

# Some Undesirable Effects of Noncontingent Reinforcement

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Noncontingent reinforcement (NCR) has been an effective treatment for a wide range of problem behaviors. Nevertheless, NCR may produce some undesirable effects when attempting to suppress responding initially, maintain treatment gains, or strengthen alternative behaviors. Specific sources of difficulty and potential solutions are discussed.

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Response-independent delivery of a reinforcer (noncontingent reinforcement or NCR) has become a widespread intervention in recent years, to the point where it is considered, along with extinction, differential reinforcement of other behavior (DRO), and differential reinforcement of alternative behavior (DRA), a highly effective and acceptable form of treatment (Carr et al., 2000). Moreover, NCR has distinct advantages over these other procedures. First, NCR is unlikely to produce side effects sometimes observed during extinction (e.g., response bursting) because NCR does not involve the elimination of access to reinforcers. Second, NCR often suppresses problem behavior more rapidly than do DRO and DRA because there is no behavioral requirement for the delivery of reinforcement. Finally, NCR schedules are easier to implement than are DRO and DRA schedules because therapists do not have to carefully monitor the occurrence of either problem or alternative behavior; they simply deliver reinforcers at the appropriate time.

In spite of these advantages, there are situations in which NCR may produce undesirable effects. Problems may occur at different stages of treatment: (a) initial response suppression, (b) maintenance, or (c) acquisition of alternative behaviors, and may require the use of alternative procedures in conjunction with or in place of NCR. We describe here several undesirable effects of NCR and offer potential solutions.

## Initial Response Suppression

NCR typically produces rapid suppression of problem behavior. Under certain conditions, however, NCR may result in response maintenance.

*Adventitious reinforcement.* NCR schedules are, by definition, response independent. However, some reinforcers may be delivered by chance soon after problem behavior occurs. This accidental contiguity between response and reinforcer may resemble an intermittent schedule of reinforcement and have a similar effect on behavior. That is, NCR may produce behavioral maintenance instead of suppression through a process that has been called "adventitious" reinforcement (Skinner, 1948). Several studies in the applied literature have reported response maintenance when NCR was used for several purposes: to

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decrease problem behavior (Vollmer, Ringdahl, Roane, & Marcus, 1997), to reverse the effects of contingent reinforcement (Thompson, Iwata, Hanley, Dozier, & Samaha, 2003), or to actually test NCR as a maintenance procedure (Dozier et al., 2001). For example, Vollmer et al. observed that aggression increased during NCR and that it tended to occur most often just prior to the delivery of reinforcement. When adventitious reinforcement is observed, alternative interventions should be considered, including extinction (Thompson et al.), which eliminates the delivery of reinforcers entirely, or a programmed delay between the occurrence of problem behavior and the delivery of a reinforcer (Britton, Carr, Kellum, Dozier, & Weil, 2000; Vollmer et al.), which essentially transforms the NCR procedure into a DRO contingency.

*Reinforcer delivery as a discriminative stimulus.* A history of reinforcement for problem behavior produces frequent pairings between a response and a reinforcer, which may lead to a situation in which the reinforcer acquires discriminative properties. If so, the delivery of a reinforcer or even its mere presence (the sight of it) in an NCR intervention may occasion problem behavior and produce maintenance instead of suppression. The discriminative function of reinforcement has been shown with both NCR (Thompson et al., 2003), in which there is no contingency between responding and reinforcement, and DRO, in which there is actually a negative contingency (Koegel & Rincover, 1977; Thompson et al.). Although it is possible that continued use of NCR eventually may eliminate discriminative control, more rapid suppression might be expected under extinction, in which reinforcers are removed completely.

### Maintenance of Treatment Effects

In almost all research on the therapeutic use of NCR, treatment is initiated with continuous or very dense schedules of reinforcement. More practical schedules are required for long-term use in applied settings; however, attempts to reduce the frequency of reinforcement may be problematic.

