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NONCONTINGENT DELIVERY OF ARBITRARY REINFORCERS AS TREATMENT FOR SELF-INJURIOUS BEHAVIOR

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Results of recent research have shown that noncontingent reinforcement (NCR) can be effective in reducing the frequency of behavior problems. In typical NCR applications, the reinforcer that is responsible for behavioral maintenance (as demonstrated through a functional analysis) no longer follows occurrences of the target behavior but instead is delivered according to a time-based schedule. Thus, it is unclear if NCR would be effective if the target behavior continued to be reinforced or if arbitrary reinforcers (i.e., those irrelevant to behavioral maintenance) were substituted for the maintaining reinforcers in the NCR procedure. In this study, 2 individuals whose self-injurious behavior (SIB) was maintained by positive reinforcement were exposed to conditions in which arbitrary and maintaining reinforcers were withheld and were delivered either contingently or noncontingently. Results indicated that noncontingent delivery of arbitrary reinforcers was effective in reducing SIB even though occurrences of SIB produced access to the maintaining reinforcer. These results suggest that (a) arbitrary reinforcers may sometimes be substituted for maintaining reinforcers, (b) an important component of NCR procedures is alteration of a behavior's establishing operation, and (c) NCR with arbitrary reinforcers might therefore be effective when maintaining reinforcers cannot be identified or withheld during the course of treatment.

DESCRIPTORS: extinction, functional analysis, noncontingent reinforcement, reinforcer assessment, self-injurious behavior

Noncontingent reinforcement (NCR), traditionally used as a control procedure, has recently been found to be an effective means of reducing the frequency of problem behaviors such as aggression, disruption, and self-injury (Hagopian, Fisher, & Legacy, 1994; Marcus & Vollmer, 1996; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993; Vollmer, Marcus, & Ringdahl, 1995). In these studies, the reinforcer that maintained the target behavior first was identified via a functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) and subsequently was delivered on a response-independent basis: The reinforcer was delivered on a fixed-time (FT) schedule regardless of whether the target behavior occurred.

NCR offers several potential advantages over differential-reinforcement-of-other-behavior (DRO) contingencies, including relative ease of use, elimination of deprivation states that might occur when an individual fails to meet criterion for reinforcement in a DRO contingency, and prevention of bursts of responding associated with the extinction component of DRO (see Vollmer et al., 1993, for a discussion of these). Additional research is needed to identify the benefits as well as the limitations that are associated with the use of NCR procedures. For example, in the studies conducted by Hagopian et al. (1994), Marcus and Vollmer (1996), and Vollmer et al. (1993, 1995), NCR was combined with extinction. The maintaining reinforcer was delivered, not following occurrences of the target behavior, but according to the predetermined FT

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schedule, in which temporal contiguity between the target behavior and delivery of the reinforcer was purely coincidental. Thus, it was unclear in these studies whether the behavior reduction associated with NCR was due to elimination of the behavior's establishing operation (Michael, 1982), extinction, or both processes.

Lalli, Casey, and Kates (1997) recently showed that NCR suppressed self-injurious behavior (SIB) in 1 individual, even though reinforcement also followed occurrences of SIB. This finding has important practical and theoretical implications that warrant further investigation. If extinction is not a critical component of NCR, the procedure might be effective despite the fact that aberrant behavior continues to be reinforced. That is, a relatively rich schedule of NCR might still produce behavioral suppression, even though parents or caregivers might attend to some proportion of behavior problems either inadvertently or because the behavior was severe enough to require immediate interruption.

