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Noncontingent Reinforcement as Treatment for Tub-Standing in a Toddler

Ryan D. Ward and Thomas S. Higbee
Utah State University

Abstract

The present case study investigated whether the tub-standing of a typically-developing toddler could be reduced by a noncontingent reinforcement procedure. The results of a brief functional analysis suggested that tub-standing was maintained by automatic reinforcement. Noncontingent reinforcement, consisting of presentation of bath toys on a fixed-time schedule, was effective in reducing the number of tub-stands per session. These results suggest that noncontingent reinforcement can be successfully applied to problem behavior in typically-developing children in naturalistic settings.

Key words: brief functional analysis, noncontingent reinforcement, tub-standing, toddler

Noncontingent reinforcement (NCR) has been widely used in recent years as a treatment for problem behavior in populations diagnosed with developmental disabilities (see Carr et al., 2000 for review). Boe (1977) first described this method of treatment. He used noncontingent presentation of variable-time food (VT) to reduce aggressive behavior in a group of women diagnosed with mental retardation. Similarly, Thelen (1979) used noncontingent delivery of attention to reduce tantrum behavior in an 8-year old girl.

Most treatment programs that employ NCR do so in a function-based manner. The reinforcing consequence that maintains the problem behavior is identified through a functional analysis (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1994), and is then presented noncontingently according to some time-based schedule, generally fixed time (FT). During NCR treatment, if the problem behavior occurs, there is generally a response programmed into the intervention. For example, extinction is widely used in conjunction with NCR for socially maintained problem behaviors (e.g., Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993), and another method, such as response blocking, is generally used in conjunction with NCR when problem behavior is automatically reinforced (e.g., Piazza, Hanley, & Fisher, 1996).

Correspondence to Thomas S. Higbee, Dept. of Special Ed. and Rehab., Utah State University, 2865 Old Main Hill, Logan, UT 84322-2865; email: tom.higbee@usu.edu.

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Noncontingent reinforcement has been shown to be effective for a variety of problem behaviors, including those maintained by attention (e.g., Hagopian, Fisher, & Legacy, 1994; Vollmer et al., 1993), escape from or avoidance of instructional demands (e.g., Khang, Iwata, DeLeon, & Worsdell, 1997), and access to materials (e.g., Lalli, Casey, & Kates, 1997). In addition, NCR has been shown to be an effective treatment for other socially inappropriate behavior, including aggression (e.g., Vollmer, Ringdahl, Roane, & Marcus, 1997), rumination (e.g., Wilder, Draper, Williams, & Higbee, 1997), disruption (e.g., Fisher, Ninness, Piazza, & Owen-DeSchryver, 1996), inappropriate speech (e.g., Carr & Briton, 1999), and pica (e.g., Piazza et al., 1998).

Aside from being effective, NCR has several benefits over other treatment options (see Carr & LeBlanc, in press, for discussion). First, most NCR procedures present the reinforcer responsible for maintenance of the problem behavior, rather than trying to mask the reinforcing contingency through some other method. Another benefit of NCR is that it appears to be as effective, if not more so, than several other common behavior-change procedures, such as differential reinforcement of other behavior (DRO; Vollmer et al., 1993), functional communication training (FCT; Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997), and extinction (Vollmer et al., 1998). In addition, NCR has been shown to be an effective treatment for automatically reinforced problem behavior, particularly when the noncontingent reinforcement is matched to the same or similar stimulus modalities as the reinforcer maintaining the problem behavior (Higbee, Chang, & Endicott, 2005; LeBlanc, Patel, & Carr, 2000). Finally, NCR is a more positive procedure for both client and clinician than other traditional behavior-reducing procedures, as evidenced by more reinforcer deliveries than under DRO methods (Vollmer et al., 1993), and less extinction-induced behavior than DRO or extinction (Vollmer et al., 1993; Vollmer et al., 1998).

