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RAPID ASSESSMENT OF THE EFFECTS OF RESTRAINT ON SELF-INJURY AND ADAPTIVE BEHAVIOR

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We evaluated the effects of restraint on occurrences of self-injurious behavior (SIB) and adaptive responses exhibited by 2 individuals across eight response-effort conditions: baseline (no restraints); restraint sleeves without stays; restraints with 5, 10, 15, 20, or 25 thin metal stays; and restraints with five thick metal stays. From this analysis, we identified a restraint level for each participant that reduced SIB but did not inhibit adaptive responding.

DESCRIPTORS: self-injurious behavior, restraint, response effort

Mechanical restraints are often used to prevent or reduce the risks associated with severe self-injurious behavior (SIB). However, the prolonged use of restraints may itself cause physical problems as well as restrict the performance of adaptive behavior. Although a number of studies have focused on methods for fading the use of restraint devices, restraint fading has not always been successful (e.g., see Fisher, Piazza, Bowman, Hanley, & Adelinis, 1997).

Because the continued use of some form of restraint or protective equipment may be necessary with many individuals who exhibit SIB, methods for identifying the level of restraint that adequately suppresses SIB but minimally interferes with adaptive behavior would be helpful. Irvin, Thompson, Turner, and Williams (1998) and Zhou, Goff, and Iwata (in press) recently evaluated the effects of response effort on hand mouthing and adaptive behavior by having participants wear arm sleeves whose rigidity could be modified by inserting varying numbers of stays into the sleeves; however, the initial degree of rigidity was determined somewhat subjectively. We describe here an empirical method for determining optimal levels of restraint by measuring occurrences of SIB and adaptive behavior under varying levels of response effort (restraint rigidity).

METHOD

Two individuals with profound mental retardation participated. Both lived in a state residential facility and had been referred for assessment and treatment of their SIB. Renee's SIB consisted of head and face hitting (measured as responses per minute); Dana's SIB consisted of hand mouthing (measured as the percentage of continuous 10-s intervals during which SIB occurred). Renee had a prior history of wearing restraint and failed to complete a restraint fading program, whereas Dana had no prior exposure to restraint. The adaptive response selected for both individuals was drinking (measured as the percentage of trials during which it oc-

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curred), which was defined as holding a cup, bringing it to the lips, and taking a sip. Drinking was selected because it involved physical movement similar to the participants' SIB (hand to face). In addition, both participants engaged in independent drinking, thereby eliminating factors other than effort (i.e., lack of coordination or training) that might interfere with performance of the adaptive behavior.

A second observer independently recorded data during 41.9% of the sessions. Interobserver agreement for Renee's SIB was calculated by dividing session time into consecutive 10-s intervals and comparing observers' records. The smaller number of responses was divided by the larger number of responses in each interval; these fractions were averaged across the session and multiplied by 100%. Interobserver agreement for Dana's SIB and for both participants' drinking was calculated on an interval-by-interval (or trial-by-trial) basis by dividing the number of intervals (trials) containing agreements by the total number of intervals (trials) and multiplying by 100%. Mean agreement was 98.9% (range, 93.4% to 100%) for SIB and 97% (range, 85.7% to 100%) for drinking.

Functional analysis. Participants were exposed to three or four assessment conditions (alone, attention, play, demand) in multielement designs based on procedures described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Results indicated that Renee engaged in uniformly high rates of SIB across all conditions, and that Dana's highest levels of SIB occurred in the alone condition (complete results are available from the authors). These data indicated that participants' SIB was not maintained by social reinforcement. Thus, the focus of the intervention emphasized the development of alternative leisure skills that did not compete entirely with SIB, thereby necessitating the use of some form of restraint device.

Restraint analysis. The arm restraints used in this study were similar to those described by Fisher et al. (1997), except that each restraint sleeve contained five pockets instead of four. Each pocket could accommodate up to five thin metal stays or one thick metal stay. Participants were exposed three times to the following sequence of conditions: baseline (no restraints); restraint sleeves without stays; restraints with 5, 10, 15, 20, or 25 thin metal stays; and restraints with five thick metal stays. Three to nine sessions were conducted daily. Sessions lasted 5 min and were separated by at least a 5-min break (usually longer). Fluids were unavailable for approximately 30 min prior to the first session each day and between each daily session. Throughout the session, an experimenter placed a cup containing a small amount of preferred liquid in front of the participant at 30-s intervals. If, after 10 s, the participant had not initiated independent drinking, the cup was removed until the next scheduled trial.

RESULTS AND DISCUSSION

Figure 1 shows rates (or percentages of intervals) of SIB and percentages of trials with independent drinking, averaged across the three sessions of each condition. Renee exhibited high levels of SIB and moderate levels of drinking during baseline. When Renee wore restraint sleeves containing 0, 5, or 10 thin stays, lower levels of SIB and higher levels of drinking were observed. When the sleeves contained 15 thin stays, Renee engaged in less than one SIB per minute and engaged in drinking during 100% of the trials. When the sleeves contained 20 or 25 thin stays, Renee exhibited zero rates of SIB and engaged in drinking during 97% of the trials. Finally, when five thick metal stays were placed in the restraint sleeves, both responses were completely eliminated. Based on these results, the level of restraint selected