Another question about NCR is the extent to which reinforcers other than those found to maintain a given behavior might suppress that behavior when delivered noncontingently. In the studies previously cited, NCR always involved delivery of the behavior's maintaining reinforcer, and it is not clear if arbitrary reinforcers[1] would have had the same effect. Results from several studies suggest that arbitrary reinforcers might compete with those that are responsible for behavioral maintenance. For example, continuous access to arbitrary reinforcers can reduce problem behavior that persists in the absence of social contingencies and is presumably maintained by automatic reinforcement (Favell, McGimsey, & Schell, 1982; Shore, Iwata, DeLeon, Kahng, & Smith, 1997). Similarly, when maintaining reinforcers are withheld via extinction, contingent (Mazaleski, Iwata, Vollmer, Zarcone, & Smith, 1993) or noncontingent (Hanley, Piazza, & Fisher, 1997) delivery of arbitrary reinforcers may rapidly decrease behavior by preventing extinction bursts. However, a more definitive test of whether arbitrary reinforcers compete with maintaining reinforcers would involve three steps: (a) demonstration of a functional relationship between the target response and the putative maintaining reinforcer, (b) demonstration that the arbitrary reinforcer does not maintain the target response, and (c) demonstration that noncontingent delivery of the arbitrary reinforcers suppresses the target response even when occurrences of the target response continue to produce the maintaining reinforcer.

In this study, we attempted to provide additional information about the mechanism or mechanisms by which NRC suppresses behavior and about the types of reinforcers that can be used in NCR procedures. After determining through a functional analysis that the SIB of 2 individuals was maintained by positive reinforcement, we conducted a preference assessment to identify highly preferred arbitrary reinforcers. We then examined the extent to which these arbitrary reinforcers suppressed SIB while SIB either did or did not produce its maintaining reinforcer.

GENERAL METHOD

Participants and Setting

Two adults living in a public residential facility for persons with developmental disabilities participated. Both had been diag-

[1] The term *arbitrary reinforcer,* as used here, merely refers to a stimulus whose contingent presentation does not maintain a specific target behavior. Although the term may not meet the technical definition of a *reinforcer* (i.e., the arbitrary stimulus may or may not maintain behaviors other than the target behavior), it seemed to be appropriate for the purposes of distinguishing between stimuli that function as maintaining reinforcers for a given behavior and those that do not.

nosed with profound mental retardation and had been referred for treatment of their SIB. Mike was a 34-year-old man who had a history of face slapping, aggression, and property destruction (e.g., throwing furniture). He followed simple instructions (e.g., "put on your shoes"), but he had no expressive verbalizations or signs. Mike received 600 mg of Tegretol® daily throughout the study. Bonnie was a 44-year-old woman whose SIB consisted of hand mouthing that produced varying degrees of tissue damage, increased her risk of infection, and limited her social interactions. Bonnie followed simple instructions, although her expressive language was limited to a few phrases that she repeated frequently (e.g., "Who's at the door?" "well hi!"). She did not receive any psychotropic medication during the study.

All sessions were conducted in therapy rooms at a day program for the treatment of SIB that was located on the grounds of the residential facility. The rooms were furnished with chairs, couches, tables, and other materials according to the experimental condition. Based on participants' availability, two to four sessions were conducted daily, 4 or 5 days per week. Functional analysis and reinforcer assessment sessions lasted 15 min, and NCR sessions lasted 10 min.

Response Measurement and Reliability

Topographies of SIB were defined as follows: *face slapping* (Mike): forceful contact of an open hand against the face or head; *hand mouthing* (Bonnie): contact of the fingers against the lips or insertion of any part of the hand into the mouth.

Observers were graduate and undergraduate students who had achieved at least 90% agreement with a trained observer for 3 other clients on three successive occasions. Observers used hand-held computers (Assistant, Model AST 102) to collect data on the frequency of SIB. These data were converted into the number of responses per minute. Interobserver agreement was assessed by having a second observer simultaneously but independently collect data during the session. Reliability was assessed for Mike during 25% of his functional analysis sessions and during 24% of his baseline and treatment sessions. Reliability was assessed for Bonnie during 36% of her functional analysis sessions and during 30% of her baseline and treatment sessions. Interobserver agreement data were not collected during the reinforcer assessment phase of the study. Reliability percentages were calculated by dividing session time into successive 10-s intervals. For each interval, the smaller number of responses was divided by the larger number of responses; these fractions were averaged across the session and multiplied by 100% to get the percentage of agreements between the two observers. Mean agreement scores for SIB were 99.2% (range, 99.1% to 100%) for Mike and 94.5% (range, 83.5% to 100%) for Bonnie. Throughout the study, data were also collected on a variety of the experimenter's behaviors (frequency of social interactions, instructions, reinforcer deliveries, etc.) to assess procedural consistency; these measures always exceeded 95%.

