

*THE EFFECTS OF NONCONTINGENT DELIVERY OF
HIGH- AND LOW-PREFERENCE STIMULI ON
ATTENTION-MAINTAINED DESTRUCTIVE BEHAVIOR*

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An adolescent with severe mental retardation and cerebral palsy who displayed attention-maintained destructive behavior was exposed to noncontingent reinforcer delivery (NCR) with either a high-preference or a low-preference stimulus while reinforcement for destructive behavior with attention remained in effect (i.e., NCR without extinction). NCR without extinction was effective only when the high-preference stimulus was available, suggesting that systematic assessment of stimulus quality may enhance the effectiveness of NCR with alternative stimuli.

DESCRIPTORS: functional analysis, behavioral assessment, developmental disabilities, noncontingent reinforcement

Noncontingent reinforcer delivery (NCR), an effective treatment for problem behavior, involves the delivery of a reinforcer on a response-independent time-based schedule (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). NCR is often combined with extinction (discontinuation of reinforcement for problem behavior) and schedule thinning (starting with dense and proceeding to lean NCR schedules) to make the treatment more practical (Vollmer et al.).

The reinforcer delivered on a time-based schedule during NCR is often the one identified by a functional analysis as being responsible for maintenance of the problem behavior (i.e., noncontingent attention for attention-maintained destructive behavior; e.g., Vollmer et al., 1993). However, recent research has shown that noncontingent de-

livery of alternative or arbitrary stimuli (i.e., those unrelated to behavioral function) identified via a preference assessment (e.g., toys, food) can also reduce problem behavior maintained by a qualitatively different reinforcer (e.g., attention; Fischer, Iwata, & Mazaleski, 1997).

Identification of effective alternative stimuli allows more flexibility in designing NCR treatments. For example, if a given toy is found to reduce behavior maintained by attention, then the former stimulus can be delivered noncontingently as treatment for attention-maintained problem behavior at times when a caregiver is not able to provide attention (e.g., when on the phone). Similarly, alternative reinforcers can be used to reduce problem behavior when extinction is impossible or impractical (e.g., automatically reinforced pica; Piazza et al., 1998). In the current study, we provide preliminary data on the importance of systematically assessing the extent to which alternative stimuli compete with destructive behavior with an adolescent who displayed attention-maintained destructive behavior. He also displayed destructive behavior maintained by tangible reinforcement and escape; these functions

This investigation was supported in part by Grant MCJ249149-02 from the Maternal and Child Health Service and Grant 1 R01 HD37837-01 from the National Institute of Child Health and Human Development, U.S. Department of Health and Human Services.

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were effectively treated but were not the focus of the current study. The effectiveness of NCR was compared using two stimuli, purported by caregivers to be highly preferred, for which the systematic assessment predicted that one stimulus would effectively compete with destructive behavior and the other would not.

METHOD

Dee, a 17-year-old boy with severe mental retardation, cerebral palsy, seizure disorder, bipolar disorder, visual impairment, and a ventriculo-peritoneal shunt, had been admitted to an intensive outpatient program for the treatment of destructive behavior (self-injury, aggression, disruption, and verbal aggression). Functional analysis and treatment evaluation sessions lasted 10 min, and stimulus preference trials lasted 30 s. Because of the risk of damage to his shunt, all attempts at self-injurious behavior (SIB) were blocked during the functional analysis and treatment sessions (i.e., the therapist's hand was placed between Dee's hand and the targeted body part). All sessions and trials were conducted in a padded room (3 m by 3 m) with a one-way mirror, behind which trained observers recorded behaviors on laptop computers. Interobserver agreement was assessed during 65.6% of sessions and 97% of reinforcer assessment trials. Exact agreement coefficients averaged 94.2% for destructive behavior. Mean total duration agreement for stimulus interaction, calculated by dividing the lower duration by the higher duration for each 30-s trial and multiplying by 100%, was 83.3%.

A functional analysis was conducted using methods similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), except that a tangible condition was included (based on caregiver report) and an alone condition was not (because of Dee's shunt). For 2 min prior to the tangible

condition, Dee was given free access to a toothbrush. At the start of the session, the toothbrush was withdrawn; thereafter, Dee received 30 s of access to the toothbrush contingent on destructive behavior on a fixed-ratio (FR) 1 schedule.

