

TREATING SELF-INJURY: WATER MIST SPRAY VERSUS FACIAL SCREENING OR FORCED ARM EXERCISE

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In three experiments, the effect of water mist spray on self-injurious and collateral behaviors was compared with either facial screening or forced arm exercise. Water mist spray was as effective as facial screening in suppressing face-slapping in Experiment 1. However, it was not as effective as facial screening for self-injurious finger-licking in Experiment 2 or forced arm exercise for excessive ear-rubbing in Experiment 3. These results suggest that while water mist spray is effective, it may be less so than alternative procedures. In Experiments 2 and 3 there was a consistent decrease in the occurrence of untreated maladaptive behaviors. In addition, there was a moderate increase in appropriate social interaction in Experiment 2 and a substantial increase in Experiment 3.

DESCRIPTORS: self-injury, water mist spray, facial screening, forced arm exercise, alternating treatments

Concern over the use of highly aversive treatments for self-injurious behavior (SIB) in the mentally retarded has led to the search for relatively mild but effective punishment techniques. One such procedure involves spraying the person's face with a fine water mist following each occurrence of SIB (Bailey, Pokrzywinski, & Bryant, 1983; Dorsey, Iwata, Ong, & McSween, 1980). The procedure is safe and relatively mild, probably being annoying rather than painful (Dorsey et al., 1980). It can be administered quickly in a group situation as it does not require long one-to-one contact or removal from the instructional area (Bailey et al., 1983). In this study, the effect on SIB of water mist spray was compared with that of facial screening (Experiments 1 and 2) and forced arm exercise (Experiment 3), two other mild procedures that have been successfully used to treat SIB. A secondary aim was to assess the collateral effects associated with the application of punishment procedures.

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EXPERIMENT 1

Experiment 1 involved a comparison of the efficacy of water mist spray and facial screening (Lutzker & Wesch, 1983) on self-injurious face-slapping.

METHOD

Subject

The subject was a 17-year-old girl who had been institutionalized for 11 years. She was diagnosed as profoundly retarded and had at least a 7-year history of face-slapping. The direct-care staff considered SIB to be moderately serious, often needing medical attention. Previous attempts had been made to treat her self-injury using brief contingent physical restraint, extinction, verbal reprimand, differential reinforcement of other behavior (DRO), and medication. Although each method was partially effective, no clinically significant reductions in the self-injury were achieved. Prior to the start of this study the subject had not been on any medication for about 6 months.

Procedure

Observation and treatment sessions were all carried out in the dayroom of the subject's residential ward. The subject was in a group with six to eight

other residents and in the care of one direct-care staff member. Toys and other play materials were available but no structured play or other training was provided. Sessions were scheduled twice daily and data were collected by two trained observers using an interval-recording technique. Each session lasted 30 min (plus whatever time was required to administer the treatment procedures) and was divided into 180 10-s intervals. The number of self-injurious responses in each interval was recorded. Time taken for administering a treatment was excluded. The SIB studied, face-slapping, was defined as a slap to the face by either hand. Reliability checks were made by a trained, independent observer on approximately 25% of the sessions across the three phases of the study. Interrater agreements were calculated for both occurrence and nonoccurrence of self-injury using an interval-by-interval comparison. Agreement scores ranged from 87% to 100% ($M = 94\%$) on occurrence and 79% to 100% ($M = 90\%$) for nonoccurrence.

An alternating treatments design (Barlow & Hayes, 1979) was used to evaluate the differential efficacy of water mist spray and facial screening for treating the SIB of face-slapping.

Baseline. Observations were carried out in both sessions for 5 days. No contingencies for any behavior were programmed during this phase and the staff were instructed to follow normal ward routine.