Phase 1: Functional Analysis

Procedure

A functional analysis (Iwata et al., 1982/1994) was first conducted to identify the variable or variables that were maintaining participants' SIB. A series of conditions, each conducted by a different experimenter, was presented in a multielement design. During the attention condition, the individual had free access to a variety of leisure items. The experimenter ignored the individual except to deliver attention (e.g., "stop, you'll hurt yourself") and brief physical contact (e.g., response interruption) contingent on each occurrence of SIB. During the demand condition, the experimenter presented

learning trials to the individual on an FT 30-s schedule using a three-step procedure (instruction, instruction plus demonstration, instruction plus physical assistance). Correct responses produced praise from the experimenter, incorrect responses produced the next level of prompt, and SIB produced termination of the trial (escape). During the alone condition, the individual was observed while alone in a room without access to any leisure materials, and no social consequences followed SIB. During the play condition, the individual had free access to leisure materials. The experimenter issued no instructions but instead initiated friendly social interaction on an FT 30-s schedule and ignored occurrences of SIB. A fifth condition (tangible) was conducted only with Mike, whose home staff reported that they had experienced considerable difficulty when they required him to change his clothes. At the beginning of a session, the experimenter removed one of Mike's personal possessions (his shoes). Contingent on the occurrence of SIB, Mike's shoes were returned for 30 s, after which they were removed again.

Results

Figure 1 shows results of the functional analysis obtained for Mike and Bonnie. Mike rarely engaged in SIB except during the tangible condition. Bonnie's highest rates of SIB were observed during the attention condition. Bonnie's play and demand conditions, both of which also included the presence of an experimenter, were associated with moderate rates of SIB, whereas consistently low rates were observed during the alone condition. Bonnie's results were consistent with what we observed outside of sessions, namely, that she was likely to engage in SIB whenever a therapist or caretaker was present, but did so more often when attention was delivered following occurrences of SIB. Thus, results obtained for both individuals indicated that their SIB was maintained by positive reinforcement (access to shoes for Mike; access to attention for Bonnie).

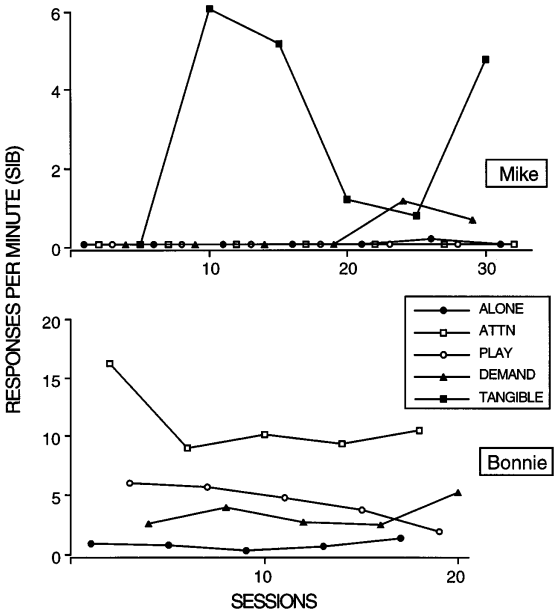

Figure 1. Number of responses per minute of SIB during the functional analysis for Mike (upper panel) and Bonnie (lower panel).

