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TRANSFER OF BEHAVIORAL FUNCTION AS A CONTRIBUTING FACTOR IN TREATMENT RELAPSE

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When relapse occurs following successful treatment to reduce problem behavior, it is often attributed to inconsistent implementation of maintenance programs. Although less likely, another potential cause for relapse is a change in the behavior's maintaining contingency over time. To examine this possibility, additional assessment was conducted with 4 individuals who were rereferred to a day-treatment program due to recurrence of their self-injurious behavior (SIB) 2 months to 2 years following successful treatment. In each case, the original treatment had been developed and implemented based on the outcome of functional analysis assessments. For 1 subject, results of a second functional analysis were consistent with those from the original assessment, indicating that the function of her SIB had remained unchanged. For the other 3 subjects, results of the second assessment suggested that their SIB had acquired new or additional functions. These findings indicate that factors other than program inconsistency can lead to relapse, and that clinical reevaluation for such cases should include a current functional analysis to determine if new treatment components are needed.

DESCRIPTORS: functional analysis, self-injurious behavior, relapse

Problem behaviors exhibited by individuals with developmental disabilities have been treated effectively with a variety of procedures, including extinction, differential reinforcement, and punishment. Although initially successful, these treatment programs sometimes fail to suppress behavior over time (Bruhl, Fielding, Joyce, Peters, & Wiesler, 1982; Murphy & Wilson, 1980; Schroeder et al., 1982). Such relapse often is attributable to deterioration in the consistency of program implementation. For example, Schroeder et al. found that reductions in self-injurious behavior (SIB) failed to be maintained in a majority of their clients 2 years following discharge from a day-treatment program, and determined that caregivers were implementing less than 20% of the original treatment procedures.

Clinicians often approach the problem of relapse by implementing different treatment procedures until they find an effective one. This strategy often involves progression through a hierarchy of least-to-most intrusive interventions, as recommended by various authors and specified in some state regulations (*Florida HRS Manual 160-4,* 1989; Green, 1990; Turnbull, Ellis, Boggs, Brooks, & Biklen, 1981). Before changes are made in existing treatment procedures, perhaps arbitrarily, an alternative strategy would involve first identifying the causes of treatment failure and then using this information to alter programs accordingly. For example, the failure of differential reinforcement pro-

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cedures could reflect satiation to the reinforcing stimulus. In this case, the use of alternative reinforcers or the modification of establishing operations may result in decreases in the problem behavior (Vollmer & Iwata, 1991). Punishment procedures also can lose their effectiveness over time, perhaps as a result of habituation to the punishing stimulus (e.g., Bruhl et al., 1982; Jones, Simmons, & Frankel, 1974; Ricketts, Goza, & Matese, 1993). If this were to happen, increasing the intensity of the punishing stimulus or changing the type of stimulus might be considered.

In recent studies on the assessment and treatment of severe behavior disorders, emphasis has been placed on the identification of behavioral function as a guide to program design. Results from several of these studies indicate that treatments based on the outcome of functional analysis assessments are more effective in reducing problem behavior than those selected arbitrarily (e.g., Repp, Felce, & Barton, 1988). It has also been shown that the same behavioral topography can be maintained by different reinforcement contingencies across individuals (Iwata, Pace, Cowdery, & Miltenberger, 1994) or by multiple contingencies within the same individual (Smith, Iwata, Vollmer, & Zarcone, 1993). Thus, the possibility arises that a behavior's maintaining contingency can change over time within the same individual and contribute to treatment relapse. Regardless of the specific treatment procedure being implemented, relapse can occur if new maintaining variable(s) are not identified, in which case arbitrary program modifications may be irrelevant or even contraindicated.

Although the literature contains few documented cases in which there was a transfer of behavioral function, the hypothesis is not without merit. Researchers have suggested that behaviors maintained by automatic (sensory) reinforcement can acquire new functions if they happen to contact social contingencies (e.g., Cataldo & Harris, 1982; Guess & Carr, 1991). For example, Carr and McDowell (1980) described a subject whose self-injurious scratching apparently developed as a result of exposure to poison oak but was later maintained by parental attention after the medical condition disappeared. Reductions in SIB when extinction was used by the subject's parents in his home indicated that scratching had obtained a new social function. In a similar manner, problem behavior maintained by social consequences (e.g., attention or escape) can acquire other functions if consistently followed by a different (reinforcing) consequence.

Transfer of function also can occur if a current (neutral) contingency extends to other reinforcers. For example, the delivery of attention or removal of instructions as neutral stimuli can become conditioned reinforcers if they are paired with reinforcing stimuli such as food or access to free-time activities. Such pairings can occur contingent on the problem behavior or in its absence. These new (conditioned) reinforcers can eventually maintain the behavior if they are provided contingent on it. Similarly, automatic (sensory) consequences for problem behavior such as SIB can become conditioned reinforcers if they are paired with existing social reinforcers. In either case, problem behavior can be maintained for extended periods in the absence of the initial reinforcer.

Beyond these hypothetical situations, little is known about specific variables responsible for transfer of function in the natural environment and the exact processes involved, because this phenomenon has not been examined empirically. Nevertheless, the environment of many individuals with developmental disabilities may be quite conducive to such transfer due to high rates of staff turnover and other changes that are common in many treatment facilities. For example, Bruhl et al. (1982) found that, over a 2½-year period during which a significant number of individuals living on a special treatment unit experienced relapses in treatment, staff turnover rate was 75%. They also noted that specific cases of relapse were correlated with the introduction of new teaching staff, visits by family members, brief hospitalizations, and transfers to the individuals' original residences. New staff members may respond differently to inappropriate behavior and may provide clients with varying types and amounts of reinforcement and aversive stimulation. Other factors, such as the availability of stimulating activities and number of individuals present in a given area, also may be correlated with staff turnover and can contribute to the develop-

ment of new behavioral functions that replace or occur in conjunction with those initially responsible for behavioral maintenance. A recent study demonstrating that a single topography of SIB can be maintained by two variables concurrently provides some plausibility for this hypothesis (Smith et al., 1993). Although the subjects' SIB may have obtained both functions simultaneously, it is equally possible that SIB was maintained initially by a single contingency but later acquired an additional function.

