectiveness of specified non-interaction periods, as would be the case with time-out. Only if the subject were in a reinforcing environment would the removal of the subject from that environment be effective in controlling behavior. The effectiveness of time-out procedures as a means of eliminating behavior has been investigated by Hamilton, Stephens, and Allen (1967) and Sachs (1973). Hamilton et al. (1967) targeted seven dangerously aggressive patients within
an institutional setting, and applied contingent time-out procedures. Results showed a reduction of the targeted behaviors in all subjects to a manageable level. Sachs (1973) applied time-out procedures to three separate behaviors: aggression, self-stimulation, and non-compliance, using a reversal design. He found time-out to be effective in the elimination of aggression and non-compliance but found that it actually increased the rate of self-stimulation in the subjects. He suggested that a further investigation of the reinforcers maintaining the behavior could lead to their elimination.

The use of aversive stimuli contingent upon the occurrence of an undesired behavior has been investigated in a number of studies (Birnbauer, 1968; Butcher and Lovaas, 1968; Risley, 1968; Tate and Baroff, 1966; White and Taylor, 1967; Whaley and Tough, 1970; Lovaas Schaffer, and Simmons, 1965; Tanner and Zeiler, 1975). Stimuli consisted of electric shock (Birnbauer, 1968; Butcher and Lovaas, 1968; Risley, 1968; Tate and Baroff, 1966; White and Taylor; 1967; Lovaas et al., 1965), loud noises (Azrin, 1958), slaps (Koegel, Firestone, Kramme, and Dunlop, 1974), lemon juice given orally (Sajwaj, Libet, and Agras, 1974), and the forced inhalation of aromatic ammonia (Tanner and Zeiler, 1975). In every case, the authors achieved a rapid and almost complete response suppression. However, the actual clinical use of punishment is rare. The restrictions placed upon the use of punishment come from both ethical (Kozol, 1975) and legal (Michigan Mental Health Code, Public Act 253, 1975) areas.

Although the range of potential aversive stimuli available to
the applied psychologist is wide and varied, many of them have properties that are undesirable for use in clinical settings. The primary stimulus that has been investigated in the reduction of behavior, electric shock (Birnbrauer, 1968; Butcher and Lovaas, 1968; Risley, 1968; Tate and Baroff, 1966; White and Taylor, 1967; Whaley and Tough, 1970; Lovaas, et al., 1965), is extremely effective, but has painful and potentially hazardous effects associated with its use. Due to these problems, the lack of public appeal reduces the probability of its being used.

Slaps (Koegel, et al., 1974) present a further problem, first in the definition of the stimulus, and second in its application. The use of a slap of the hand to the face or buttocks of a subject would be difficult to measure in terms of its strength. This would prevent the stimulus from being dispensed on a consistent basis either by the same experimenter or across different experimenters.

Ammonia (Tanner and Zeiler, 1975) presents physical danger to the subject in its application if not administered properly. An overexposure to the substance or allowing the liquid to come in contact with the subject's skin can cause damage. The application of this procedure must be limited to highly trained staff, thereby decreasing its potential for wide scale usage.

Exposure to extremely loud noises (Azrin, 1958) has the potential of causing physical damage to the subject's ears, while the use of lemon juice (Sajwaj, et al., 1974) may cause permanent damage to the subject's teeth if used over an extended period of time.

A recent approach to the elimination of self-injurious behaviors is the contingent application of "overcorrection" procedures as described
by Foxx and Azrin (1973). The authors describe a variety of procedures for the elimination of several types of undesired behaviors. Of these, the one used to eliminate self-injurious behaviors is a technique called "positive practice," through which the subject is directed to exhibit an extended series of appropriate behaviors that involve topographical features which are incompatible with the behavior to be eliminated. An example of the procedure would be to position the subject's hands in a randomly ordered set of positions contingent upon the subject using his or her hands in a self-injurious manner as in face slapping. As the subject's hands are placed in the positions, they are held for a specific amount of time. The duration of the treatment is generally suggested to extend over a period of 10 to 15 minutes. Additional procedures can be developed to treat other inappropriate behaviors having different topographical features. Head banging could be over-corrected by establishing a series of head positions (like the hand positions used for face slapping) which were to be maintained for specified lengths of time. Epstein, Doke, Sajwaj, Sorrell, and Rimmer (1974) found the application of this type of overcorrection to one targeted behavior to have a positive effect in the reduction of other undesired behaviors the subject might emit; however, it also increased some undesired behaviors. The authors concluded that overcorrection, because of its generality, is an effective method of dealing with a multiplicity of problem behaviors in one child. The two major disadvantages of overcorrection are the amount of time needed to administer the procedure successfully, and its potential for abuse. The overcorrection
procedure requires the trainer to engage in specific behaviors with the subject over extended amounts of time which would limit the time available to be spent with other children. Further, when dealing with a resistant child, having to hold that child's hands in a specific position for long periods of time could result in the experimenter becoming abusive to the child. Also, if the child does successfully escape the experimenter's grasp during the application of the treatment, inadvertent reinforcement may occur. A further problem would be the limited number of children that could be treated in one class at the same time.