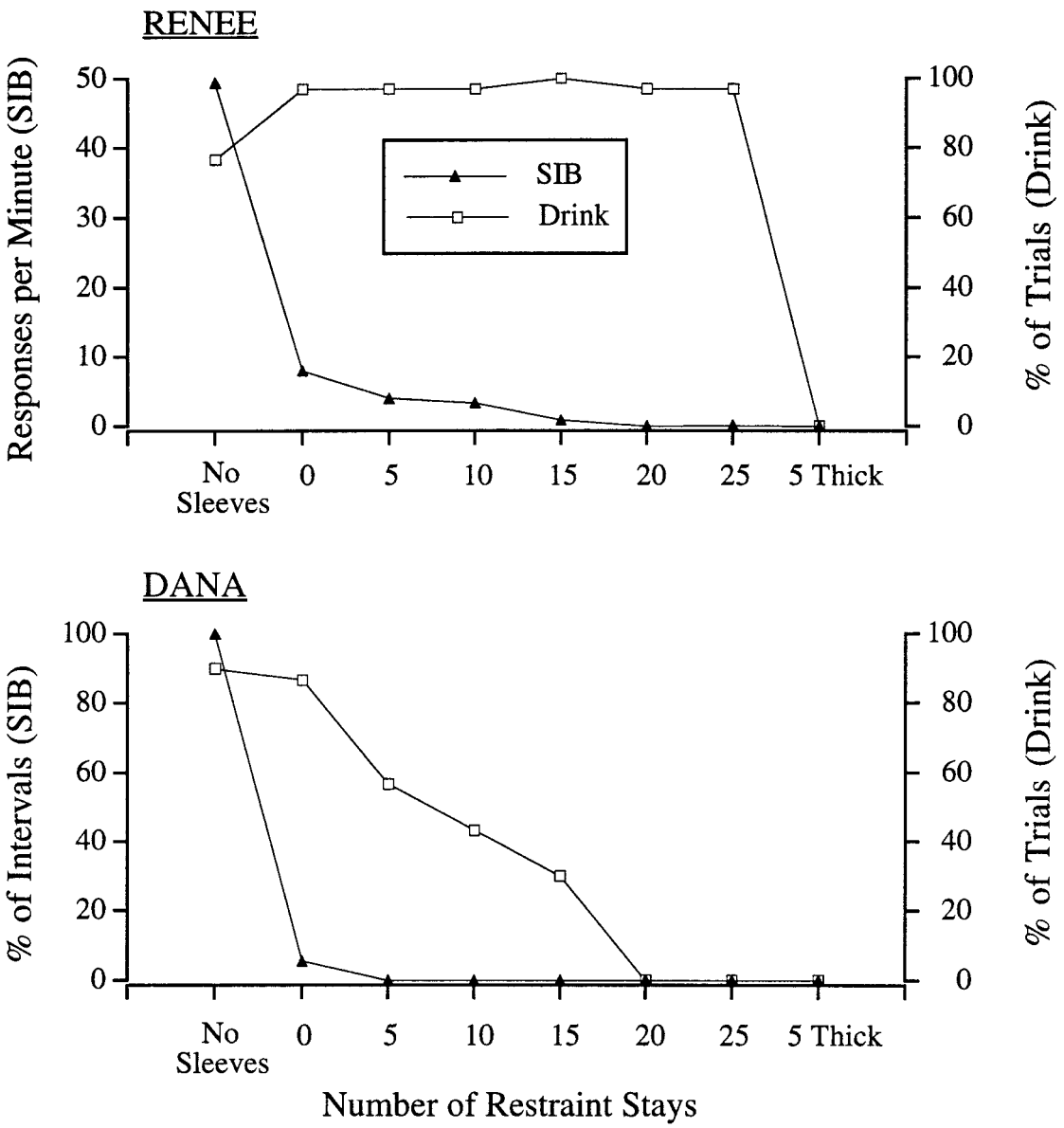

Figure 1. Levels of SIB and adaptive behavior (drinking) observed during baseline and arm restraint conditions when restraints contained different numbers of stays.

for Renee was 20 thin stays. Although 15 stays suppressed Renee's SIB to almost zero, 20 stays completely eliminated her SIB and had negligible suppressive effects on drinking.

Dana exhibited high levels of both SIB and drinking during baseline. When the restraint sleeves were placed on her without any stays, Dana's SIB decreased to less than 10% of the intervals, whereas her drinking remained high. Thereafter, with the addition of 5, 10, or 15 thin stays, Dana's SIB was completely eliminated while her drinking occurred on progressively fewer trials. During the final three conditions (20 thin stays, 25 thin stays, five thick stays), both responses were completely eliminated. Therefore, sleeves containing no stays were selected for

Dana. Although five stays suppressed Dana's SIB to a greater extent than did no stays, five stays also had a more deleterious effect on drinking.

The above determinations were based on empirical analysis of the effects of different levels of restraint (response effort) on both SIB and adaptive behavior, and were completed in a relatively brief amount of time. Although, for purposes of replication, each of the conditions was conducted three times, 5-min exposures to each of the eight conditions included in the present analysis could be completed in 40 min (excluding break time between sessions). Procedures similar to those used here may be helpful in determining optimal restraint levels either at the beginning of treatment or when attempts to fade restraints meet with limited success.

Our results, however, are preliminary and require further evaluation. For example, condition sequence may affect responding through either fatigue or satiation. In addition, future research should determine whether data from brief sessions reflect responding over longer periods of time. We must also emphasize that the response used as the index of adaptive behavior was one for which there was presumably a high degree of motivation (drinking preferred liquids). To determine the extent to which differing restraint levels interfere with responses more typical of those included in training programs, other types of tasks (e.g., self-care or vocational activities) should be included in the analysis. Finally, effort was defined in the present study simply as the number of stays in the restraint. There are more precise ways to quantify effort (e.g., force, as a function of resistance, response duration, distance, and acceleration), although these may require instrumentation that is unavailable in most clinical settings.

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