November 2022

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Lauren D. Turenne
University of South Florida

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Decreasing Property Destruction and Self-Injurious Behavior with DNRO

by

Lauren D. Turenne

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science Department of Child and Family Studies College of Behavioral and Community Sciences University of South Florida

Major Professor: Sarah Bloom, Ph.D., BCBA-D Kimberly Crosland, Ph.D., BCBA-D Raymond Miltenberger, Ph.D., BCBA-D

Date of Approval November 14, 2022

Keywords: Autism Spectrum Disorder (ASD), Differential Negative Reinforcement of Other Behavior (DNRO), Token System

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Abstract

Differential negative reinforcement of other behavior (DNRO) involves the delivery of reinforcement and the removal of an aversive stimulus contingent on the absence of problem behavior. HT was an 8-year-old female diagnosed with autism spectrum disorder (ASD). She used an augmentative and alternative communication (AAC) device to communicate independently using typed sentences composed of three or more words. She frequently engaged in property destruction (PD) and self-injurious behavior (SIB) in the form of head banging when presented with a demand. The purpose of this case study was to decrease SIB and PD and increase on-task behavior using a DNRO procedure embedded with a preexisting differential reinforcement of other behavior (DRO) token system. Results from this study suggest that the DNRO procedure implemented on top of the existing DRO token system improved on-task behavior.

Keywords: Autism Spectrum Disorder (ASD), Differential Negative Reinforcement of Other Behavior (DNRO), Token System, Property Destruction (PD), Self-Injurious Behavior (SIB)
Decreasing Property Destruction & Self-Injurious Behavior with DNRO

Children diagnosed with developmental disabilities (DD), including autism spectrum disorder (ASD), may engage in problem behaviors (Horner et al., 2002). Previous research has demonstrated reinforcement-based procedures to be an effective treatment for the reduction of disruptive behaviors (Vollmer & Iwata, 1992). In the case of problem behavior maintained by escape from academic demands, the reinforcer delivered in a differential reinforcement of other behavior (DRO) procedure could involve brief escape from the demand (Kodak et al., 2003). “DRO involves the delivery of reinforcement contingent on the nonoccurrence of the target response for a prespecified interval of time” (Vollmer & Iwata, 1992, p. 395). Cooper et al. (2020, p. 604) suggest that practitioners should set an initial DRO interval at which the individual’s current level of behavior will contact reinforcement when the DRO procedure is implemented.

DRO schedules can include fixed-interval (FI), variable-interval (VI), fixed-momentary (FM), and variable-momentary (VM) (Cooper et al., 2020, p. 601). The current case study implemented a differential negative reinforcement of other behavior (DNRO) procedure in conjunction with an existing fixed-interval DRO token system. Escape or avoidance of aversive stimuli could maintain challenging behavior, therefore, those stimuli could be used to reinforce the absence of problem behavior, as in DNRO (Wheatley et al., 2020). Wheatley et al. (2020) implemented a DNRO procedure to increase compliance with wearing an anti-strip suit to prevent inappropriate fecal behavior. Escape was provided contingent on zero levels of inappropriate fecal behavior throughout the DNRO interval. If the participant attempted to
remove the anti-strip suit during the DNRO interval, the therapist blocked the attempt and reset the timer. The DNRO interval increased from 30 s during baseline to wearing the anti-strip suit the entire duration of the school day. The findings from Wheatley et al. (2020) demonstrate that DNRO was an effective intervention for increasing compliance with wearing an anti-strip suit for extended periods of time.

Buckley and Newchok (2006) used DNRO to decrease ear covering and screaming evoked by music for a 7-year-old boy with pervasive developmental disorder. An auditory stimulus assessment was conducted to evaluate musical variables hypothesized to evoke problem behavior. The music selections were played through a compact disk (CD) or tape in random order. The control condition included free access to preferred items in the absence of music. If problem behavior occurred during the assessment, music was terminated for 30 s. The taped music condition revealed high levels of problem behavior related to the CD and control conditions. The DNRO procedure used a 30 s interval and a brief explanation to instruct the participant to keep his hands down while the music was playing. In the absence of problem behavior, the music was terminated for 30 s to provide a brief escape. DNRO intervals increased when problem behavior occurred less than 5% of the intervals for two consecutive sessions. Disruptive behaviors increased during return to baseline and decreased to near 0 when DNRO was reintroduced. This study provides evidence for using negative reinforcement to decrease problem behavior evoked by music (Buckley & Newchok, 2006).