Several studies have attempted to compare the relative effectiveness of many of these procedures (Corte, et al., 1971; Lovaas and Simmons, 1969; Bachman, 1972). Corte et al. (1971) compared extinction, reinforcement of competing behaviors, and punishment. Their findings suggest extinction may be ineffective, and that the effectiveness of reinforcement of competing behaviors may be highly dependent upon the deprivation of the subject. Punishment, however, proved to be quite effective in the reduction of targeted behaviors.

Lovaas and Simmons (1969) compared extinction with punishment, and also included a reversal procedure using social reinforcement contingent upon the targeted behaviors. They found that extinction may be an effective procedure for reducing self-injurious behaviors; however, due to its delayed effects, it may allow for severe damage to the subject during its application. Punishment was found to be the most effective procedure in the rapid reduction of undesired behaviors. Lovaas and Simmons (1969) also found that the subject's rate of self-injurious
behaviors increased under the application of contingent reinforcement.

Bachman (1972) compared treatment modalities of self-injurious behaviors based on data found in animal experimental studies using D.R.O., reinforcement of competing behaviors, extinction, time-out, and punishment. He concluded that punishment is the most effective means of eliminating a behavior in animals and suggested that it should be the most effective in eliminating self-injurious behaviors in humans. He also noted that the harmfulness of the punishing stimulus would be small when compared to the cumulative dangerous effects of the self-injurious behavior.

Considering each of the previous techniques described as singular procedures, each with their strong and weak points, Wolf, Risley, and Mees (1964) investigated the use of combinations of several procedures in the elimination of self-injurious behavior trying to increase their overall effectiveness. A combination of punishment with extinction contingent upon specified targeted behaviors, with a D.R.O. used to reinforce the subject for nontargeted behaviors was used in an attempt to eliminate violent tantrumming and self-injurious behaviors in a three and a half year old boy. Wolf and Risley (1967) conducted a follow-up study, in which the same boy's behaviors were eliminated in his special education classroom. This child was eventually allowed to enter a regular classroom.

In the treatment of self-injurious behaviors, one of the major considerations in the selection of a procedure must be its proven ability to reduce the behavior rapidly. Extinction's tendency to increase
the target behavior prior to decelerating it makes this technique
a less desirable treatment for self-injurious behavior (Burmeister
and Forehand, 1971). Both D.R.O. and reinforcement of incompatible
behaviors as treatments in the elimination of self-injurious be-
haviors have some delay in their effects which may allow for interim
damage to the subject. The only techniques repeatedly demonstrated to
be effective involve the use of aversive stimulation. As pointed out,
however, these procedures have many properties that make them undesirable
in their practical application. Shock, ammonia, slaps, and loud noises
all are similar in their painfulness; while many, such as ammonia and
lemon juice, may cause permanent damage to the subject. While these
punishers present problems mainly dealing with their external effect,
the use of negative social attention presents several problems; i.e.,
the potential physical abuse by the experimenter, the lack of replic-
cability of the treatment, and the possibility that any type of attention
may be reinforcing despite its type.

The purpose of this study is to investigate the effects of a pun-
ishing stimulus that presents few, if any, harmful effects, yet provides
for rapid response suppression over a wide variety of self-injurious
behaviors. The stimulus to be investigated is a mist of water directed
toward the face of a subject contingent upon the occurrence of a tar-
geted self-injurious behavior.
METHOD

Subject and Setting

Seven profoundly retarded, non-ambulatory residents of a private residential facility served as subjects. Selection was based upon a high rate of behaviors considered to be self-injurious. Subjects were placed in a visually restricted area of their classroom for all sessions, with the exception of one subject whose sessions were conducted in her bed. The experimental area was approximately 4 x 6 feet, separated from the rest of the room by a movable partition.