Although many uses of NCR are function-based (present the reinforcer maintaining the behavior as identified through a functional analysis), this need not be the case in order for NCR treatments to be effective. In some cases, identification of the reinforcer maintaining a given problem behavior may be difficult or not possible. Furthermore, in the case of automatically reinforced behavior, it may not be possible for the reinforcer maintaining the problem behavior to be withheld. In these cases, treatment involving arbitrary NCR may be beneficial. For example, Hanley, Piazza, and Fisher (1997) assessed the effectiveness of arbitrary NCR treatment on destructive behavior that was attention maintained. They identified highly-preferred stimuli through a preference assessment and then presented these stimuli noncontingently. Their results showed that noncontingent presentation of a highly-preferred stimulus reduced destructive behavior to the same degree that presentation of noncontingent attention did, suggesting that the tangible items were to some extent substitutable for attention. In this study, the destructive behavior was placed on extinction, but others have shown that arbitrary NCR is effective even when the problem behavior still produces the maintaining reinforcer (e.g., Fisher, Iwata, & Mazalenski, 1997; Lalli et al., 1997). These results suggest that although function-based NCR is preferred when possible, arbitrary NCR can be effective in reducing problem behavior, and is therefore a viable treatment option.

Although extensive research has been conducted on the effects of NCR treatment on a variety of problem behaviors in individuals diagnosed with developmental disabilities and other disorders, there has been relatively little investigation of NCR as treatment for problem behavior in typically-developing children. Thus, the primary purpose of the present case study was to evaluate the effectiveness of NCR as a treatment for a socially relevant problem behavior (problematic standing in the tub at bath time, hereafter tub-standing) in a typically-developing toddler. A secondary purpose was to evaluate the feasibility of conducting a functional analysis on this socially relevant problem behavior in the home environment.

Method

Participant and Setting

The participant, Maude, was a typically-developing 16-month old child. All sessions lasted 20 min and were conducted during her regular bath time at approximately 8:30 P.M. Sessions were generally conducted on Tuesday, Thursday, Saturday, and Sunday. Sessions were not conducted on Monday, Wednesday, or Friday because Maude went swimming on those days, after which she was bathed at the swimming facility.

Response Definition and Measurement

The target behavior was tub-standing, defined as both feet flat on the tub floor and both hands off of the tub floor. Tub-standing is particularly dangerous for young children because they can slip on the smooth surface of the tub and fall. In fact, slips and falls accounted for 82% of bathtub injuries in children in a recent study (Columbus Children's Research Institute, 2005). Thus, interventions that decrease this behavior are desirable. For the purposes of this study, instances where standing was assisted (holding on to the side of the tub, faucet, etc.) or unassisted were not differentiated. Data collected were the number of tub-stands per 20 min session. This method of data collection was chosen because it provides an accessible picture of the overall frequency of the target behavior.

Functional Analysis

Functional analysis procedures were similar to those used by Iwata et al. (1994). Preliminary observation suggested that tub-standing was not maintained by escape (no incident ever resulted in getting out of the tub or elimination of task demands), and was also not maintained by access to tangibles (bath toys were generally freely available during tub time). Therefore, a brief functional analysis with two conditions, attention and alone, was conducted in an alternating-treatments design in which functional-analysis conditions were alternated across successive days. Each functional-analysis condition was conducted for four days, for a total of eight days of functional analysis.

During the attention condition of the functional analysis, the participant was placed in the tub without access to bath toys or other tangibles, and all incidences of tub-standing resulted in the delivery of contingent attention in the form of a verbal prompt delivered by the experimenter to sit down (e.g., sit down, please, you are going to hurt yourself). This condition was conducted to assess whether tub-standing was maintained by parent attention. During the alone condition, the participant was placed in the tub without access to bath toys or other tangibles and all incidences of tub-standing were recorded. This condition was conducted to determine if tub-standing would be maintained regardless of the social consequences for this behavior (i.e., automatically reinforced). Due to the safety hazard produced by tub-standing, during the attention condition of the functional analysis if tub-standing was not terminated within 5 s following the verbal prompt, the participant was forcibly sat down on the tub floor (modified response blocking). In the alone condition of the functional analysis, there were no verbal prompts on occurrence of tub-standing, but the participant was forcibly sat down on the tub floor 5 s after any instances.