Treatments. During the first (alternating treatments) phase, two procedures were introduced. The first was water mist spray, in which the subject's face was sprayed with 0.5 to 0.75 cc of water at room temperature immediately after each occurrence of face-slapping. The second treatment was facial screening, in which a terrycloth bib (30 cm \times 35 cm) was tied around the subject's neck and pulled over her face and held firmly at the back of her head for 5 s after each occurrence of face-slapping. Release from the facial screening was contingent on 5 s of nondisruptive behavior. Two therapists administered the treatments but only one was present at any one time. The two procedures were counterbalanced daily across time of day and

therapists during the 10 days of this phase. In a follow-up phase lasting 15 days, the more effective treatment was implemented each day across both time periods.

On average, water mist spray took about 5 s to administer contingent on each occurrence of SIB. The average duration of screening during the first five sessions was about 25 s and ranged from 5 s (minimum requirement) to 1 min. Thereafter, the average length of screening was usually about 5–6 s. Only one therapist was required to execute the procedures.

RESULTS

Figure 1 shows the total number of face-slaps during the alternating treatments phase and the mean number of face-slaps during the two daily sessions in the baseline and follow-up conditions. The overall mean number of face-slaps per session during baseline was 21.9 (range, 18.5–26.0). The mean number of SIBs during water mist spray sessions was 5.6 (range, 2.0–10.0); during the facial screening, the mean number was 4.2 (range, 0–12.0). In the following phase, when facial screening was used in both treatment sessions each day, SIB decreased further to an overall mean rate of 0.9 responses per session (range, 0–3.5).

EXPERIMENT 2

Experiment 2 compared the same two procedures with another SIB, excessive finger-licking, and also investigated whether the treatment effects could be replicated across different therapists and time (maintenance). Collateral behaviors, both inappropriate and socially appropriate, were also monitored during the study.

METHOD

Subject

The subject was a 17-year-old girl who had been institutionalized for 12 years. She was profoundly retarded and resided in the same ward as the subjects in the other two experiments. She had a 10-year history of low-rate self-injurious behav-

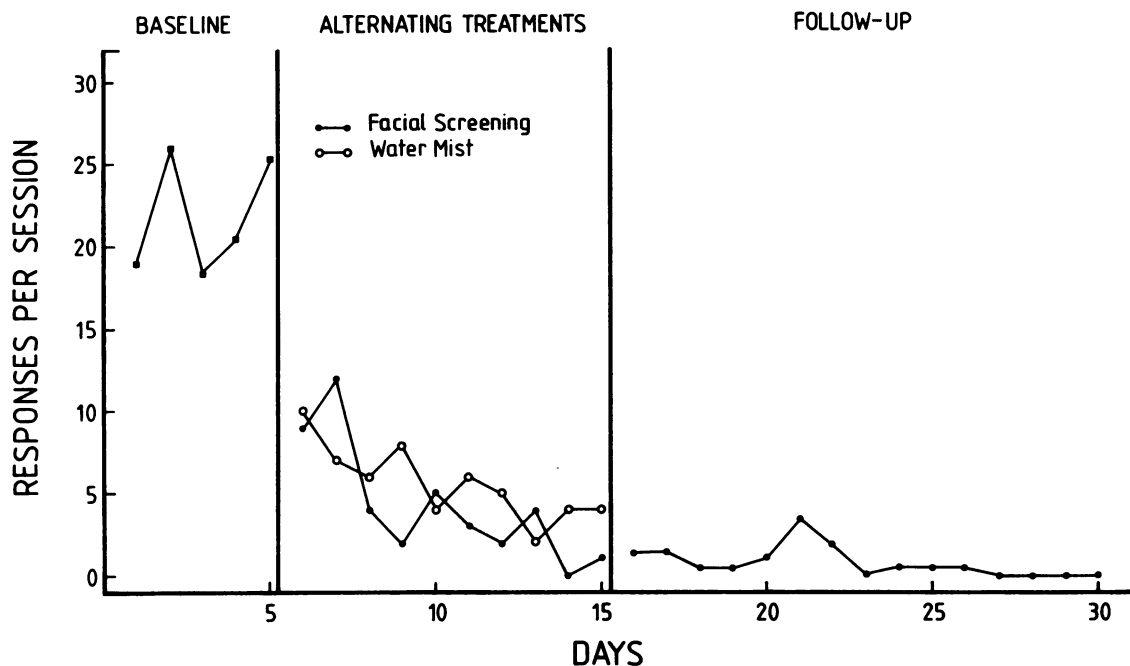


Figure 1. The number of face slaps made in each session during the alternating treatments phase. For the baseline and follow-up phases, the means of the two daily sessions are shown.