Kodak et al. (2003) used noncontingent escape (NCE) and DNRO for decreasing problem behavior maintained by escape and increasing compliance. The participants were diagnosed with ASD and engaged in problem behaviors such as property destruction (PD), task refusal (TR), and aggression toward others (ATO) during instructional time. Compliance was measured as the
number of trials with independent responding to the task. An alternating treatments design embedded in a nonconcurrent multiple baseline across subjects was employed. Both the NCE and DNRO conditions provided a continuous break in the first session. The NCE condition provided a 10 s break every 10 s. When the participant completed two consecutive sessions with an 85% reduction for problem behavior from baseline, the NCE interval increased. The DNRO condition provided a 10 s break contingent on the absence of problem behavior in the 10 s interval. If problem behavior occurred, the timer was reset, and a break was delivered contingent on the absence of problem behavior in the 10 s interval. Like the NCE condition, the DNRO interval increased only if the rate of problem behavior met the criterion level. Results show both NCE and DNRO decreased problem behavior and increased compliance for both participants. The authors did not report which component they felt was most effective. This study provides evidence that DNRO and NCE are effective treatments for increasing compliance and decreasing maladaptive behaviors.

Vollmer et al. (1995) examined the effects of NCE on negatively reinforced SIB for two participants who exhibited autistic-like behaviors. SIB included head hitting or punching, head banging, and hand or arm biting. A functional analysis (FA) was conducted for each participant to determine the function of SIB and the authors found SIB was escape maintained. NCE was examined using a multiple baseline design across subjects, and the effects of DNRO and NCE were evaluated for 1 participant within a reversal (A-B-A-C) design. During the NCE condition, escape from academic activities was delivered on a fixed-time (FT) schedule independent of the participant’s behavior. The schedule for increasing the FT intervals differed across both participants. During the DNRO condition (1 participant), escape from academic tasks was provided contingent on absence of SIB. The participant could receive a 20 s break and if the
individual engaged in SIB during the DNRO interval, the timer was reset. The results from Vollmer et al. (1995) revealed that NCE had a more immediate suppressive effect for both participants. The authors concluded that NCE could be an effective treatment for SIB maintained by escape.

HT frequently engaged in property destruction (PD) and self-injurious behavior (SIB) in the form of head banging when presented with an instruction. The purpose of the current case study was to decrease SIB and PD and increase on-task behavior using DNRO superimposed on a DRO token system. The token economy used a FI reinforcement schedule of 4 mins.
Method

Participants, Setting, & Materials

HT was an 8-year-old female diagnosed with ASD. She used an augmentative and alternative communication (AAC) device, and she could communicate independently using typed sentences composed of three or more words. Sessions lasted between 1 to 3 hr and were conducted in the clinic. Data were collected using Motivity™. Motivity™ is a management platform that assisted the therapist with data collection. The therapist entered the frequency of SIB and PD into the Motivity™ system, and Motivity™ calculated the rate. The therapist entered the frequency of trials with correct responding and Motivity™ calculated on-task behavior as the percentage of correct responding out of the observed trials. The required materials were HT’s token board, a timer, reinforcers (phone), and discrete trial teaching (DTT) stimuli. DTT stimuli included matching with point-to-point correspondence, independent work, and receptive identification.

Target Behaviors

HT frequently engaged in perseveration, ATO, nose picking, mouthing, PD, and SIB. PD was defined as any behavior directed towards an object (either directly or by way of another object) that may result in damage. Most often, HT banged her hands on the table. SIB was defined as behavior directed towards the self (either directly or by way of an object) that may result in injury. HT banged her device on her head or slammed her knees together or on the ground. The BCBA reported to the therapist that an FA was previously conducted by someone else at the agency. Although the data and procedures were not provided, the BCBA said that the
FA showed that SIB and PD occurred frequently during instructional activities and was maintained by escape from demand.