Subject 1 was a 25-year-old female who had been institutionalized since the age of 3 years. Her diagnosis was profound mental retardation due to postnatal infection, rubeola. She appeared to have vision and hearing that were within normal limits but had no speech and showed few positive instruction-following behaviors. She had major motor seizures, and quadriplegic involvement with spasticity of the lower extremities. A verbal report from her mother indicated she had engaged in self-injurious and aggressive behaviors for less than five years. The self-injurious behavior targeted for this study was one in which the subject would, with a pincer-like grasp of her thumb and index finger, tear portions of flesh from her lip and forearm.

Subject 2 was a 10-year-old female who had been institutionalized since the age of four years. Her diagnosis was profound mental retardation associated with a congenital cerebral defect. She had impairments of both hearing and vision, and her physical condition included cerebral
palsy, quadriplegia, and hip-dysplasia. The targeted behavior for the subject was a repetitive mouthing response that generally precipitated occurrences of vomiting. There was no indication of the history of this behavior in the subject's records.

Subject 3 was a 37-year-old female who had been institutionalized since the age of ten. A diagnosis of encephalopathy due to congenital cerebral defect was noted. She had no speech, and showed no instruction-following behaviors. The first indication of a repetitive mouthing response, the target behavior for this study, had been recorded in a psychological report when the subject was 17 years of age.

Subject 4 was a 26-year-old female who had been institutionalized since the age of four years. Her diagnosis was profound mental retardation with encephalopathy at birth due to unknown causes. She had no indication of visual or hearing impairment, but exhibited no instructional control. Her physical condition included cerebral palsy and severe spastic quadriplegia. No indication in the subject's records was given as to the onset of her self-injurious behavior, hand-biting, though the degree to which the subject's hands were damaged from the repetitive behavior suggested a long history.

Subject 5 was a 19-year-old male who had been institutionalized since the age of three years. His diagnosis was profound mental retardation due to Schilder's Disease. His physical condition included severe quadriplegia, and some limitations of both vision and hearing. The targeted behavior for the subject was a repetitive mouthing response. There was no indication of the history of this behavior in the
subject's records.

Subject 6 was a five-year-old female who had been institutionalized since the age of one and a half years. Her diagnosis was congenital encephalopathy, associated with a prenatal infection. The subject had impaired hearing and vision and exhibited motor seizures. The subject's mother indicated a problem with repetitive mouthing prior to admission to the facility.

Subject 7 was a 13-year-old female resident who had been institutionalized since the age of one and a half years. Her diagnosis was profound mental retardation due to postnatal brain trauma. Her physical condition included quadriplegia, associated with spasticity. She engaged in severe head banging which was noted in her records upon admission.

Permission was obtained to run this study from the director of the facility prior to its beginning.

Observation

Targeted behaviors were selected on the basis of their possible injurious effects upon the residents, and their relative high rate of occurrence during pre-baseline observations. The response definitions used in this study were as follows:

1) Mouthing - insertion of either hand into the mouth beyond the first knuckle.

2) Hand-biting - insertion of either hand into the mouth beyond the first knuckle, combined with a rotating motion of the jaw that would indicate chewing. This behavior was subject specific and discriminable by the outcome.

3) Skin-tearing - closure of the index finger and thumb in a pincer-like fashion while in contact with either the lip or forearm.
4) Head-banging - a repetitious contact of the head with a stationary object or other portion of the body.

The occurrences of these behaviors were recorded during continuous 10-second intervals using a partial interval scoring procedure (Powell, Martindale, and Kulp, 1975). A cassette tape containing pre-recorded auditory prompts was used to indicate the beginning of each interval. The percent of intervals during which the targeted behavior occurred was obtained by dividing the positively scored intervals by the total number of intervals and multiplying by 100. All sessions were of a constant length for each subject, usually 20 minutes.

**Reliability**

Reliability was taken for each subject's data at a minimum of every tenth session, or at least once per condition. During sessions in which reliability was assessed, data was taken by both the experimenter assigned to that session and an independent observer. To avoid the reliability observer scoring only the consequation of the behavior, and not the actual occurrence of behavior during treatment sessions, consequences were delayed on a random schedule with the interval varying from one to five seconds. Such a delay would allow the behavior to occur in one interval and the punisher in the next; the observer, if scoring only the consequation of the behavior would miss correct intervals randomly and lower the reliability quotient. Reliabilities were calculated by dividing the number of agreements of the targeted behavior on an interval-by-interval basis by the total number of agreements plus disagreements. Reliability scores ranged from 96.5% agreements to 100%
agreements, with a mean of 99.2% agreements across all sessions.