An initial approach to the examination of transfer of behavioral function and its role in treatment relapse involves studying those cases in which successful treatment eventually failed. With recent advances in the functional analysis of behavior disorders, treatment failure can be examined empirically, and more effective strategies for approaching relapse can be developed and implemented.

Although typical follow-up observations of staff behavior should allow the detection of "procedural drift" in implementing prescribed interventions, they may not reveal a transfer of operant function. That is, deterioration in program consistency would not necessarily eliminate transfer of function as a possible cause for relapse, because both can occur at the same time. Thus, clinical reevaluation might be aided by the inclusion of a current assessment to determine if new treatment components are needed to address new behavioral functions.

In this study, individuals whose SIB had been exposed to an initial functional analysis and successful treatment program were reassessed after their caregivers reported a relapse from 2 months to 2 years following discharge from a treatment center. The purpose of the second functional analysis was to determine if treatment failure was due, at least in part, to a change in the variables maintaining the subjects' SIB.

METHOD

Subjects and Setting

Four adults living in a public residential facility and diagnosed with profound mental retardation participated. Their ages ranged from 22 to 46 years. They had been referred to a day-treatment program for assessment and treatment of SIB because their behaviors produced tissue damage and significantly interfered with progress in their educational programs. All of the subjects had some receptive but no expressive language skills, and none had a medical diagnosis suggesting an organic etiology for their SIB. Brenda's SIB consisted of head and body hitting and banging. David, who was blind and nonambulatory, engaged in head hitting and arm and hand biting. Stacey, who also was blind, engaged in head and body hitting and eye poking. Diane's SIB consisted of head hitting and banging.

The study was conducted in therapy rooms at a day-treatment program located on the grounds of the facility. All sessions were conducted individually in rooms approximately 3.0 m by 4.8 m or 5.7 m by 10.5 m. Three to five sessions were run daily, usually 5 days per week. All sessions lasted 15 min, during which a therapist and/or observer(s) were present in the room, which contained a table and several chairs. Follow-up observations were conducted in the subjects' residences or at their work sites.

Response Measurement and Reliability

Self-injurious responses were defined as follows: *face, head, or body hitting*—forceful contact of the hand with any part of the face, head, or other body part (e.g., leg, chest); *head or body banging*—forceful contact of any part of the head or body with a stationary object (e.g., wall, floor, furniture); *arm or hand biting*—closure of the upper and lower teeth on the flesh anywhere on the hand, wrist, or arm; and *eye poking*—contact of the fingers with the eye. Subjects' compliance with instructions, aggression, disruption, and appropriate interaction with leisure materials also were routinely measured to assess other aspects of their behavior and are not reported here. Finally, data on experimenters' delivery of instructions and attention indicated over 90% compliance with assessment protocols.

Observers collected data on response frequency using a hand-held computer (Assistant, Model A102) that audibly signaled 10-s intervals. Observers were graduate and undergraduate students

who had demonstrated proficiency with this type of data collection by attaining a 90% agreement criterion prior to the beginning of the study. Interobserver agreement was assessed during at least 25% of the sessions. In comparing observers' records, agreement percentages were calculated on an interval-by-interval basis. The smaller number of responses in each 10-s interval was divided by the larger number of responses; these fractions were summed across all intervals and divided by the total number of intervals in the session. Mean interobserver agreement across subjects was 97% for SIB, 97% for experimenter delivery of attention, and 94% for experimenter delivery of instructions.

Experimental Design and Procedures

All subjects' first assessment involved repeated exposure to four conditions (alone, demand, attention, play) in a multielement design (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). Brenda's and David's second assessment was conducted in the same manner as the first. For Diane's and Stacey's second assessment, the conditions remained the same but the sequence of presentation differed: only one test condition (attention, demand, or alone) was run at a time in sequential fashion, while the play condition served as a continuous control. Recent data (Iwata, Duncan, Zarcone, Lerman, & Shore, in press) suggest that this latter design variation decreases the likelihood of sequence effects that are sometimes found when using the multielement design.

In the attention condition, the therapy room contained a variety of leisure materials. The therapist ignored the subject throughout the session but attended to SIB by providing attention in the form of statements of concern and disapproval (e.g., "stop, you'll hurt yourself") and physical contact (e.g., patting the subject's back or briefly blocking the response). This condition examined the effects of positive reinforcement (attention) on the rate of SIB. In the demand condition, training materials were present, and the experimenter presented learning trials to the subject every 30 s using a graduated prompting procedure (i.e., verbal instruction, modeling, physical guidance). The tasks were similar to those found in the subject's habilitation plan. Contingent on SIB, the experimenter terminated the trial by removing the materials and turning away for 30 s. This condition examined the effects of negative reinforcement (escape from instructions) on the rate of SIB. In the alone condition, the subject was placed in a therapy room with no materials present other than furniture. No one was present in the room except the observer, who never interacted with the subject. This condition simulated a barren environment and examined the extent to which SIB would persist in the absence of any social consequences. In the play condition, the therapy room contained a variety of leisure materials and ambient stimulation (e.g., music from radios, air from fans). The experimenter provided attention, physical contact, and toy play every 30 s. No instructions were delivered, and all instances of SIB were ignored. This condition simulated an enriched environment and served as a control for the other three conditions.