ior, including face-punching, jaw-hitting, and self-biting, which did not need programmed intervention. Her predominant self-injurious behavior was excessive finger-licking. The subject was not receiving medication at the time of the study. Although no systematic behavioral intervention for SIB had been used previously, extinction and DRO procedures had been used informally by the direct-care staff with minimal effectiveness.

Procedure

Baseline and treatment sessions were held in the dayroom of the subject's residential ward, except during the maintenance phase, when observations were scheduled throughout the ward. Observations were made by four trained observers during two 1-hour sessions each day (excluding treatment time). The principal data were collected by one observer assigned randomly each day. Three inappropriate behaviors were observed, defined as follows: finger-licking—subject's tongue contacts her thumb or forefinger; jaw-hitting—subject hits

her jaw with a closed fist or the palm of her hand; finger-rubbing—subject rubs her index finger and thumb together with sputum. Appropriate social interaction was defined as the subject engaging in behavior appropriate to the situation. Examples include smiling, communicating, or laughing in response to a resident or staff member talking to or playing with the subject.

For recording, the 60-min sessions were divided into 360 10-s intervals. During each interval all occurrences of finger-licking and jaw-hitting were recorded, while only the occurrence or nonoccurrence of finger-rubbing and of appropriate social interaction was recorded. Time taken for administering a treatment was excluded as in Experiment 1. The mean occurrence agreements (with ranges in parentheses) were: finger-licking, 93% (84%–98%); jaw-hitting, 87% (79%–100%); finger-rubbing, 81% (76%–97%); and appropriate social interaction, 92% (85%–100%). The mean non-occurrence agreements were: finger-licking, 89% (73%–100%); jaw-hitting, 86% (70%–100%);

finger-rubbing, 81% (75%–95%); and appropriate social interaction, 91% (80%–99%).

An alternating treatments design was used to evaluate the differential efficacy of water mist spray and facial screening on the SIB of finger-licking.

Baseline. Observations were carried out in both sessions for 7 days. Toys and other play materials were available but no structured or formal play was organized by the staff.

Treatments. During the first treatment phase, the two procedures used in Experiment 1, water mist spray and facial screening, were presented contingent on finger-licking. The treatments were counterbalanced across time of day and therapists during the 7 days of this phase. In the second treatment phase, which lasted 12 days, the more effective treatment was implemented across both sessions each day. In a third phase over the next 11 days, four new direct-care staff sequentially administered the more effective treatment during both sessions.

As in Experiment 1, the average duration of water mist was about 5 s, and about 30 s (range, 5 s to 1 min 30 s) for facial screening in the first five sessions. Thereafter it averaged about 5–6 s.

Maintenance. In the final phase, the direct-care staff were required to carry out the treatment whenever the subject licked her fingers. Observations were carried out as in other phases but over an 8-hour period 1 day per month. This lasted 6 months, after which the subject was included in a social skills training program.

RESULTS

Figure 2 shows the rate of finger-licking and the percent intervals of appropriate behavior across all conditions. For all but the alternating treatments phase, the data from the two daily sessions were averaged. During the various phases, the mean frequencies per minute for finger-licking (with ranges in parentheses) were: baseline, 3.7 (2.6–6.6); alternating treatments: water mist spray, 2.8 (1.1–5.5) and facial screening, 0.2 (0.0–0.3); first phase of facial screening alone, 0.1 (0.0–0.3); replication across therapists, 0.5 (0.0–1.7); and the 6-month maintenance phase, 0.05 (0.03–0.07).