Procedures

Baseline. Target behaviors were recorded for each subject in the absence of contingencies. Baseline data were recorded for each subject until trends in the data stabilized.

Water Mist. The stimulus used in the study was a mist of water directed toward the subject's face contingent upon the occurrence of a self-injurious behavior. The water was dispensed from a standard soft plastic plant sprayer, available in most garden supply stores. The sprayer was always adjusted to insure maximum misting effect (diffusion of the spray, as opposed to a direct stream of water) and held no closer than one foot from the subject's face.

Experimental Design

An ABAB reversal design (Baer, Wolf, and Risley, 1968) was used throughout this experiment for each subject, except for Subject 6 who never underwent a reversal, due to the severity of his self-abusive behavior. Following the collection of the initial baseline data, the water mist was applied contingent upon the targeted response. A second baseline and subsequent re-institution of the treatment procedures were conducted in order to demonstrate functional control of the procedure over the response.
RESULTS

The water mist proved to be an effective stimulus for all subjects in the reduction of self-injurious behaviors. Mean percentages of intervals of inappropriate behaviors presented for each subject across experimental conditions are presented in Table 1. For all subjects, targeted behaviors fell to below 5% of observed intervals within an average of 3.43 days. The behaviors were suppressed an average of 51.47% in the initial treatment phase and 60.13% in the return to treatment, when compared to the initial baseline rates.

Records for each subject's self-injurious behaviors are presented in Figures 1 through 7. Figures 1 through 4 indicate the behavior of mouthing for Subjects 1 through 4. Data for hand-biting (Subject 5), skin-tearing (Subject 6), and head-banging (Subject 7) are presented in Figures 5, 6, and 7, respectively.

The reduction of mouthing in Subjects 1, 2, 3, and 4 represent almost complete elimination of the targeted behavior given a wide range of baseline responding. Baseline means varied from 87% to 54.2%. The reduction of self-injurious behaviors in Subjects 5, 6, and 7 indicates a substantial suppression of the targeted behavior. The baseline percentage for Subject 5 remained stable for all but one of the seven sessions. The data for Subject 6 remained stable throughout all conditions, with complete suppression of skin-tearing after only one session in the first treatment condition. The high variability of the baseline percentages in Subject 7 as compared to treatment
Table 1: Condition means of self-injurious behaviors across subjects.
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<td>5</td>
<td>SKIN-TEARING</td>
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<td>6</td>
<td>HEAD BANGING</td>
<td>39.75</td>
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# CONDITIONS NOT RUN
Figure 1: Percent of 10 second intervals for Subject 1.
Figure 2: Percent of 10 second intervals for Subject 2.
Figure 3: Percent of 10 second intervals for Subject 3.
Figure 4: Percent of 10 second intervals for Subject 4.
Figure 5: Percent of 10 second intervals for Subject 5.
Figure 6: Percent of 10 second intervals for Subject 6.
Figure 7: Percent of 10 second intervals for Subject 7.
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percentages also shows a substantial decrease.
DISCUSSION

The overall purpose of this study was to evaluate the effects of a mild punisher across a variety of subjects who displayed various types of self-injurious behaviors. The study utilized a reversal design replicated across seven subjects.

The use of the water mist as an aversive procedure within a typical applied setting is dependent upon many variables. Among these are the problems previously cited: Will the water mist work? Does it harm the subject? How likely is it to be abused and what are the results of such abuse? Other variables that must be considered are its use by non-professional staff and questions of enhancing its generality.

Results indicated a rapid response suppression for all seven subjects relative to initial baseline rates. The mean number of days required to reduce the behavior to less than five percent of observed intervals indicates a decrease to this level in an average of less than four 30-minute sessions. This decrease was consistent across subjects. The data show a mean reduction in responding of 51.47% during the initial treatment condition, and 60.13% during the second treatment. Although these data can be misleading due to the variability of the initial baseline rates across subjects, they do indicate a substantial reduction in behavior. The two sets of data considered together suggest a rather rapid response suppression with a large decrease in responding.