Treatment programs based on results of the functional analyses were implemented for all subjects at both the day-program and residential settings. When reductions in SIB were maintained in both settings, subjects were discharged from the treatment center, and staff in their residences were trained to implement the programs. Two to five follow-up observations were conducted for all subjects after staff training was completed. Prior to their readmission for the second assessment, 3 of the subjects were observed again under naturalistic conditions to determine if staff were implementing the treatment programs correctly.

RESULTS

Because the focus of this study was on maintaining variables for the subjects' SIB, session-by-session data are presented only for results obtained during the functional analysis assessments, whereas treatment data are summarized in more abbreviated form. The baseline for a given treatment consisted of the assessment condition in which the highest

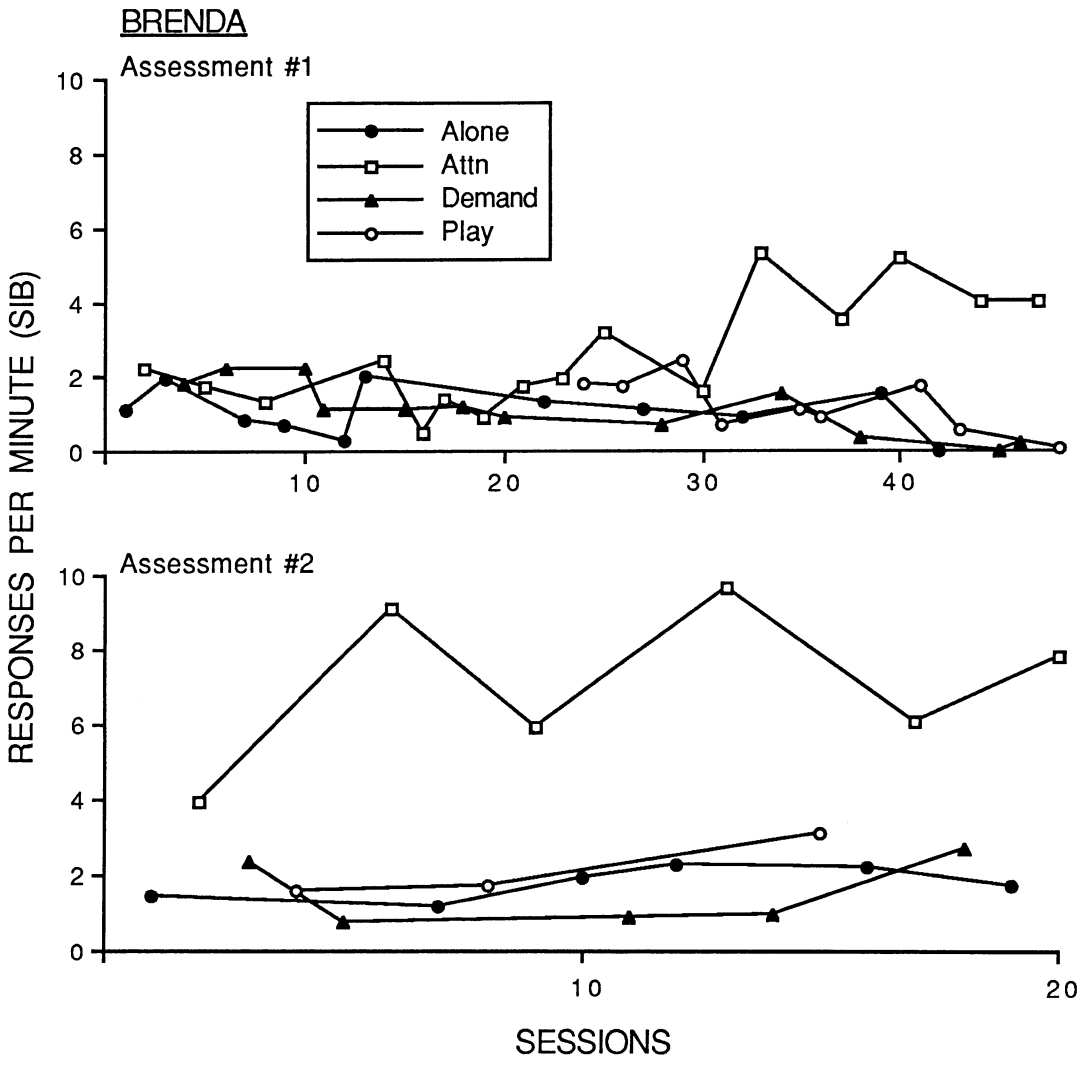

Figure 1. Responses per minute of SIB in Brenda's initial functional analysis (top panel) and reassessment (bottom panel).

rates of SIB were observed. Baseline and treatment data are reported as mean number of responses per minute during the last five sessions.