Potential alternative reinforcers were identified using the two-step process described by Piazza *et al.* (1998). The purpose of the assessment was to identify stimuli with high levels of interaction and low rates of destructive behavior. First, a pool of 15 preferred stimuli was identified based on caregiver report using a structured interview called the Reinforcer Assessment for Individuals with Severe Disabilities (Fisher, Piazza, Bowman, & Amari, 1996). Each stimulus was then individually presented noncontingently five times during 30-s trials (the order of the 75 trials was randomized within blocks during one of four sessions) while destructive behavior continued to produce attention (a brief verbal reprimand). Thus, during each trial, Dee could choose to interact with the available stimulus, display destructive behavior and receive attention, or both. During each trial, the duration of interaction with the stimulus and the rate of destructive behavior were measured. Interaction was defined individually for each item. For example, interaction with music was scored if Dee rocked to the music, sang, or held the cassette player. Alternatively, interaction was scored if Dee consumed edible items or manipulated objects.

Finally, we compared the effectiveness of NCR using a stimulus (music) that the preference assessment predicted would compete effectively with destructive behavior (high-preference [HP] stimulus) and one (Rainstick) that the preference assessment predicted would not compete with destructive behavior (low-preference [LP] stimulus). During the preference assessment, the HP stimulus was associated with high levels of interaction ($M = 100\%$ of time during the

trials) and low rates of destructive behavior ($M = 0.0$ responses per minute), whereas the LP stimulus was associated with lower levels of interaction ($M = 68\%$) and high rates of destructive behavior ($M = 41.2$ responses per minute).

During the treatment evaluation, three conditions were alternated randomly using a multielement design. During the attention condition, which served as a control, the therapist began the session sitting in a chair and reading a magazine, but stood to block SIB when it occurred. Otherwise, toys were available and the therapist delivered a brief verbal reprimand contingent on destructive behavior. In the other two conditions, NCR without extinction was in effect (i.e., destructive behavior continued to produce attention on an FR 1 schedule). In one of these conditions (HP alternative), the HP alternative stimulus was available noncontingently throughout the session. In the other condition (LP alternative), the LP alternative stimulus was available noncontingently throughout the session.

RESULTS AND DISCUSSION

Results of the functional analysis and treatment evaluation are shown in Figure 1. Dee's destructive behavior was sensitive to attention ($M = 13.7$ responses per minute), escape ($M = 2.6$ responses per minute), and tangible reinforcement ($M = 4.8$ responses per minute), when compared to the rates of behavior observed in the toy play condition ($M = 1.9$ responses per minute). Results of the treatment evaluation show that NCR without extinction immediately reduced attention-maintained destructive behavior to zero when the HP stimulus was used ($M = 0.0$ responses per minute), but when the LP stimulus was used ($M = 19.7$ responses per minute) rates were comparable to the attention condition ($M = 23.8$ responses per

minute). Thus, the preference assessment accurately predicted that noncontingent access to the HP stimulus would reduce attention-maintained destructive behavior and that access to the LP stimulus would not.

The method employed in the current investigation to identify stimuli that competed with attention-maintained behavior has previously been used to select reinforcers that compete with problem behavior (e.g., pica) hypothesized to be maintained by automatic reinforcement (e.g., Piazza et al., 1998). This preference assessment method is based on choice principles, in that the individual can choose to obtain the alternative stimulus, which is available noncontingently, or to obtain the putative automatic reinforcer by displaying destructive behavior (e.g., oral stimulation automatically produced by pica). The current results suggest that this method (i.e., having the individual choose between the reinforcer for destructive behavior and alternative stimuli) may also be useful for developing treatments for socially reinforced problem behavior. It should be noted that we were unable to rule out that Dee's behavior was maintained at least in part by automatic reinforcement because an alone condition was not included in the functional analysis. However, the behavior occurred far more often when it produced attention (and attention was otherwise unavailable) relative to the other test and control conditions.

Another limitation is that the present study involved a single subject, and thus the findings should be regarded as preliminary and interpreted with caution. Further research is needed in which these procedures are used with additional participants in order to determine the generality of these findings. A third limitation of this investigation is that NCR with the HP stimulus was evaluated in relatively brief (10-min) sessions. In the current case, NCR with the HP stimulus was only one component of a comprehensive