A major factor in the non-use of punishment procedures in many institutions is that they inflict a high degree of what subjectively
could be referred to as "pain" upon the subject. Electric shock, ammonia, slaps and loud noises all have properties that are apparently painful to the subject. Rather than a description of the amount of pain involved with the water mist, most experimenters who underwent administration of the stimulus described it in terms of being uncomfortable or annoying. It is this feature that should increase consumer appeal for the use of the treatment. However, the minimal painfulness of the stimulus might detract from its usefulness with higher level subjects whose behavior might be maintained by the social attention of the person administering the spray.

The effectiveness of many aversive stimuli described in the literature is based on the minimal application of some potentially dangerous treatment which, if applied for long durations, could cause physical damage. Such is the case with most of the treatments considered in this text. An example would be the damage to the mucosa of a subject who had been exposed to long durations of aromatic ammonia. Similar situations exist for the other stimuli. In contrast to this standard drawback of most aversive stimuli, the water mist would appear not to produce such effects. The most serious effect of the water mist used excessively would be an extremely wet subject. An experimenter would have to go far beyond the procedures outlined to harm the subject.

Problems of generality plague many behavioral treatments. If the subjects are only treated in special environments having highly specific stimulus conditions, the subjects will adapt appropriately; that is, their responding will typically remain at initial baseline
rates in settings other than those in which they are treated (Corte, et al., 1971). In order to increase generality of treatment effects across settings, general ward staff must be free to apply the treatment whenever a response is noted in any setting. The fact that the stimuli cannot cause damage to the subject, while overuse of the treatment will cause no harm to the subject, enhances this possibility. It is not always possible or desirable, from a generality point of view, to position staff member and subject within close proximity. Such placement would set the occasion for a discrimination on the part of the subject that treatment would be applied only in this specific condition.

The misting apparatus described allows for treating subjects out of range of a short-range mist. The spray bottle is adjustable to a fine stream that will travel over a much greater distance, up to 6 to 8 feet. The possibility of damage to the subject's eyes by a stream of water discussed in the introduction is negatively correlated with distance; therefore, this would not be a problem. Thus, it would be feasible to station spray bottles in convenient locations around a ward for general use by the staff, increasing the generality of the treatment.

The generality of the procedure was demonstrated both across subjects and the various types of self-injurious behavior. The subjects selected offered a wide range of age and physical involvement, with few consistent factors across subjects other than their level of mental retardation. The difference in the self-injurious behaviors that the subjects exhibited varied in several aspects. Even those subjects defined as "mouthers" had some differences in the aspects of their
behaviors, such as duration, overall percent of responding both within and across sessions, and the degree of physical damage done as a result of the response. These results indicate adaptability of the water mist as a punisher with a variety of self-injurious behaviors.

Another feature of the spray that may enhance its use across settings is its ease of application. Not only is the actual administration of the stimulus easy, but the effort and cost of maintaining the equipment is minimal. The low probability of harm to the subjects reduces the precautions that must be considered with stimuli, such as ammonia (Tanner and Zeiler, 1975). The stimulus may, therefore, be applied to subjects as a secondary task for the experimenter; that is, while concentrating on another subject or task, the experimenter may use the mist quickly and without thought of harm to the subject.

The specific procedure described in this study, although effective, is not necessarily recommended as a single treatment for disruptive or inappropriate behaviors. Research on the effects of punishment procedures, even those which are supposed to be "educative" in nature (e.g., overcorrection), have consistently failed to demonstrate their effectiveness in developing appropriate responses. In fact, Epstein, et al., (1974) have provided data which suggest possible negative side effects with the use of overcorrection (e.g., reducing one inappropriate behavior via overcorrection led to an increase in an untreated inappropriate behavior). Therefore, it is recommended that punishment procedures such as the one described in this study be used in conjunction with other procedures so as to teach new, appropriate responses while
eliminating undesirable ones.

The selection of an appropriate behavioral deceleration procedure must be subject specific. That is to say, the procedure should fit the behavior to be eliminated. It is recommended that overtly punishing procedures be used only in cases where the behaviors to be eliminated, if not reduced rapidly, present potential danger to the subject. In cases of less harmful behaviors (e.g., stereotypic rocking, etc) other procedures such as D.R.O., extinction, or time-out may be a more appropriate choice. Although they may reduce the subject's behavior more slowly than punishment, they have been demonstrated as effective procedures.
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