

*FUNCTIONAL ANALYSIS OF SELF-INJURIOUS BEHAVIOR
AND ITS RELATION TO SELF-RESTRAINT*

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Some individuals who engage in self-injurious behavior (SIB) also exhibit self-restraint. In the present study, a series of three functional analyses were conducted to determine the variables that maintained a participant's SIB, one without restraint items available, one with a preferred and effective form of self-restraint (an airplane pillow) available noncontingently, and one with this item delivered contingent on SIB. Results suggested that SIB was reinforced by escape and by access to self-restraint materials, self-restraint appeared to be maintained by automatic reinforcement, and continuous access to highly preferred restraint materials effectively suppressed SIB.

DESCRIPTORS: self-injurious behavior, self-restraint, functional analysis

Self-restraint is a behavior that has been observed as a correlate of self-injurious behavior (SIB; Smith, Lerman, & Iwata, 1996) and has been defined as preference for self-confinement of responding over SIB. A number of hypotheses regarding the operant mechanisms involved in the relation between SIB and self-restraint have been proposed. These include (a) SIB and self-restraint as members of the same response class (Derby, Fisher, & Piazza, 1996; Smith et al.), (b) SIB and self-restraint as functionally independent response classes (Smith et al.), (c) access to self-restraint serving as positive reinforcement for SIB (Smith et al.; Vollmer & Vorndran, 1998), and (d) termination of SIB as negative reinforcement for self-restraint (Fisher, Grace, & Murphy, 1996).

Smith, Iwata, Vollmer, and Pace (1992) assessed the maintaining variables of SIB and self-restraint by alternating functional analysis conditions in which self-restraint was and was not available. Results obtained with four participants were idiosyncratic, with 2 of the participants' self-restraint being maintained by escape from the aversive consequences of SIB, 1

participant's self-restraint serving the same function as his SIB, and the other participant's self-restraint being maintained by a different reinforcer than his SIB. Other methods have been used to test the relation between SIB and self-restraint. For example, Smith et al. (1996) assessed whether access to self-restraint served as positive reinforcement for SIB by delivering self-restraint materials either contingently, following SIB, or noncontingently. Higher levels of SIB were observed in the contingent restraint condition than in the noncontingent restraint condition, suggesting that the participant's SIB was maintained by access to self-restraint. Derby et al. (1996) investigated whether SIB and self-restraint were both maintained by contingent attention by alternating a contingent attention condition for either SIB or self-restraint with a noncontingent attention condition. Results indicated that both SIB and self-restraint were maintained by attention. Fisher and Iwata (1996) suggested an approach for further research on the assessment of SIB and self-restraint. The authors recommended conducting procedures similar to those by Smith et al. (1992) to determine the function of SIB and to generate hypotheses regarding the function of self-restraint. Based on the outcomes obtained, decisions about subsequent analyses could be

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determined. For example, if the functional analysis showed that SIB may be multiply controlled, further analyses examining the maintaining variable of SIB may be appropriate.

Different analyses have been conducted to further identify the relation between SIB and self-restraint. The present investigation replicated and extended this line of research by applying a combination of the analyses proposed by Smith et al. (1992, 1996) to further evaluate the variables that control self-injury and self-restraint for a single individual. In addition, systematic preference assessments were included to identify the most preferred and effective form of self-restraint for inclusion. First, a functional analysis without restraint materials was conducted to determine the maintaining variable of the participant's SIB. Next, a functional analysis with preferred restraint materials available was conducted to identify the effects of self-restraint on SIB. Following this, a third functional analysis was conducted to directly evaluate the relation between SIB and self-restraint by examining whether SIB was maintained by access to self-restraint during situations when alternative restraint items were and were not available.

METHOD

George was a 5-year-old boy who had been diagnosed with autism and had been admitted to the staff-intensive unit of a residential program for treatment of his severe SIB that resulted in frequent tissue damage. George's SIB consisted of chin-to-shoulder hitting, defined as forceful contact between his chin and either shoulder or between his chin and an object placed between his chin and either shoulder. His self-restraint consisted of placing various materials (e.g., a life vest or stuffed animals) but not body parts between his chin and shoulder.