In terms of collateral behaviors, jaw-hitting de-

creased during the study from a mean rate of 1.5 per minute during baseline to virtually zero in the maintenance phase. A similar trend occurred with finger-rubbing, which decreased from about 86% in the baseline to about 12% in the maintenance phase. As shown in the figure, a greater increase in appropriate social interaction occurred under facial screening than under water mist in the alternating treatments phase. Appropriate social interaction continued to increase during the facial screening alone condition until new therapists were introduced. With one exception (therapist C), appropriate social interaction initially decreased and then increased with the introduction of each new therapist, and reached an average of 15% in the maintenance phase.

EXPERIMENT 3

Although water mist spray caused a decrease in the SIB of the two subjects in Experiments 1 and 2, facial screening was more effective in Experiment 2. Experiment 3 compared the effect of water mist spray on SIB with that of another punishment procedure, forced arm exercise (deCatanzaro & Baldwin, 1978).

METHOD

Subject

The subject, a 17-year-old girl who had been institutionalized for 12 years, resided in the same ward as the subjects in the previous two experiments. She was diagnosed as profoundly retarded and had a 10-year history of SIB involving face-hitting and rubbing her ears. As a result of almost continual rubbing, her ears had become badly infected. No systematic behavioral intervention for SIB had been used, but contingent verbal reprimands and DRO had been used informally by the direct-care staff with limited success. The subject was an epileptic and received 200 mg of Tegretol daily throughout the study.

Procedure

Observation and treatment sessions were conducted in the residential ward where the subject lived with 38 other profoundly retarded girls. In