Brenda

First functional analysis. Results of Brenda's initial functional analysis are shown in the top panel of Figure 1. Although rates of SIB were initially undifferentiated, her behavior eventually increased in the attention sessions and decreased in all others. This pattern suggested that her SIB gradually came under discriminative control of the different experimental conditions and that it was maintained by positive reinforcement (attention). A treatment procedure combining extinction (ignoring) and differential reinforcement of other behavior (DRO) with attention as the reinforcer successfully reduced her SIB (Mazaleski, Iwata, Vollmer, Zarcone, & Smith, 1993). Results obtained during baseline and treatment are summarized in the top left portion of Table 1. Two follow-up observations conducted while staff implemented treatment on Brenda's res-

Table 1
Results of Treatment Based on Subjects' First and Second Assessments, Expressed as Mean Responses per Minute During the Last Five Baseline (Bl) and Treatment (Rx) Sessions

Subject	First assessment	Second assessment
Brenda	Bl: 3.8 (attention) Rx: 0.5 (DRO/EXT)	Bl: 22.7 (attention) Rx: 0.4 (NCR/EXT)
David	Bl: 1.4 (demand) Rx: 0.0 (EXT)	(a) Bl: 6.1 (demand) Rx: 1.3 (EXT) (b) Bl: 2.6 (attention) Rx: 0.0 (DRO/EXT) (c) Bl: 4.4 (alone) Rx: 1.2 (alone)
Diane	Bl: 7.6 (attention) Rx: 0.1 (NCR/EXT)	(a) Bl: 3.1 (attention) Rx: 4.0 (NCR/EXT) (b) Bl: 2.5 (alone) Rx: 0.0 (enriched environment)
Stacey	Bl: 2.0 (demand) Rx: 0.6 (EXT)	(a) Bl: 5.9 (demand) Rx: 5.4 (EXT) (b) Bl: 4.4 (demand) Rx: 0.3 (water mist) (c) Bl: 2.5 (alone) Rx: 0.3 (toy play)

idence 1 month following discharge indicated that SIB occurred infrequently (M = 0.5 responses per minute). About 1 year after Brenda's discharge, staff reported a recurrence of high levels of SIB. Although no additional follow-up observations were conducted at that time, it was suspected that program inconsistency had caused the relapse due to a large turnover in staff during the intervening period. Nevertheless, evidence of program inconsistency would not necessarily preclude the possibility of a transfer of function, so Brenda was readmitted to the day-program unit for a second assessment.

Second functional analysis. Results of Brenda's reassessment are shown in the bottom panel of Figure 1. These data indicated that her SIB remained sensitive to attention as a maintaining reinforcer and suggested that treatment relapse resulted from inconsistent implementation of her maintenance program. A second treatment program, which combined extinction (ignoring) and the noncontingent delivery of reinforcement (NCR) with attention as the reinforcer, was implemented at the day program (see Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993, for additional details). Results of this treatment, summarized in the top right portion of Table 1, again showed that SIB was reduced with a procedure expressly designed to treat attention-maintained behavior. Three follow-up observations revealed that low levels of SIB were maintained in the residential setting (M = 1.0).

David

First functional analysis. Results of David's initial functional analysis are shown in the top panel of Figure 2. With the exception of one session, all SIB occurred in the demand condition, indicating that David's behavior was maintained by escape from instructions. A treatment program combining escape extinction (Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990) and positive reinforcement (praise and candy) for compliance with instructions reduced David's SIB, and staff in his residence were trained to implement the procedure during his regular training sessions. The left side of the second panel in Table 1 summarizes the results of David's treatment. Five follow-up observations, conducted