Phase 2: Reinforcer Assessment

Procedure

A pool of potential reinforcers was generated based on staff interviews and informal observation of the individuals. During a series of trials, pairs of these stimuli were presented to the individual in a random order, until each stimulus had been paired with every other stimulus (Fisher et al., 1992). On each trial, the first stimulus chosen by an individual within 5 s of presentation of the pair was scored as selected, and the individual was allowed to consume the item (food) or was given 5-s access to it (material). Attempts to approach both stimuli were blocked, and failure to select either stimulus within 5 s resulted in removal of the stimuli and presentation of the next trial. Both individuals showed a strong preference for food items, and Mike never selected any nonfood items during his initial assessment.

Thus, it was unclear whether his food selections accurately reflected relative preferences among foods or merely preference for food over nonfood items. Therefore, a second assessment was conducted for Mike consisting only of food items that had previously been selected frequently. Twenty-two stimuli were presented to Bonnie, and six were presented to Mike (second assessment only).

Results

The three items chosen most frequently by each individual were tentatively labeled *arbitrary* reinforcers and were selected for use during the NCR phase of the study. Mike chose Kit Kat™, pudding, and Skittles™ during 80%, 70%, and 60% of the trials, respectively. Bonnie chose Kit Kat™, juice, and Spree™ during 91%, 82%, and 82% of the trials, respectively.

Phase 3: Noncontingent Reinforcement Assessment

Procedure

Arbitrary reinforcement test. The NCR assessment began with a test to determine whether the stimuli selected from the reinforcer assessment were, in fact, arbitrary (i.e., irrelevant with respect to behavioral maintenance). An AB design was implemented for both individuals in which A represented an alone baseline identical to that used in the functional analysis and B represented the test condition. During the fixed-ratio (FR) 1 (food) test condition, a small piece of food (one of the three items selected from the reinforcer assessment, presented in random rotation) was delivered to the individual following each occurrence of SIB. Because Bonnie"s SIB was found to be maintained by attention, it was necessary to separate the potentially confounding effects of attention from those of food. That is, if the experimenter handed the food to Bonnie following SIB and if this contingency produced an increase in SIB, it is possible that behavior change may have been a function of the attention and not of the food. During Bonnie's test, a therapist positioned behind a partition reached around the partition and placed the food item on a plate located on a table. This control procedure was not used for Mike, whose SIB was not sensitive to attention as a reinforcer. Instead, the therapist sat near Mike and placed the food on a plate located on a table.

NCR conditions. Both individuals were exposed to a series of conditions in which the maintaining and arbitrary reinforcers were either delivered or withheld. These conditions were presented in either a multiple baseline across settings design (Mike) or a reversal design (Bonnie). The baseline condition, FR 1 (maintaining reinforcer), was identical to the functional analysis condition with the highest rates of SIB for each individual, in which occurrences of SIB produced access to the maintaining reinforcer (shoes for Mike, attention for Bonnie). During the next condition, NCR (arbitrary reinforcer) plus FR 1 (maintaining reinforcer), the experimenter delivered an arbitrary reinforcer (an item used in the arbitrary reinforcer test) on an FT 10-s schedule. Occurrences of SIB continued to produce access to the maintaining reinforcer. Finally, we wanted to determine whether response suppression would be maintained under leaner NCR schedules. However, it seemed highly probable that SIB would increase under a lean NCR schedule if SIB continued to be reinforced. Therefore, in the next condition, NCR (arbitrary reinforcer) plus extinction (maintaining reinforcer), arbitrary reinforcers were delivered according to the FT 10-s schedule, but SIB did not produce the maintaining reinforcer (the experimenter ignored occurrences of SIB). When rates of SIB were below 0.5 responses per minute for five consecutive sessions during the NCR (arbitrary reinforcer) plus extinction (maintaining reinforcer) condition, the NCR schedule was