**Response Measurement and Interobserver Agreement**

On-task behavior was measured as any instance in which HT completed the academic activity within 5 s and without problem behavior (+ = complies without prompts/no problem behavior; - = complies with prompts/problem behavior). Data were collected as the percentage of correct responding out of the observed trials. A second observer was not available to collect data that would have allowed us to calculate interobserver agreement, however, if interobserver agreement (IOA) data was assessed, it would have been collected for approximately 33% of the sessions. Observers would independently score the percentage of correct responding. An agreement would be defined as both observers score the trial as an instance in which the participant completed the task with/without engaging in problem behavior and with/without prompts. Trial-by-trial IOA would be calculated by dividing the number of trials agreed by the total number of trials and multiplied by 100.

**Experimental Design**

The experimental design employed was an AB design to demonstrate a treatment effect. The DNRO condition was implemented along with the DRO token system. The intervention followed baseline (DRO token system isolated) to determine if the behavior would further decrease.

**Procedures**

**Baseline**

Before the therapist began working with the client, the BCBA created a DRO token board procedure on a FI schedule of 4 mins. During baseline, the therapist continued to implement the
DRO token system in isolation. The therapist placed the token board on the table, set a timer for 4 mins, and instructed the child to engage in an academic task. Each academic task was considered a trial. For example, the therapist placed an independent worksheet (i.e., math worksheet) on the table in front of the participant. If the participant completed the independent worksheet within the 4-min interval and refrained from engaging in SIB or PD, she received a phone icon on the token board, which indicated her preferred reinforcer. If SIB or PD occurred, the therapist placed an X icon on the token board and reset the timer for 4 mins. If the participant continued to engage in SIB for a prolonged period, the therapist moved her chair away from the table and grabbed a foam pad to block her from hitting her head or knees on the ground. Once the participant received all 5 tokens, the therapist counted the number of phone icons placed on the token board. Each phone icon represented 1 min of leisure time the participant could have with her phone. An X icon symbolized 0 mins of free time with the phone. For example, if the participant received 1 X icon and 4 phone icons, then she obtained 4 mins of leisure time with her phone. The DRO intervals remained constant throughout the duration of the study.

**DNRO Intervention**

During the DNRO condition, the therapist continued to execute the DRO token procedure in conjunction with DNRO. The therapist used the same procedures previously stated for the DRO token system and set the DNRO interval to a fixed-time schedule of 4 mins. Each academic task was considered a trial. If the participant completed the academic task (i.e., independent math worksheet) within the 4 min interval and refrained from engaging in SIB or PD, she received a 1 min break from the academic task and a phone icon on the token board. The therapist gave a vocal warning (i.e., “HT, it is time to do work.”) to prompt that it was time to transition back to work after the 1 min elapsed. If SIB or PD occurred, the therapist placed an X icon on the token
board and reset the DNRO interval for 4 mins. If the participant continued to engage in SIB for a prolonged period, the therapist moved her chair away from the table and grabbed a foam pad to block her from hitting her head or knees on the ground. Once the participant received all 5 tokens, the therapist counted the number of phone icons placed on the token board. The participant could receive 1 min of phone time per token (phone icons only) earned. The DNRO intervals remained constant throughout the duration of the study.
Results