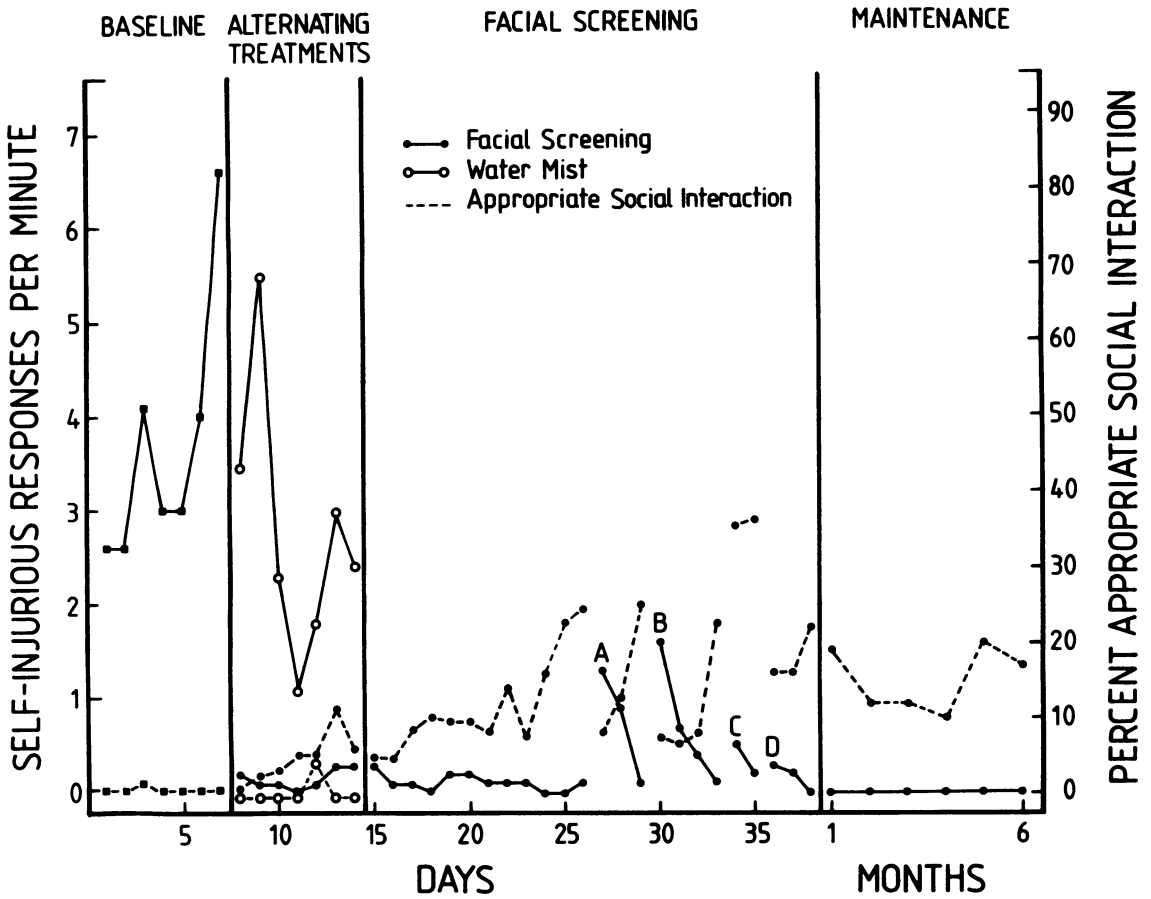


Figure 2. The number of finger-licks per minute and the percent occurrence of appropriate social interaction in each session during the alternating treatments phase, and the means of the two daily sessions during baseline and the facial screening alone phases. The mean data are presented for the maintenance phase. A, B, C, and D refer to therapists.

addition, observations were made throughout the ward during the maintenance and follow-up phases. Observations were undertaken by three trained observers in a morning and afternoon session each day. An interval-recording method was used to collect the data. Each session lasted 1 hour, divided into 360 10-s intervals. Time taken for administering a treatment was excluded as in previous experiments. During each interval, the occurrence or nonoccurrence of each of the following behaviors was recorded: ear-rubbing—rubbing her left ear with her hand; face-hitting—hitting her face with the palm of either hand; appropriate social interaction—engaging in behavior appropriate to the situation. Examples included smiling, communicating, or laughing in response to a resident or staff member talking to or playing with the subject.

All reliability procedures were carried out in the same manner as described previously. The mean occurrence agreements (with ranges in parentheses) were: ear-rubbing, 89% (82%–100%); face-hitting, 100%; and appropriate social interaction, 83% (79%–97%). The mean nonoccurrence agreements were: ear-rubbing, 85% (75%–100%); face-hitting, 100%; and appropriate social interaction, 80% (70%–96%).

An alternating treatments design was used to compare the efficacy of water mist spray and forced arm exercise on the SIB of ear-rubbing.

Baseline. Observations were carried out in both sessions for 15 days. No contingencies were programmed for any behavior during this phase, and the direct-care staff were instructed to carry out their usual ward routine. Toys and other play ma-

terials were present in the ward. One direct-care staff member was responsible for the subject and seven other residents.

Treatments. In the first treatment phase, two procedures were used, alternated over the two daily treatment sessions. The first was water mist spray, which was identical to that in Experiments 1 and 2 except that it was now applied to ear-rubbing. The second treatment was forced arm exercise, which was given each time the subject moved her hand towards her ear. The therapist caught her wrist before she touched her ear, extended her arm until it was straight and by her side and then gently pumped it up and down 25 times at a rate of approximately one per second. The alternating treatments phase lasted 15 days. In the second treatment phase, which lasted 10 days, the more effective treatment was implemented in both sessions.

The average duration of the water mist was about 5 s and for the forced arm exercise, about 30 s. Only one therapist was required to execute each of the procedures.

Maintenance. In a third phase, all the direct-care staff in the subject's ward were instructed to use the forced arm exercise for each occurrence of ear-rubbing. Data were collected as in the previous phase, but over an 8-hour period 1 day per week. The maintenance phase lasted 10 weeks.

Follow-up. During follow-up, observations were made over an 8-hour period 1 day each month for 12 months.