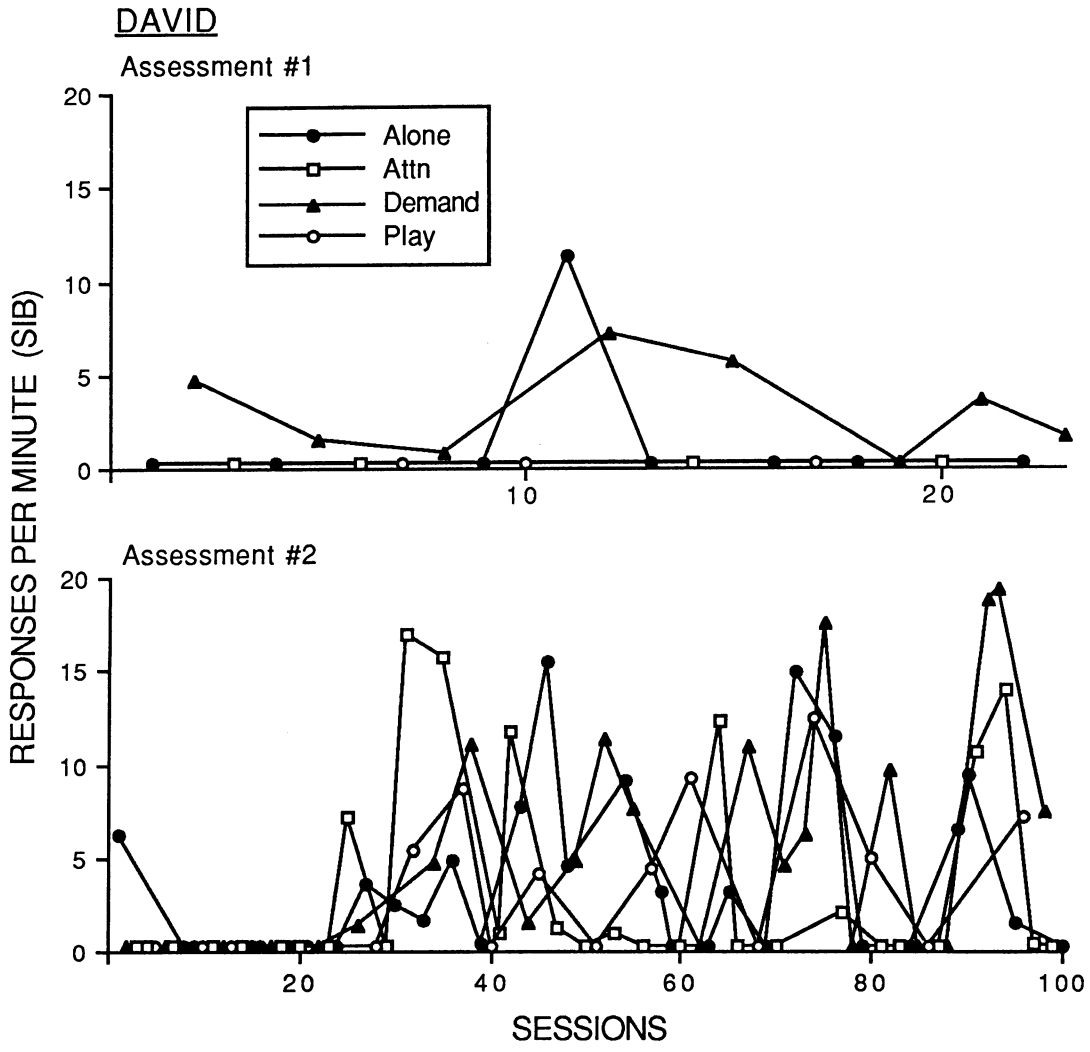

Figure 2. Responses per minute of SIB in David's initial functional analysis (top panel) and reassessment (bottom panel).

1 month after the completion of staff training, revealed that David's SIB remained at a low level during his training programs (M = 0.5 responses per minute). However, staff soon reported that David had begun to exhibit SIB outside of instructional situations. Several observations of David in his residence revealed that staff were providing attention contingent on SIB that occurred in noninstructional contexts. Thus, it appeared that David's SIB had obtained an additional function (attention as a reinforcer) since his discharge, and that a specific component of his original treatment program may have contributed to the transfer of behavioral function. Because he was not responsive to social interaction originally, praise was paired with food reinforcement contingent on compliance during his training sessions. This procedure apparently had resulted in the development of a new conditioned reinforcer (attention) that maintained SIB in noninstructional situations. Two months after David's discharge, he was readmitted to the day-treatment program.

Second functional analysis. Results of David's second functional analysis are shown in the bottom

panel of Figure 2. Data on his SIB remained undifferentiated for 100 sessions, a pattern of responding quite different than that seen in his first assessment. A number of factors, including interaction effects, control by several variables (multiple control), or control by automatic reinforcement, could have been responsible for such results. To further assess his SIB, the functional analysis was continued while treatment procedures were implemented systematically during some of the experimental conditions. David was first reexposed to escape extinction during the demand sessions. When his rate of SIB decreased in these sessions, a treatment procedure combining extinction (ignoring) and DRO (with attention as the reinforcer) was implemented during the attention sessions. Results of these treatment procedures, which produced large reductions in SIB, are summarized on the right side of the second panel in Table 1 (see "a" and "b"). Because both treatments involved direct manipulation of the suspected maintaining contingencies (attention and escape), these findings suggested that David's SIB had obtained an additional function. Most interestingly, results (see Table 1, "c") also show that his rate of SIB decreased during alone sessions following treatment during both demand and attention sessions. These results suggested that the undifferentiated data (i.e., high rates of SIB in the alone and play conditions) probably were due to interaction or sequence effects produced by the rapidly changing conditions of the multielement design (Iwata et al., in press). Although it is unclear why such effects were not observed during his initial assessment, it is possible that multiple control (evident during the second assessment but not the first) represents a further complicating factor. After staff were trained to implement the additional treatment (extinction plus DRO) in noninstructional contexts, four follow-up observations (two during training programs and two during leisure time) indicated that SIB was virtually eliminated in his residential setting (M = 0.0).

Diane

First functional analysis. Results of Diane's first functional analysis are shown in the top panel of Figure 3. Although her data were initially undifferentiated, consistently higher rates of SIB were observed in the attention condition by the 20th session. A treatment program combining extinction (ignoring) and NCR (with attention as the reinforcer) nearly eliminated Diane's SIB (see Vollmer et al., 1993, for additional details). Results of Diane's treatment are summarized on the left side of the third panel in Table 1. Five follow-up sessions conducted 1 month after discharge revealed that low rates of SIB occurred in her residence (M = 0.04 responses per minute). A little more than a year following Diane's discharge, staff reported that her SIB had increased dramatically in her residence. Subsequent observations revealed that staff were correctly ignoring her SIB, but they were not providing noncontingent reinforcement as specified in her treatment program.

Second functional analysis. Diane's second functional analysis was initially conducted in a multielement format. However, her rates of SIB remained variable and undifferentiated after nearly 40 sessions. Because differential responding appeared to develop gradually during Diane's first assessment, and because results of David's second assessment suggested that merely conducting additional sessions might not be an efficient way of obtaining clearer data, her assessment was terminated and restarted with a modified experimental design as described above (sequential exposure to test conditions with a continuous control). Results of a recent study indicated that this design may yield clear results when multielement assessment data are relatively undifferentiated (Iwata et al., in press). The bottom panel of Figure 3 shows the results of Diane's second assessment. Rates of SIB were variable in all conditions, and no differentiation occurred between any test condition and the control condition. These results were ambiguous and suggested two possible interpretations. First, high levels of responding during the alone condition indicated that her SIB was maintained independent of social consequences (i.e., by automatic reinforcement). Second, responding during the other test conditions suggested that social consequences (escape and/or attention) might have maintained SIB