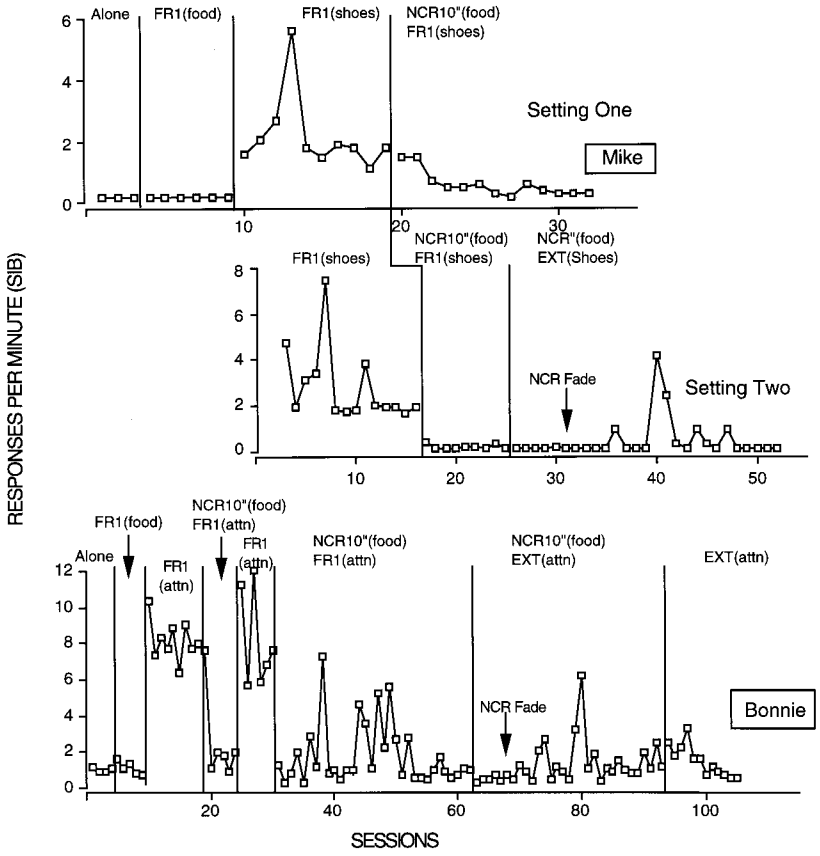

Figure 2. Number of responses per minute of SIB during the arbitrary reinforcer assessment for Mike (top and middle panels) and Bonnie (bottom panel).

faded using procedures described by Vollmer et al. (1993). Fading began by eliminating one of the scheduled reinforcer deliveries during each minute (i.e., the FT 10-s schedule was reduced from six to five reinforcers per minute). If the rate of SIB was at or below 0.5 responses per minute during a session, another reinforcer delivery was eliminated from the schedule in the next session. If the rate of SIB was above 0.5 responses per minute during one session (Mike) or for two consecutive sessions (Bonnie), the rate of NCR delivery was increased to its previous level. After the rate of reinforcement was reduced to one per minute, reinforcement was faded more slowly (to 0.5, 0.33, 0.25, and finally, 0.2 reinforcers per minute).

Extinction (maintaining reinforcer). This condition was conducted only with Bonnie, for whom the NCR fading was unsuccessful. The therapist remained in the room but did not deliver attention when Bonnie engaged in SIB. NCR was not implemented during this condition.

Results

Results obtained for Mike are shown in the top and middle panels of Figure 2. As seen in the first two conditions, rates of SIB were zero during the alone baseline and did not increase when food was presented contingent on SIB, indicating that food was an arbitrary reinforcer for Mike. Although Mike's behavior did not contact the contingency because he never emitted SIB, the availability of food (held by the experimenter)

should have occasioned SIB if food were a maintaining reinforcer. Mike's SIB immediately increased during the FR 1 (shoes) condition, which was conducted in a different location by a different experimenter. When NCR (food) was superimposed on the FR 1 (shoes) baseline, SIB decreased somewhat gradually in Setting 1 and immediately in Setting 2, even though occurrences of SIB still produced access to shoes. This result was compromised somewhat because the NCR procedure was implemented in Setting 2 before a clear treatment effect was observed in Setting 1. SIB remained low in Setting 2 when it was placed on extinction. Although there were periodic increases in SIB as the NCR schedule was faded, Mike continued to meet the criterion for fading, and his treatment was terminated following five consecutive sessions in which SIB occurred at a rate of less than 0.5 responses per minute with an NCR schedule of 0.2 reinforcers per minute (one every 5 min) in effect.