Sessions were conducted two to four times per day, 4 to 5 days per week, in a room that

contained a videocamera, a table, four chairs, and materials appropriate to the assessment condition. Sessions were 10 min long (except as noted below) or until the criteria for session termination (100 or more occurrences of the response) had been met. The participant never met the criteria for session termination. Observers were present in the observation room during sessions and recorded the frequency of SIB and the occurrence of self-restraint using 10-s partial-interval recording. SIB was summarized as responses per minute, and self-restraint was summarized as percentage of intervals. A second observer scored 59% and 68% of sessions for SIB and self-restraint, respectively. Interobserver agreement was calculated on an interval-by-interval basis by dividing the number of agreements by the number of agreements plus disagreements in each 10-s interval and multiplying by 100%. Mean percentages of agreement were 99% (range, 79% to 100%) for SIB and 98% (range, 70% to 100%) for self-restraint.

A functional analysis without a self-restraint item was conducted, based on procedures by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Four conditions (no interaction, attention, play, and demand) were arranged in a multielement design. During all sessions, a therapist and one or two observers were present in the room. During the no-interaction condition, no materials or interaction were presented. During the attention condition, a moderately preferred item (a musical book) was continuously available, and instances of SIB resulted in brief attention. During the play condition, highly preferred items (water snake and gel ball) were continuously available, and brief attention was delivered on a fixed-time 15-s schedule. The participant was never observed to self-restrain with the leisure items included during attention and play sessions. During the demand condition, a difficult task (auditory-to-visual match to sample using letters) was continuously presented using three-step

prompting, and SIB resulted in a 15-s break from the task.

Next, two preference assessments, a paired-stimulus assessment (Fisher et al., 1992) and a competing-items assessment (Piazza, Adelinis, Hanley, Goh, & Delia, 2000), both including nine self-restraint items, were conducted to identify George's most preferred and effective item (i.e., that which resulted in the highest levels of self-restraint and lowest levels of SIB). During the competing-items assessment, each item was singly presented during four 3-min demand sessions. During preference assessments, the self-restraint item was placed on a table in front of George; if he independently initiated placement of the item on his neck or shoulders, the therapist assisted him with correct placement. In addition, George was observed to remove all items independently. Following identification of his most preferred self-restraint items (two different airplane pillows: a black air-filled pillow and a white feather-stuffed pillow), a second functional analysis was conducted that included continuous access to the black pillow (a U-shaped pillow that fit around the back of his neck and rested on the top of his shoulders) across assessment conditions. During the second and third functional analyses, the pillow was placed on a table in front of George, and he independently placed this item on himself.

Based on the results of the second functional analysis, a third functional analysis was conducted to determine whether George's SIB was sensitive to contingent access to self-restraint and whether this sensitivity was affected by the noncontingent availability of an additional high-preference self-restraint item. During this assessment, the two most preferred items (airplane pillows) were used, and three conditions were compared: contingent access to restraint, during which no self-restraint materials were available and occurrences of SIB resulted in access to the black pillow for 15 s; contingent access to restraint with

noncontingent access to alternative restraint, during which the white pillow was continuously presented and occurrences of SIB resulted in access to the black pillow for 15 s; and noncontingent access to restraint (control condition), during which one pillow was continuously presented and occurrences of SIB resulted in no consequences.

RESULTS AND DISCUSSION

The functional analysis without a self-restraint item showed that George exhibited differentially higher levels of SIB during the demand condition (Figure 1, top). These findings suggested that George's SIB was reinforced by escape from demands. An alternative interpretation is that the prompting procedure implemented during demand sessions interrupted alternative forms of self-restraint (ones not involving a pillow), and SIB terminated those prompts and allowed the resumption of self-restraint. Thus, it is possible that access to self-restraint functioned as reinforcement for SIB during demand sessions. To assess this possibility, we measured alternative forms of self-restraint (holding chin against table, placing hands between chin and shoulder, sitting on hands, and placing hands in shirt) during eight of these functional analysis sessions (two of each condition type). Results showed that George exhibited moderate levels of self-restraint during the demand condition and rarely exhibited self-restraint during the alone, attention, and play conditions (conditions in which alternative forms of self-restraint were freely available). These results suggest that self-restraint was not differentially restricted during the demand condition. Thus, it seems unlikely that the termination of demands resulting in access to alternative forms of self-restraint would have resulted in a reinforcement contingency for SIB.