Noncontingent Reinforcement

Following the functional analysis, three sessions of baseline were conducted. These sessions were identical to the alone condition of the functional analysis. Following three baseline sessions, noncontingent reinforcement treatment began. During noncontingent reinforcement sessions, the participant was placed in the tub and the experimenter delivered access to bath toys on a FT schedule in which the participants' behavior did not influence the frequency of reinforcement. The bath toys used were foam alphabet letters and numbers, plastic cups of varying sizes, rubber sea animals that could be filled with water and squirted, and a bath-time book with pictures of various sea animals. These toys were chosen for inclusion on the basis of approximately 6 months of preliminary observation of the participant at bath time and were all highly-preferred toys. When the FT interval timed out, Maude was given access to a randomly chosen bath toy for 30 s, after which the toy was removed from the tub. Following the next elapsed interval, another toy was presented. This treatment regimen continued until the end of the session. The initial FT schedule value was FT 2 min. This value was then thinned to an FT 5 min schedule. Tub-standing increased under FT 5 min, so the schedule density was increased to FT 3 min. As in the functional analysis, all instances of tub-standing were blocked. Thus, the present treatment constituted a NCR without extinction procedure.

Results And Discussion

Functional Analysis

Figure 1 shows the results of the functional analysis. During the attention condition, tub-standing occurred on average 9.5 times per session. During the alone condition, tub-standing occurred at a higher rate, on average 14.8 times per session. In addition, the number of tub-stands per session during the attention condition was highly variable, while under the alone condition the number of tub-stands was more stable across sessions. These results suggest that tub-standing was maintained simply by stimulation produced by the act of standing itself (i.e., automatic reinforcement).

NCR Treatment

Figure 2 shows that the number of tub-stands during the three baseline sessions was similar to that seen in the alone condition of the functional analysis, with an average of 12.3 times per session. Following implementation of NCR 2 min, tub-standing was decreased to 1 stand per session, and remained low for the four days that NCR 2 min was in effect. Following schedule-thinning to NCR 5 min, tub-standing increased to around eight times per session. When the NCR schedule density was increased to NCR 3 min, tub-standing decreased to one stand per session and did not occur for the last two sessions of NCR treatment.

These results are related to several areas. First, the results of the functional analysis suggested that tub-standing was maintained by automatic reinforcement. This type of automatic reinforcement may be, and probably is, different from the type that is thought to influence other types of problem behavior. For Maude, who has been walking for

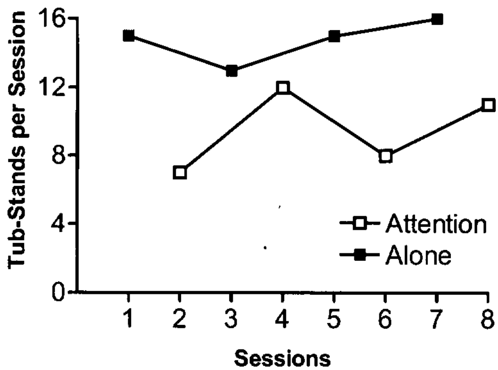

Figure 1. Tub-stands per session during functional analysis. Open points represent data from the attention condition, and closed points represent data from the alone condition.

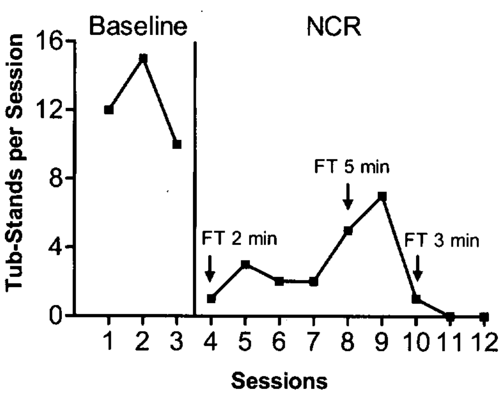

Figure 2. Tub-stands per session during noncontingent reinforcement treatment.