Bonnie's data are shown in the bottom panel of Figure 2. As was the case with Mike, contingent presentation of food did not increase Bonnie's rates of SIB above those observed during the alone condition, indicating that food was an arbitrary reinforcer. Her SIB increased markedly during the FR 1 (attention) condition. When NCR (food) was added to and then later removed from the FR 1 (attention) condition, Bonnie's rate of SIB decreased rapidly and then returned to its previous level. When the NCR (food) condition was reinstated, her SIB decreased again, although periodic increases were observed. Bonnie's SIB was then placed on extinction, and this procedure, combined with a rich schedule of NCR, produced the lowest rates of SIB observed during the experiment. Our attempt to fade the NCR schedule met with limited success. When the rate of NCR reached two reinforcers per minute, Bonnie's SIB increased and became variable. Although she eventually met the criterion for fading reinforcer deliveries to one per minute on two occasions, her SIB increased following both of these sessions. It is possible that these increases in SIB could have represented "superstitious" behavior that is maintained through adventitious reinforcement (Skinner, 1948). Alternatively, Bonnie's periodic increases in SIB during previous NCR conditions, as well as our failure to fade the NCR schedule beyond one reinforcer per minute, might have been due to the relationship between Bonnie's arbitrary reinforcers and her SIB. That is, delivery of food undoubtedly increased salivating and may actually have occasioned some hand mouthing. Therefore, in an attempt to reduce her rate of SIB to a clinically acceptable level, the NCR component was withdrawn while extinction remained in effect. During this final condition, Bonnie met the criterion for treatment completion (a rate of SIB below 0.5 responses per minute for five consecutive sessions).

Following the completion of the study, maintenance programs were designed for both individuals. Presentation of maintaining reinforcers contingent on SIB was deemed undesirable as a maintenance procedure. Likewise, extinction alone, although effective in reducing both participants' SIB, did not provide them with a means of gaining access to reinforcement by exhibiting appropriate behavior. Therefore, the maintenance programs consisted of (a) differential reinforcement for alternative behavior (DRA), in which Mike was taught to sign for shoes or other materials and Bonnie was taught to say "hi" for attention; (b) noncontingent reinforcement, in which Mike had continuous access to his favorite shoes except when necessary and Bonnie received frequent attention from staff; and (c) extinction, in which SIB did not produce access to materials (Mike) or attention (Bonnie). Staff members were taught to implement

these procedures, and follow-up data collected in the participants' homes showed that SIB continued to be suppressed well below baseline levels.

DISCUSSION

Results of this study indicated that noncontingent delivery of arbitrary reinforcers suppressed SIB. A functional analysis was first conducted to identify the source of reinforcement for Mike's and Bonnie's SIB. Subsequently, several highly preferred stimuli (arbitrary reinforcers) were identified for both individuals through a preference assessment. Finally, in a series of conditions in which the arbitrary and maintaining reinforcers were either delivered or withheld, it was found that the arbitrary reinforcers did not maintain SIB when delivered contingently. However, these reinforcers suppressed SIB when delivered noncontingently, even though SIB continued to produce access to its maintaining reinforcer.