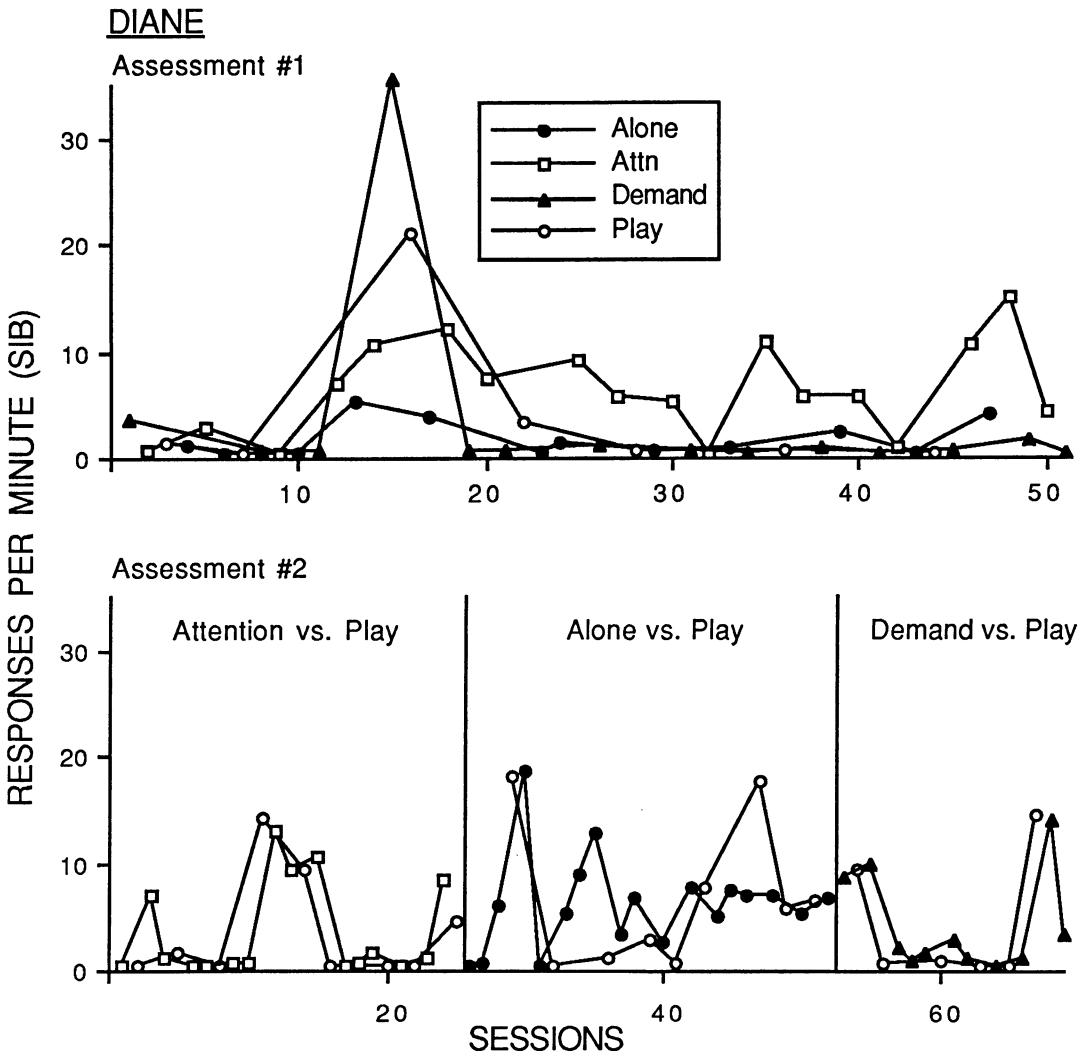

Figure 3. Response per minute of SIB in Diane's initial functional analysis (top panel) and reassessment (bottom panel).

in conjunction with automatic reinforcement. Because attention had been the previous maintaining reinforcer, Diane's original treatment procedure (extinction plus NCR) was reimplemented, but it produced no decrease in SIB (see right side, "a," of the third panel in Table 1). Although the data indicated that her SIB actually increased somewhat during treatment, the overall pattern of her behavior (alternating high and low rates) remained unchanged across baseline and treatment phases.

A new treatment program that provided Diane access to alternative reinforcers in an enriched environment (Horner, 1980) resulted in immediate near-elimination of her SIB (see right side, "b" of the third panel in Table 1). For this procedure, Diane was seated at a table in a larger therapy room with continuous access to paper, crayons, and juice (these particular items had not been provided during the attention or play conditions of her functional analysis). During each session, Diane began to color immediately and engaged in this activity throughout the session without stopping. Possibly, the activity provided access to reinforcers that competed with those maintaining her SIB. In a series of experimental manipulations, Berkson and Mason (1965) obtained similar results by providing objects

(e.g., toys and food items) to subjects who engaged in stereotypic behavior. They found that reductions in stereotypy depended on active manipulation of the objects.

Although Diane's treatment mainly addressed an automatic-reinforcement function for her SIB and revealed nothing about other possible (social) functions, further examination of these variables was not feasible. In the presence of the alternative activity (coloring), Diane's SIB was nearly eliminated; in its absence, her SIB appeared relatively insensitive to social contingencies. Nevertheless, results of Diane's assessment and treatment suggested that her SIB had obtained at least one new function (automatic reinforcement). Furthermore, the failure of her previous treatment program suggested that this new function may have superseded or replaced the initial one. When Diane was discharged from the day program, staff in her residence were encouraged to provide her with leisure activities as often as possible throughout the day. Three follow-up observations conducted 4 months after her discharge revealed that the reduction in SIB was maintained in her residential setting (M = 0.2).