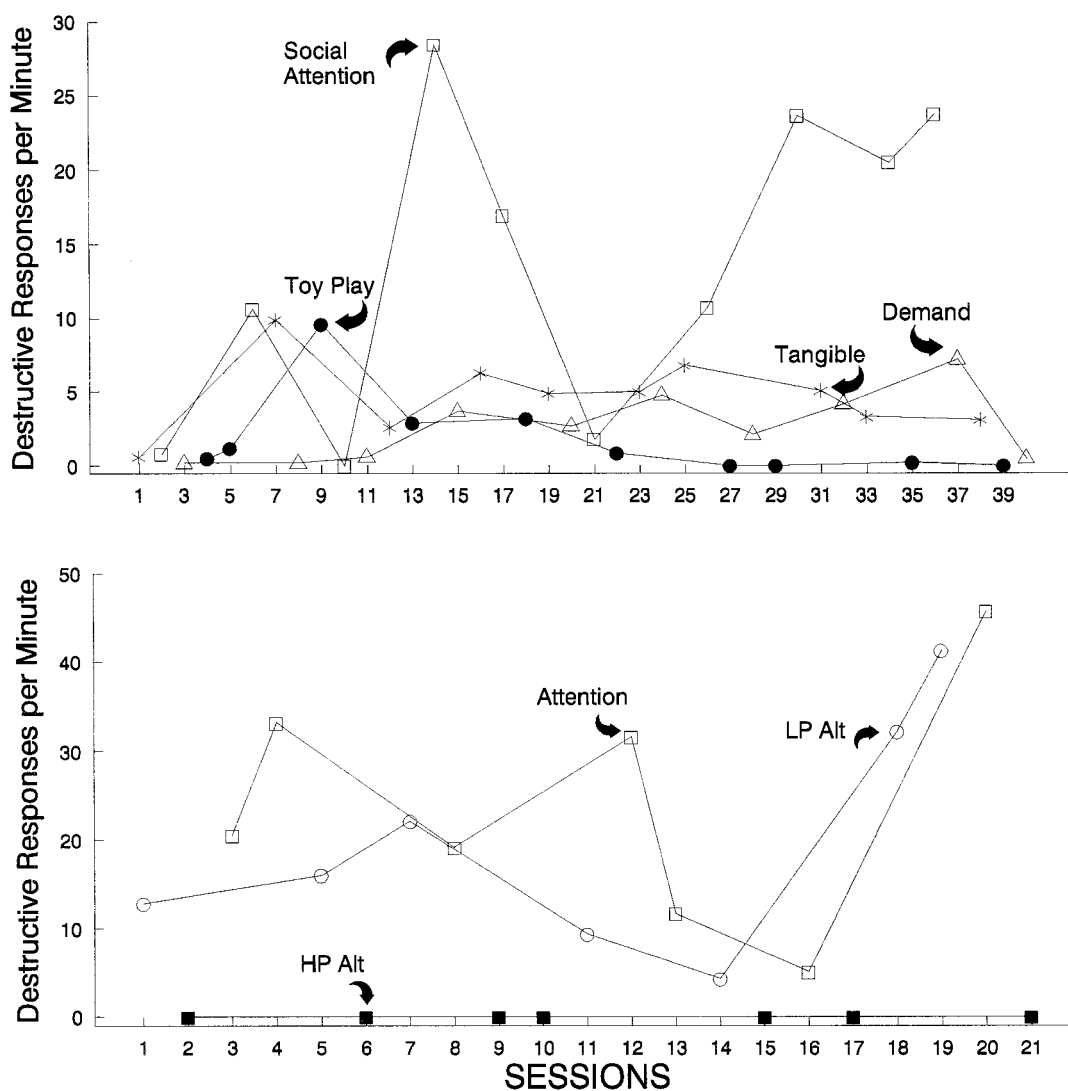


Figure 1. Rates of destructive behavior during the functional analysis (top panel) and the treatment evaluation (bottom panel) of noncontingent reinforcer delivery without extinction.

treatment package. We recommend that this component be used primarily when the establishing operation for attention-maintained problem behavior is present (e.g., low-attention conditions) but is impractical to deliver attention for appropriate behavior (e.g., when the parent is busy).

REFERENCES

Fischer, S. M., Iwata, B. A., & Mazaleski, J. L. (1997). Noncontingent delivery of arbitrary reinforcers as treatment for self-injurious behavior. *Journal of Applied Behavior Analysis, 30*, 239-249.

Fisher, W. W., Piazza, C. P., Bowman, L. G., & Amari, A. (1996). Integrating caregiver report with a systematic choice assessment. *American Journal on Mental Retardation, 101*, 15-25.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982/1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27*, 197-209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2*, 3-20, 1982)

Piazza, C. C., Fisher, W. W., Hanley, G. P., LeBlanc, L. A., Worsdell, A. S., Lindauer, S. E., & Keeney,

- K. M. (1998). Treatment of pica through multiple analyses of its reinforcing functions. *Journal of Applied Behavior Analysis, 31*, 165–189.
- Vollmer, T. R., Iwata, B. A., Zarcone, J. R., Smith, R. G., & Mazaleski, J. L. (1993). The role of attention in the treatment of attention-maintained self-injurious behavior: Noncontingent reinforcement and differential reinforcement of other behavior. *Journal of Applied Behavior Analysis, 26*, 9–21.
- Received April 12, 1999*
Final acceptance November 16, 1999
Action Editor, Timothy R. Vollmer