These findings extend current research on the effects of NCR in several ways. First, it appears that the suppressive effects of NCR are due primarily to alteration of a behavior's establishing operation (deprivation from reinforcement) rather than to extinction, because extinction was not implemented during the initial NCR conditions. Second, the data suggest that behavioral suppression via NCR may not necessarily require identification or delivery of the reinforcer that is maintaining the target problem behavior. That is, potent arbitrary reinforcers that were identified through a preference assessment seemed to substitute for those that maintained SIB. Third, the fact that adventitious reinforcement did not occur during the NCR (arbitrary reinforcer) plus FR 1 (maintaining reinforcer) conditions suggests that a rich schedule of NCR may override either contingent or inadvertent reinforcement for problem behavior. Although these findings must be interpreted cautiously due to the small subject sample, they provide additional information on the mechanisms by which NCR suppresses behavior, illustrate some variations in the use of NCR procedures, and clarify the results of some previous research.

Mazaleski et al. (1993) found that arbitrary reinforcers did not compete with maintaining reinforcers, which, at first glance, may appear to conflict with findings reported here. Their results showed that a DRO contingency with arbitrary reinforcers was ineffective unless the target behavior (SIB) was simultaneously placed on extinction. The failure of the DRO contingency could have been due to the use of arbitrary reinforcers (i.e., it is possible that arbitrary reinforcers would not have competed with those that maintained SIB under any circumstances), the absence of extinction, or schedule differences between delivery of the arbitrary and maintaining reinforcers (i.e., the DRO 15-s schedule for delivery of the arbitrary reinforcers may have been too lean to compete with the CRF schedule of reinforcement for SIB). In the present study, the first two possibilities were eliminated: Arbitrary reinforcers delivered in the absence of extinction produced behavioral suppression. Thus, the negative results reported by Mazaleski et al. were, in all likelihood, a function of schedule differences. In other words, it is possible that a rich DRO schedule of arbitrary reinforcers *might* compete with maintaining reinforcers. The choice between NCR and DRO might then be a practical matter; as noted by Vollmer et al. (1993), NCR schedules are easier to implement because there is no behavioral requirement for delivery of the reinforcer. This is particularly relevant when the target behavior occurs at high rates, which often may be the case at the beginning of treatment, because short interresponse times would require frequent resetting of the DRO interval.

In a recent examination of the motivational aspects of NCR, Marcus and Vollmer (1996) also presented results that seem to conflict with those reported here. Noting that NCR may suppress behavior through either extinction or reduced motivation (elimination of the behavior's establishing operation), the authors suggested that the latter influence represented a potential limitation of NCR procedures because it might interfere with the acquisition of adaptive behavior. Marcus and Vollmer exposed 3 individuals to DRA contingencies combined with NCR procedures to determine whether reinforcer satiation produced by NCR would have disruptive effects on the alternative response. Although such effects were not observed, data for 1 participant (Sally) during the NCR/DRA condition showed that the alternative response did not occur when the NCR schedule was rich and increased only when the schedule was thinned. The DRA contingency was not implemented for another participant (Rob) until after the NCR schedule had been thinned. Thus, for 2 individuals, the alternative response increased only when the rate of reinforcement under the NCR procedure was leaner than that available during baseline, leaving open the possibility that rich schedules of NCR might suppress responding primarily through reduced motivation (elimination of an establishing operation) rather than through extinction. In the NCR (arbitrary reinforcer) plus FR 1 (maintaining reinforcer) conditions of the present study, extinction was not in effect; thus, response suppression must have been a function of reduced motivation. Lalli et al. (1997) also obtained response suppression with NCR in the absence of extinction (see the data for Harry).

Because of a number of methodological differences among the studies by Marcus and Vollmer (1996), Lalli et al. (1997), and the present one, additional research is needed to examine more thoroughly the basis for response suppression that is obtained with NCR procedures. For example, it is possible that rich schedules of NCR suppress the target behavior through satiation, whereas lean schedules produce extinction of the target behavior. Hagopian et al. (1994) compared the effects of rich (10-s) versus lean (5-min) schedules of NCR. They observed behavioral suppression during the rich condition but not during the lean one, but it is possible that reductions in the target behavior (extinction) might have occurred in the lean condition had it continued for a longer period of time.