Results of the paired-stimulus assessment identified two high-preference items (airplane

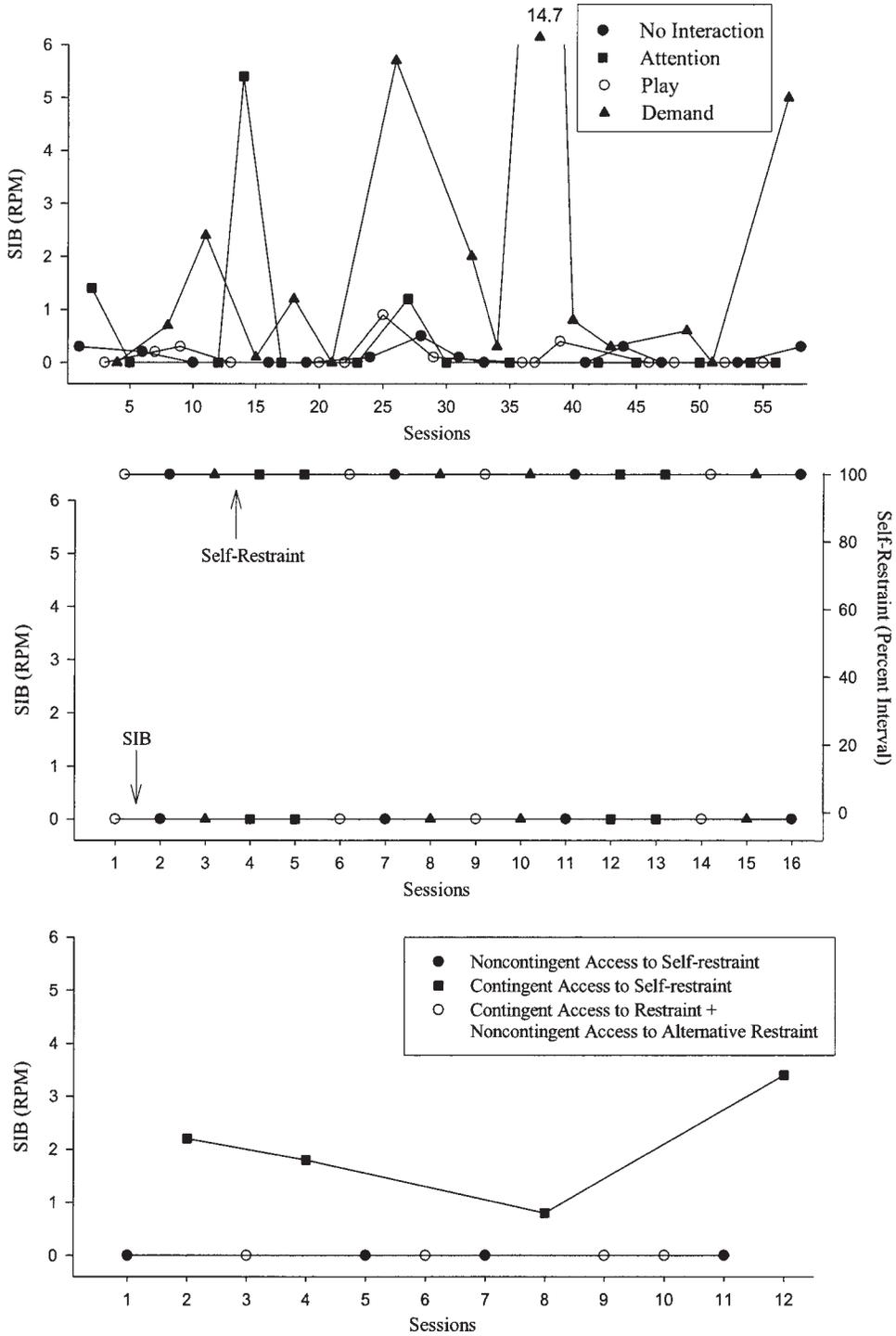


Figure 1. Results of the three functional analyses. The top panel shows the results of the first functional analysis (without a self-restraint item). The middle panel shows the results of the functional analysis with a self-restraint item. The bottom panel shows the results for the third functional analysis that compared the effects of contingent self-restraint when alternative forms of self-restraint were and were not available.