a relatively brief period of time, standing and walking appear to be reinforcing in and of themselves, and the results of the functional analysis suggest that simply standing may have been reinforcing enough to maintain itself even in the absence of other differential consequences. This result suggests that highly preferred activities, particularly those that have been relatively recently learned, may be "automatically" reinforcing. If this were the case, one might expect tub-standing to decrease without intervention as the novelty of it fades. Conclusions as to whether this type of "automatic" reinforcement is similar in kind to other types of automatic reinforcement, such as perceptual (e.g., visual) or sensory (e.g., oral) stimulation must await further research.

The results of the present case study provide further support for the efficacy of NCR as treatment for problem behavior. Previous NCR studies have generally been conducted in extremely-controlled clinical settings, and little research has been conducted on the feasibility or utility of NCR as an intervention in naturalistic settings (see Carr et al., 2000, for discussion). The results of the present case study suggest that implementation of an effective NCR treatment for problem behavior in a typically-developing child may be accomplished in a relatively brief amount of time in a naturalistic setting. Future research should more clearly delineate and circumscribe the types of problem behaviors, natural settings, and conditions that contribute to or limit the use of NCR as an effective problem-behavior reducing procedure.

The results from the present functional analysis are encouraging because they suggest that empirically-validated methods for determining behavioral function that have long been employed in structured settings such as laboratories, clinics, and schools may also be used by practitioners, parents, or other caregivers in the home. Specifically, these results suggest that the reinforcer maintaining common problem behaviors in typically-developing children may be identified using an easily-implemented functional analysis in the child's home environment. Future research should assess the utility of functional analyses in identifying behavioral function of other commonly-encountered problem behaviors in typically-developing children.

The primary limitation of the present case study is that it involved only one subject. There are no other data on treatments for tub-standing in toddlers, and therefore the generality of the present results is unclear. Another limitation of the present case study was that, due to the dangerous nature of tub-standing, any instances of tub-standing were followed by forcibly sitting the child down in the tub. Particularly during the alone condition of the functional analysis, this course of action could be argued to have produced a consequence for tub-standing, thus undermining the function of the alone condition. Aside from structural changes to the tub, however, this was the only viable approach. Furthermore, the different results from the attention and alone conditions of the functional analysis, both of which included this modified response blocking, suggest that the reinforcer maintaining tub-standing *was* differentiated by these conditions. Thus, notwithstanding the response-blocking procedure, the results of the functional analysis appear valid.

Another potential limitation of the present case study is that the items delivered under the NCR schedules were not chosen on the basis of a formal preference assessment. It has been shown that arbitrary NCR without extinction (as in the present study) is effective only when highly preferred items are delivered during NCR (e.g., Fisher, O'Connor, Kurtz, DeLeon, & Gotjen, 2000). In the present case study, preference for stimuli delivered during NCR was not formally assessed, but observation for several months prior suggested that all of the stimuli used were highly preferred items. In addition, the results of the NCR manipulations are clear; NCR resulted in large and lasting decreases in tub-standing. Thus, although the lack of formal preference assessment in the present study is less desirable from an experimental standpoint, the treatment data clearly show that the intervention was effective nonetheless. A final limitation is that formal interobserver agreement data were not collected during the case study. While the target behavior was clearly defined and easily detected, this may limit the validity of the current results. Future researchers should examine the effects demonstrated in the present study utilizing more formal research controls.

In conclusion, the decreases in tub-standing under NCR provide further evidence that NCR is an effective problem-behavior reducing procedure. In addition, because the nature of the NCR was not specifically matched to any known reinforcing stimulus properties, these results may lend support to the assertion that arbitrary NCR can be a productive treatment intervention when behavioral function cannot be identified. Finally, these results suggest that NCR may be an effective treatment to reduce dangerous or problem behaviors in typically-developing children in naturalistic settings.

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