Results from the present study also address a potential concern about the accidental delivery of noncontingent reinforcement soon after a target behavior is emitted, which may lead to response maintenance through adventitious reinforcement. Such effects have rarely been found in applied research (Vollmer, Ringdahl, Roane, & Marcus, 1997), which may be due to the fact that (a) NCR typically has been combined with extinction, or (b) there is a relatively low probability that NCR actually follows the target behavior in close temporal contiguity (i.e., reinforcement is always or usually delivered soon after the behavior during baseline [contingent reinforcement], whereas reinforcement may follow behavior but also may follow periods of nonresponding during treatment [NCR]). Neither of these factors could account for the absence of accidental effects in the present study because the reinforcer that was responsible for behavioral maintenance was delivered contingently and following each response (i.e., on an FR 1 schedule). Thus, reduced motivation may also account for the absence of accidental reinforcement effects, at least when the NCR schedule is dense. That is, if an individual receives noncontingent reinforcement that is sufficient to substantially reduce motivation, coincidental (or

even contingent) delivery of reinforcement following behavior may not produce response maintenance.

The above interpretation must be offered cautiously because we did not examine accidental effects thoroughly. Such an analysis would involve the use of schedules in which varying proportions of reinforcers explicitly followed (or did not follow) occurrences of the target behavior, which would allow a determination of how much accidental reinforcement produced response maintenance. This potential limitation of NCR procedures warrants further investigation, because the periodic increases in Bonnie's SIB during the NCR (food) plus FR 1 (attention) condition may have been the product of accidental reinforcement.

Finally, the finding that arbitrary reinforcers might substitute for (i.e., compete with) maintaining reinforcers suggests that NCR procedures might still be effective even when the reinforcers that maintain aberrant behavior cannot be identified, as might be the case with behavior that is maintained by automatic reinforcement. Under such conditions, preference assessments might provide a means of identifying potent arbitrary reinforcers whose delivery could suppress aberrant behavior maintained by other sources of reinforcement, as was shown by Vollmer, Marcus, and LeBlanc (1994).

In summary, results from the present study provide additional support for the use of NCR as a treatment procedure and suggest that NCR might be effective despite the presence of several potentially limiting conditions. Given the positive results reported here and in a number of studies in which there has been significant variation in client characteristics, target behaviors, maintaining reinforcers, and NCR parameters, NCR may be an attractive alternative to DRO, DRA, and extinction as an initial means of producing rapid behavioral suppression.

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STUDY QUESTIONS

1. In the Introduction, the authors raised two issues regarding noncontingent reinforcement (NCR) that needed further investigation. What were these issues, and how did the authors propose to address them?

2. Describe the procedures used to identify the maintaining and arbitrary reinforcers whose effects were evaluated in the final phase of the study.

3. Using Mike as an example, describe each of the the following conditions, including its purpose, the procedures involved, and the results obtained: (a) FR 1 (food), (b) FR 1 (shoes), and (c) NCR 10 s (food) plus FR 1 (shoes).

4. What was unusual about the food delivery procedure used for Bonnie, and why did the authors use this procedure?

5. Why was the FR 1 (maintaining reinforcer) component eliminated and replaced with extinction before an attempt was made to fade the schedule of NCR?

6. The authors concluded that reduced motivation (i.e., alteration of an establishing operation) rather than extinction was the mechanism by which NCR decreased SIB. What was the primary basis for this conclusion?

7. The authors also concluded that there was little evidence of adventitious reinforcement associated with the NCR procedure. What set of data supports this conclusion and what set of data renders the conclusion somewhat tentative?

8. What are the major implications of the finding that noncontingent delivery of arbitrary reinforcers suppressed SIB despite the fact that SIB continued to produce its maintaining reinforcer?

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