RESULTS

Figure 3 shows the percent intervals of ear-rubbing and appropriate behavior across all conditions. For all but the alternating treatments phase, the data from the two daily sessions were averaged. The mean percentage of intervals in which SIB occurred (with ranges in parentheses) were: baseline, 98.4 (83–100); alternating treatments: water mist spray, 22.7 (4–83); forced arm exercise, 9.2 (0–54); forced arm exercise alone, 2.3 (0–11); and virtually zero in both the maintenance and follow-up phases.

The mean percentage of intervals during which face-hitting occurred was 0.8 during baseline, increasing during the alternating treatments phase to 4.5, but decreasing to only 0.2 by the follow-up phase. As shown in the figure, appropriate social interaction increased under the two treatment conditions in the alternating treatments phase to a mean of about 3% during water mist and about 15% during forced arm exercise. Appropriate social interaction initially decreased and later increased when forced arm exercise was used alone, thereafter gradually increasing to a mean of about 44% during follow-up.

DISCUSSION

Water mist spray suppressed the target behaviors being treated but less quickly and completely than alternative treatments, facial screening (Experiment 2) or forced arm exercise (Experiment 3). For all subjects, when the more effective treatment was used alone, their SIB reached zero or near-zero levels within a few days, although in Experiment 3 there was a brief, initial increase. An increase in SIB also occurred when new therapists were introduced in the third treatment phase of Experiment 2 but, again, this was only transient and was minimal with the last two therapists. By the end of each experiment, the SIB was completely suppressed.

One of the aims of this study was to compare water mist spray with two other procedures. A limitation of any such comparison is that, in the absence of other similar studies, a definitive statement can only be made about the particular parameter used in relation to the behaviors treated (Watson, Singh, & Winton, 1986). It can be argued that the superiority of forced arm exercise in Experiment 3 occurred, at least in part, because it involved preventing the arm from reaching the face rather than following an actual hit as occurred with water mist spray. In this study, it is not possible to draw a firm conclusion because the forced arm exercise was made on the precursor, whereas the water mist was made contingent on the completion