pillows) that were approached on over 80% of trials. Results of the competing-item assessment indicated that the two pillows resulted in 100% engagement in self-restraint and no SIB. In contrast, SIB was observed with the remaining seven items (range, 0.7 to 6.8 responses per minute).

Results of the restraint functional analysis (Figure 1, middle) indicated that self-restraint occurred during 100% of the intervals and SIB did not occur. Although no consequences were delivered for self-restraint during this second functional analysis, it occurred at high levels across conditions, suggesting that it might be maintained by nonsocial consequences. SIB may have been suppressed during this functional analysis because access to self-restraint materials competed with SIB or because continuous access to self-restraint may have attenuated the aversiveness of the demand task, decreasing the likelihood of SIB during the demand condition. For these reasons, it seemed likely that access to self-restraint materials may have also functioned as a reinforcer for George's SIB.

To evaluate whether SIB was maintained by self-restraint and to evaluate whether the suppressive effects of continuous access to self-restraint materials generalized across items, a third functional analysis was conducted. Results of this analysis (Figure 1, bottom) indicated that self-restraint occurred at high levels across contingent access to restraint ($M = 75\%$), contingent access to restraint with noncontingent access to alternative restraint ($M = 82\%$), and noncontingent access to restraint ($M = 96\%$). SIB occurred only during contingent access to restraint, suggesting that SIB was maintained by access to a self-restraint item only when alternative restraint materials were unavailable. Alternative restraint materials either competed with or served as an abolishing operation for access to the black pillow as reinforcement.

In summary, different analyses were applied to determine the maintaining variable of SIB

and its relation to self-restraint. Using multiple analyses was important because the results suggested that SIB was maintained by both escape and contingent access to self-restraint. Although a comprehensive assessment approach was used to examine the variables that maintained SIB in relation to self-restraint, the maintaining variables of self-restraint were not systematically evaluated. It is possible that self-restraint was maintained by avoidance of SIB (Fisher & Iwata, 1996). That is, self-restraint may have mitigated the aversive properties of SIB (e.g., pain). Future research should include analyses that identify the variables that maintain self-restraint.

The third functional analysis was based on procedures used by Smith et al. (1996), in which the control condition involved continuous access to self-restraint. However, this control condition did not rule out the possibility that simply removing the restraint materials for periods of time produced the increases in SIB (independent of the contingency). Future investigators could include a control condition in which restraint materials are presented and withdrawn on fixed- or variable-time schedules.

Although a direct treatment comparison of various items was not conducted, we were able to identify a more socially acceptable item (airplane pillow) for the child to hold on his shoulder than items used previously (e.g., a life vest) based on the results of a preference assessment. Use of preference assessments to identify stimuli that served as appropriate forms of self-restraint was an extension of Vollmer and Vorndran (1998), who conducted a treatment analysis in which a more appropriate item (a cardigan sweater) was used to replace a less appropriate self-restraint item (a leather jacket). In addition, two of the assessment conditions (demand and contingent restraint) were associated with high levels of SIB when restraint was unavailable and were associated with little to no SIB when self-restraint was available. These findings suggested that noncontingent access to

preferred restraint materials either reduced the motivation to engage in SIB or competed with SIB even when extinction was not in effect. These results suggest that presenting few demands and providing continuous access to preferred restraint materials may serve as an initial treatment option for individuals who exhibit SIB maintained by escape and by contingent access to self-restraint. For George, self-restraint was viewed as an appropriate alternative to SIB, because he could continue to participate in teaching programs and typically scheduled activities while preferred restraint materials were available. The current clinical plan for this participant is to fade to socially acceptable self-restraint materials (the airplane pillow could be deflated so that it fits underneath a sweater) combined with demand fading.

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