Stacey

First functional analysis. Results of Stacey's initial functional analysis are shown in the top panel of Figure 4 and indicate that her SIB was maintained by negative reinforcement (escape from instructions). Results of her treatment program (escape extinction), which effectively reduced her SIB, are summarized on the left side of the fourth panel in Table 1. Follow-up observations conducted at Stacey's work site 2 months after staff training was completed revealed that staff were implementing the procedure correctly, and that SIB occurred at a low rate (M = 0.2 responses per minute). About 2 years after her discharge, staff reported an escalation in Stacey's SIB. A subsequent observation at her work site revealed that staff still implemented escape extinction correctly. (Observations could not be conducted in her residence because staff discontinued all of Stacey's training programs due to the severity of her SIB.)

Second functional analysis. Stacey's second analysis was initially implemented in a multielement format but yielded undifferentiated data. In an attempt to minimize interaction effects, her assessment was restarted with the same design used for Diane's second analysis. Results of this assessment are shown in the bottom panel of Figure 4. Variable rates of SIB occurred in all experimental conditions, with the highest rates occurring in the demand condition. These results suggested that her SIB remained sensitive to escape as a maintaining consequence, but that it had obtained at least one new function. The high rates of SIB during the alone condition indicated that her behavior was maintained in the absence of social consequences. Stacey's treatment program included several components. First, escape extinction was reimplemented during the demand sessions, but it produced no reduction in SIB after 21 sessions (see right side, "a," of the bottom panel in Table 1). A contingent water-mist procedure (Dorsey, Iwata, Ong, & McSween, 1980) was then added, which resulted in a large reduction in SIB during demand sessions (see right side, "b," of the bottom panel of Table 1). Next, Stacey was provided with an alternative means of self-stimulation (play with toys) in noninstructional contexts. During these sessions, Stacey was taught to manipulate a variety of toys (horns, stuffed animals), and she eventually began to play with these leisure materials throughout the session without stopping. This procedure resulted in a large reduction in SIB (see right side, "c," of the bottom panel of Table 1). Following Stacey's discharge, staff in her residence implemented the toy-play procedures but were unable to implement the water-mist procedure, which required one-to-one supervision. Two follow-up sessions conducted 1 month after her discharge indicated that low rates of SIB were maintained in the residential setting (M = 0.2).

DISCUSSION

Results of this study indicate that the maintaining contingencies for a behavior disorder can change over time, and suggest that such changes in operant function may contribute to treatment relapse fol-

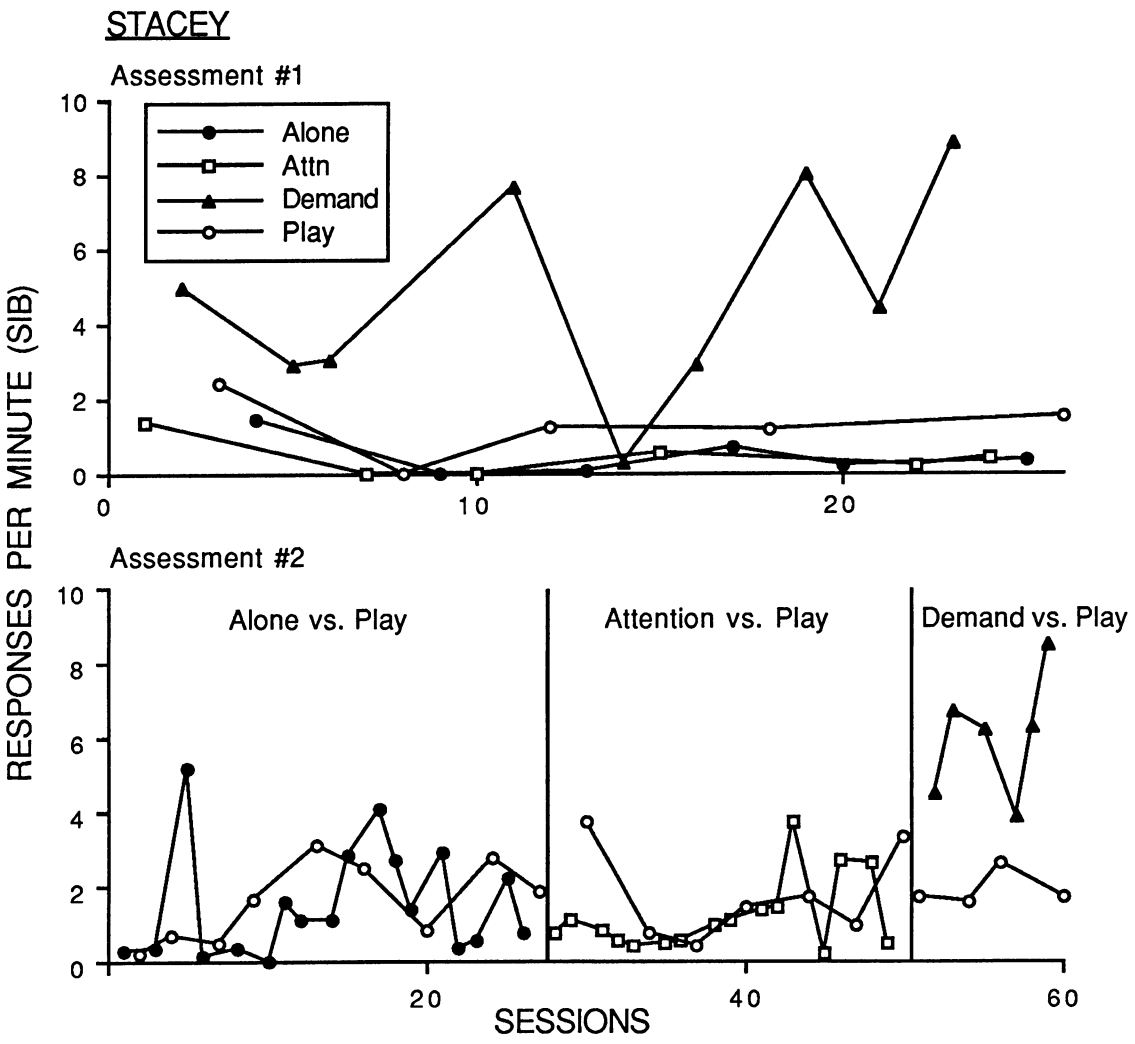

Figure 4. Response per minute of SIB in Stacey's initial functional analysis (top panel) and reassessment (bottom panel).