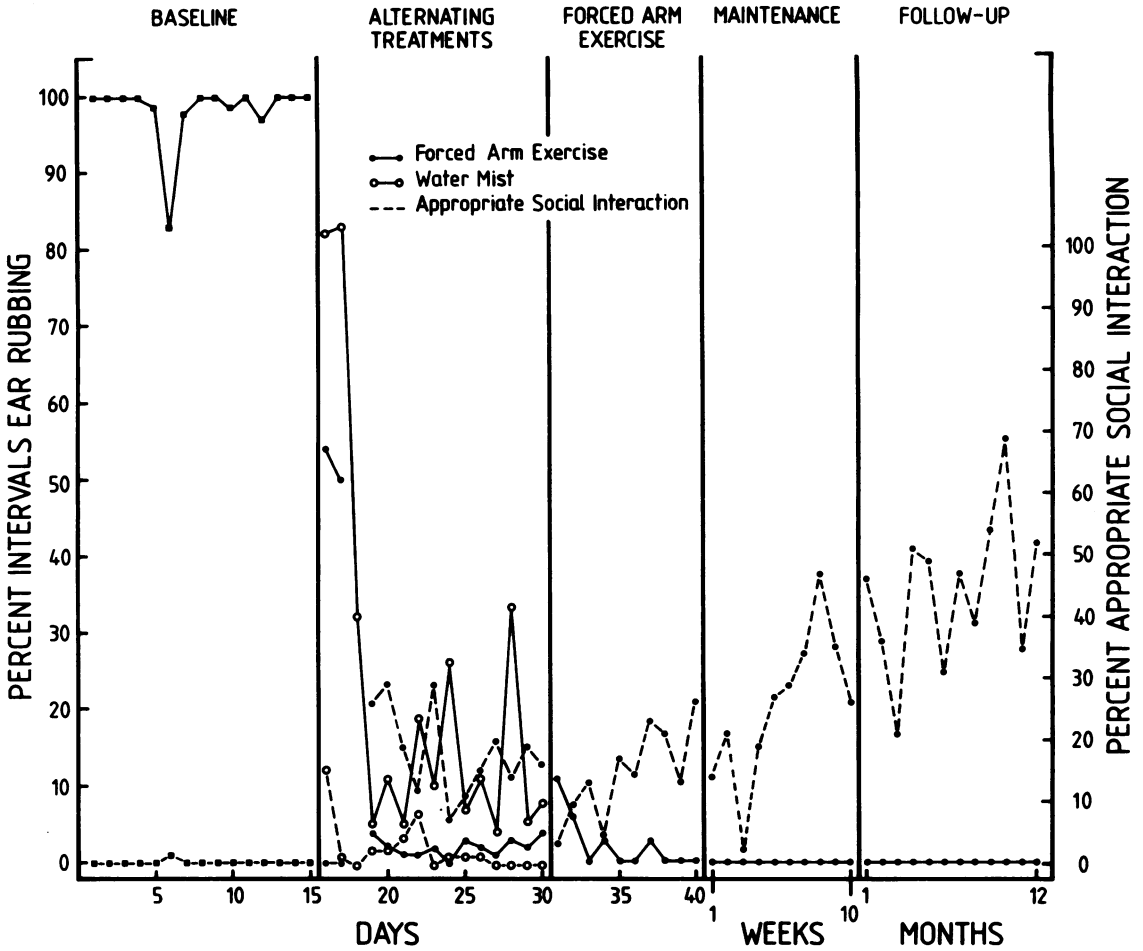


Figure 3. The percent occurrence of ear-rubbing and appropriate social interaction in each session during the alternating treatments phase, and the means of the two daily sessions during baseline and forced arm exercises alone phases. The mean data are presented for the maintenance and follow-up phases. The missing data point on day 18 (forced arm exercise) indicates the subject was not available for that session.

of the behavior. In practical terms, a more realistic comparison would be between both procedures applied after the behaviors are completed because residential staff usually are not close enough to stop the behavior before it is completed.

Although untreated, the undesirable and socially appropriate collateral behaviors monitored in Experiments 2 and 3 changed in positive directions. In Experiment 2, jaw-hitting and finger-rubbing decreased consistently with the introduction of facial screening, although only jaw-hitting reached near-zero levels. In Experiment 3, face-

hitting decreased to near-zero levels following a substantial increase during the alternating treatments phase.

The most significant changes in collateral behaviors were observed in the percent occurrence of appropriate social interaction, particularly in terms of the magnitude and generality of the change. In Experiment 2, appropriate social interaction differentially increased when the two treatments (water mist and facial screening) were introduced in the alternating treatments phase and increased further when the screening procedure was used alone. A

similar differential increase was observed in Experiment 3, when water mist and forced arm procedures were introduced in the alternating treatments phase, with greater increases being observed in successive phases when only the forced arm procedure was used. Given the growing concerns about punishment procedures, the implications of unprogrammed benefits of the procedures used in this study are very significant. Future studies might focus on this aspect of the procedures.

Because appropriate social interaction increased over time in both Experiments 2 and 3, it may be argued that this may be due to a maturational confound (Campbell & Stanley, 1963) rather than the side effects of the independent variable. However, cogent arguments can be presented against such an interpretation. The treatment procedures had a differential impact on appropriate social interaction during the alternating treatments phase in both experiments, suggesting that the collateral effects were indeed a consequence of the independent variables. In Experiment 2, appropriate social interaction initially decreased and then increased with the introduction of each new therapist, suggesting that collateral effects were not the result of mere passage of time. Finally, our findings are in accord with those in other studies where similar increases in adaptive social behavior through the suppression of self-stimulation (e.g., Koegel, Firestone, Kramme, & Dunlap, 1974) were observed.

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