Figures 1 and 2 show the rate of PD and SIB during baseline and the DNRO condition, respectively. In figure 1, the mean rate for PD was equal to 0.7 during baseline and decreased to 0.3 after introducing DNRO. Figure 2 shows the rate of SIB during baseline and treatment phases. During baseline, the mean rate for SIB was equal to 0.06. SIB was equal to zero for 50% of the sessions during baseline. During the intervention phase, the mean rate for SIB increased to 0.18. This demonstrates an increase in SIB after the introduction of DNRO. During sessions 6, 13, and 15, after DNRO was introduced, both the rate of SIB and PD decreased to 0. SIB occurred at lower rates per hour when compared to PD. Figure 3 demonstrates the percentages for on-task behavior across both conditions. There is a slight increasing trend for percentage of on-task behavior. Although there is high variability in the data, the mean for on-task behavior during baseline was equal to 57% and increased to 64% during the DNRO condition. After the presentation of DNRO, during session 9, on task behavior was recorded at 0%.
Figure 1: Rate (per hour) of PD across baseline (DRO token economy isolated) and DNRO (w/DRO token economy) conditions.
Figure 2: Rate (per hour) of SIB across baseline (DRO token economy isolated) and DNRO (w/DRO token economy) conditions.
Figure 3

Figure 3: Percentage for on-task bx across baseline (DRO token economy isolated) and DNRO (w/DRO token economy) conditions.
Discussion

The purpose of this case study was to decrease SIB and PD, as well as increase on-task behavior using DNRO with a DRO token system. The results extend on previous literature (Kodak et al., 2003; Wheatley et al., 2020) that suggest that DNRO may be an effective treatment to increase on-task behaviors, although more data would be needed to see if the high levels of compliance in the last two sessions continued. However, this study did not directly replicate the procedures previously described in past literature. For example, Kodak et al. (2003) assessed NCE and DNRO for decreasing problem behavior maintained by escape and increasing compliance. Kodak et al. (2003) increased the DNRO intervals if the rate of problem behavior was equal to or less than the criterion level. A break was delivered contingent on the absence of problem behavior. Compared to Kodak et al. (2003), the current study assessed DNRO with DRO for decreasing SIB and PD maintained by escape, while increasing on-task behavior. DNRO intervals remained constant throughout the entire study and a break from academic demands were delivered contingent on the absence of the target behaviors. Wheatley et al. (2020) implemented DNRO to increase compliance with wearing an anti-strip suit to stop inappropriate fecal behavior. Escape was provided contingent on the absence of inappropriate fecal behavior throughout the DNRO interval. The DNRO interval increased from 30 s in baseline to wearing the anti-strip suit the entire school day. Compared to Wheatley et al. (2020), the current study implemented a DNRO procedure superimposed on a DRO token economy to increase compliance with instructional activities. The DNRO intervals remained stable and a break from academic instructions was delivered contingent on the absence of problem behavior. Both Kodak
et al. (2003) and Wheatley et al. (2020) found DNRO to be an effective treatment for increasing compliance and decreasing defiant behaviors. The results from the current case study support previous findings that DNRO could be effective for increasing on-task behaviors. Although DNRO was not as effective for decreasing SIB, PD decreased after introducing the DNRO intervention found in this study. Failure to replicate effects of previous literature could be due to differences between our procedures and previous studies undermined the effectiveness of our protocol.

Although DNRO increased compliance relative to baseline, during session 9 (DNRO condition), on-task behavior was recorded at 0%. It is unclear why on-task behavior did not occur; however, possible explanations include, but are not limited to the following: (a) environmental changes (novel therapists/teachers), (b) difficulty of the academic demands, or (c) lesser preferred reinforcers were used (phone was not available). Treatment integrity data were not collected during the duration of this study; if the phone was not available, the experimenter failed to implement the treatment as intended. However, on-task behavior increased after introducing DNRO with the DRO token economy. Future research is needed to investigate the effects of DRO with DNRO procedures replicated from previous literature and should also include treatment integrity.

DNRO does not include a contingency for compliance, therefore, it is not evident as to why on-task behavior increased from baseline to intervention. A few implications are plausible: (a) on-task behavior was inadvertently reinforced, (b) demands became less aversive as breaks increased, thus reducing the motivating operation (MO) for escape, or (c) positive reinforcement became effective for reinforcing on-task behavior only after DNRO (in conjunction with the DRO token system) reduced the escape-maintained behaviors. Further research is needed to
assess these implications and for other justifications as to what effects DNRO has for reducing escape-maintained behaviors and increasing on-task behaviors, as well as the conditions in which DNRO is most effective.
References