lowing the completion of successful intervention. Reassessments for 3 individuals rereferred to a day-treatment program suggested that the variables maintaining their SIB had changed in some manner, although, for 2 subjects, results of these analyses were not as clear as those obtained during their initial assessments.

The function of Brenda's SIB appeared to remain unchanged. Therefore, the extinction component of her original program was continued and, although the reinforcement component was modified (from DRO to NCR), it still focused on attention as the maintaining contingency. For the other 3 subjects, previous reductions in SIB were recaptured when, based on the results of their reassessments, new treatment procedures were implemented that focused on additional maintaining contingencies. David's new program (extinction plus DRO) was designed to address the additional (positive reinforcement) function his SIB had acquired and was implemented in conjunction with his initial treatment (extinction) for SIB maintained by negative reinforcement. By contrast, Diane's previous treatment (extinction and NCR for attention-maintained SIB) was replaced with an intervention (enriched environment) that addressed a possible

automatic function of her SIB, because treatment procedures involving social contingencies no longer appeared to be effective. Outcomes of these subjects' previous and ensuing treatment programs seemed to confirm interpretations of the assessment by according hypotheses about transfer of behavioral function some additional credibility.

Stacey's results were more problematic. Extinction for escape behavior should have been effective in reducing SIB during her second treatment, because rates of SIB were highest in the demand condition of her reassessment. The failure of this procedure cannot be readily explained, although other studies have found that some individuals' SIB can be highly resistant to extinction (e.g., Goh & Iwata, 1994; Iwata et al., 1990). Therefore, a punishment procedure (water mist) was added during structured training sessions. Treatment for SIB occurring outside of instructional contexts focused on access to alternative sources of stimulation (toys), which apparently competed with the "self-stimulatory" component of her behavior.

Due to the preliminary nature of this study, conclusions about transfer of behavioral function in these subjects must remain tentative. However, the assessment data presented here suggest that factors other than inconsistency in program implementation can lead to relapse, and that clinical reevaluation for such cases should include a current functional analysis. Due to possible changes in behavioral function, 2 subjects' initial treatment programs were no longer effective, and a 3rd subject required an additional program to reduce his SIB in all contexts. These results also suggest that transfer of function may not be a rare occurrence and, as such, should be subjected to closer scrutiny. The specific nature and mechanisms of function transfer may vary across individuals. For these subjects, changes in the maintaining contingencies for SIB formed slightly different patterns. David's SIB appeared to obtain an additional function that operated in conjunction with his initial one, and results of his treatment programs indicated that both variables (escape and attention) maintained his SIB, although in different contexts. On the other hand, the new reinforcer(s) maintaining Diane's SIB appeared to replace or supersede those originally responsible for behavioral maintenance. Fluctuations in the rate of her SIB were unaffected by changes in social context during her second assessment. Finally, data from Stacey's second assessment revealed that her SIB still contained an escape component, but that her SIB now persisted in the absence of social consequences.

The small number of subjects in this study and the limited scope of the follow-up observations restrict conclusions about the prevalence of function transfer and its probable causes. Results of this study are also limited by the ambiguous data from 2 subjects' reassessments. Although these data were used to generate several hypotheses about variables maintaining SIB and to design treatment programs accordingly, alternative interpretations should be considered. For Diane and Stacey, variables unaccounted for in the second analysis could have obscured the results. For example, the maintenance of Diane's SIB in the absence of social consequences may have resulted from a history with extremely thin, intermittent schedules of reinforcement. However, her SIB should have decreased when she was reexposed to the initial treatment, which included not only extinction but the nearly continuous delivery of noncontingent attention. For Stacey, continued responding in the absence of instructions could be explained by the adventitious avoidance of instructions or by the proximity of others in these conditions. However, the failure of Stacey's initial treatment (escape extinction) when applied during her second treatment does not support this assumption. Thus, a different interpretation of the results for David, Diane, and Stacey suggests that the first functional analysis simply failed to reveal those variables that were later identified through the reassessment. Such an interpretation, although possible, is not consistent with the success of the initial treatment programs.

Although reassessment can be somewhat complicated and time consuming, this strategy seems to be more efficient than implementing arbitrary treatment procedures until success is achieved. The problem of treatment relapse is further complicated when initial treatments are not based on results

from functional analysis assessments, because any number of hypotheses can be entertained when treatment suddenly fails. Thus, the possibility of relapse in general and a transfer of behavioral function specifically underscore the relevance of functional analysis procedures not only during assessment but also when problems arise throughout treatment and follow-up.

Additional studies are needed to determine the extent to which transfer of operant function contributes to treatment relapse. Research in this area might benefit from direct manipulation of variables potentially responsible for change in behavioral function and attempts to simulate this change under controlled conditions. If these mechanisms can be identified, clinicians could develop specific procedures to minimize the occurrence of such problems in the natural environment or, at the very least, inform caregivers about how to avoid situations in which behavior disorders can acquire new reinforcing functions.

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