*Temporary effects of NCR.* The overabundant delivery of reinforcers that occurs in most NCR interventions reduces the frequency of behavior by eliminating deprivation, the establishing operation or EO (Michael, 1982, 1993) that occasions responding. Because this effect usually is temporary, the cessation of NCR may result in reemergence of the target behavior. For example, Kahng, Iwata, Thompson, and Hanley (2000) observed increases in two of three participants' problem behaviors within several minutes after NCR sessions ended. For this reason, NCR should be viewed as a temporary intervention and should be replaced with (a) extinction and (b) a differential reinforcement procedure that explicitly reinforces the absence of problem behavior (DRO) or strengthens alternative appropriate behavior (DRA), which the individual can use to gain access to reinforcement when deprivation states again are experienced.

*Effects of schedule thinning.* Results of a number of studies have shown increases in the occurrence of problem behavior when initially dense NCR schedules were thinned (e.g., Hagopian et al., 2000; Kahng, Iwata, DeLeon, & Wallace, 2000; Lalli, Casey, & Kates, 1997; Vollmer, et al., 1998). These increases in problem behavior appeared to represent extinction bursts, which are a temporary problem. More serious is the possibility that problem behavior would reemerge and contact reinforcement, which may permanently compromise or even reverse treatment effects. As a result, NCR schedule thinning is almost always accomplished in conjunction with extinction for problem behavior. It should be noted that Lalli et al. observed that problem behavior was maintained at low levels for one participant when an NCR schedule was thinned without extinction (i.e., problem behavior continued to be reinforced). This, however, was an unusual effect that, to our knowledge, has not been replicated.

### Acquisition of Alternative Behavior

The eventual goal of all behavior-reduction programs is to establish more socially appropriate alternative behaviors, and the most significant limitations of NCR can be found during this phase of the intervention process. As is the case

with extinction, NCR contains no explicit provision to strengthen behavior. Thus, a necessary adjunct to NCR interventions is the inclusion of a DRA procedure. However, to the extent that NCR produces satiation by eliminating the EO for problem behavior, it may adversely affect any attempt to use the same reinforcer in a DRA contingency. Put another way, if, as a result of receiving free reinforcers, and individual is unmotivated to engage in problem behavior, the person should be similarly unmotivated to engage in other behaviors to produce the reinforcer.

Two studies have examined this potential limitation of NCR. Marcus and Vollmer (1996) initially treated two individuals' problem behavior with dense NCR schedules and subsequently implemented DRA procedures. Acquisition of the alternative behavior was not adversely affected when the NCR schedule was thinned rapidly (one participant) or when NCR was thinned prior to the implementation of DRA (the other participant). Goh, Iwata, and DeLeon (2000) evaluated the effects of DRA *prior* to thinning the NCR schedule, and neither of two participants showed any increase in alternative behavior. When the NCR schedules were thinned subsequently, increases in alternative behavior were not observed until the NCR schedules were reduced to 8%-15% of their original values. The implications of these data are that (a) DRA schedules are unlikely to be effective (or necessary) in combination with dense NCR schedules, and (b) NCR schedules must be thinned prior to implementing DRA procedures.

### Summary

NCR has a number of behavioral effects. The most significant of these from a clinical standpoint is a reduction in the frequency of behavior previously maintained by the reinforcer that is delivered. This effect has contributed to NCR's success as an intervention across a wide range of problem behaviors; it also has facilitated many procedural modifications for the varied contingencies that maintain those behaviors. NCR has additional effects, however, which may produce undesirable outcomes. A review of potential problems that may be encountered when using

NCR suggests that NCR should be viewed as temporary means of reducing behavior. Successful implementation may require the addition of extinction or an explicit contingency (DRO) in which the occurrence of problem behavior does not produce reinforcement. Finally, NCR will not establish alternative behavior and may actually interfere with the implementation of DRA programs.

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