

*CREATING TIC SUPPRESSION: COMPARING
THE EFFECTS OF VERBAL INSTRUCTION TO
DIFFERENTIAL REINFORCEMENT*

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The purpose of this study was to compare two methods designed to produce tic reduction in 4 children with Tourette's syndrome. Specifically, a verbal instruction not to engage in tics was compared to a verbal instruction plus differential reinforcement of zero-rate behavior (DRO). Results showed that the DRO-enhanced procedure yielded greater reductions in tic frequency.

DESCRIPTORS: differential reinforcement, tics, verbal instruction

Tourette's syndrome is a neurobehavioral condition involving rapid, repetitive motor movements and vocalizations known respectively as motor and vocal tics. Because the condition has a neurobiological origin, the expression of tics is often attributed to internal factors (e.g., Casey, Tottenham, & Fossella, 2002; Peterson et al., 1998). Thus, when a person with Tourette's syndrome exhibits a decrease in tic occurrence, it may commonly be concluded that either the underlying biological mechanisms have temporarily changed or the person has "voluntarily" suppressed his or her tics. From a behavior-analytic perspective, an alternative course of inquiry would be to investigate reinforcement contingencies that may occasion or directly control tic reduction. The current study compared the effects of verbal instruction, which had previously been demonstrated to be effective in tic reduction (Meidinger et al., in press), to instruction plus differential reinforcement on the rate of tic expression.

METHOD

Participants

Four children with Tourette's syndrome (3 boys and 1 girl) participated in the study.

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Nick was 10 years old and displayed exaggerated arm and hand shaking and obscene gesturing. He had also been diagnosed with bipolar disorder, oppositional defiant disorder, and attention deficit hyperactivity disorder (ADHD). Louis was 10 years old and displayed exaggerated eye blinking, lip pursing, mouth raising, and mouth stretching. Billy was 11 years old, and his tics consisted of exaggerated eye blinking, eye rolling, mouth stretching, and nose wrinkling combined with eye closing. He had also been diagnosed with obsessive compulsive disorder. Mary was 9 years old and displayed eye rolling. She had also been diagnosed with ADHD. Although the children and their parents may have reported additional tics, such tics did not occur during the study or occurred so infrequently that they were not included for analysis (see below for tic inclusion criteria used in baseline).

Procedure

Data collection. All data collection occurred in a room (3 m by 3 m) that was equipped with a one-way observation mirror. All sessions were videotaped and the parents, but not the participants, were informed that the children were being recorded. After completion of the study, all videotapes were scored for the occurrence of tics using either a frequency count (Mary) or a 10-s partial-

interval scoring method (Nick, Louis, and Billy). A frequency measure was used for Mary because her tics occurred infrequently, and the partial-interval scoring method was not sufficiently sensitive to detect changes in tic frequency. Partial-interval recording was used for the remaining participants due to the large number of tics and their relatively high baseline frequencies.

Conditions. Each participant was exposed to five consecutive 5-min conditions. During all conditions, a token dispenser (70 cm by 60 cm by 30 cm) was placed on a table in front of the participant. The dispenser was controlled by the researcher from an adjacent room. When the machine was activated, it dispensed a silver token into a hopper located on the front of the unit. Tokens remained in the hopper until the session ended. Participants were informed that the machine was a "tic detector" and had the ability to detect tics via motion sensors, although the machine had no such capability. In baseline, the participant was told that the tic detector would count the tics and that he or she should feel free to engage in as many or as few tics as needed. An observer behind the observation mirror recorded the participant's tics to determine which tics occurred most frequently and to establish operational definitions of those tics. Tics that were present but occurred fewer than five times in the baseline condition were not targeted in the subsequent treatment comparison. During the verbal instruction condition, the participant was asked to sit in the room with the tic detector in operation. Each participant was verbally provided with a list of his or her targeted tics and then asked to prevent these behaviors. Specifically, he or she was instructed to "do whatever you need to do to keep your tics from happening during the next 5 min." The DRO-enhanced instruction condition was similar to the verbal instruction condition. Therefore, the participant was instructed to continue attempts to

stop tic occurrence. In addition, a 10-s resetting DRO procedure in which a token was delivered in the token dispenser by a researcher sitting in the adjacent room was introduced. The participant was told that the tic detector would dispense a token for every 10 s that he or she went without exhibiting the target tics. In addition, he or she was told that the tokens could be exchanged for money (i.e., "a few cents for each token") at the end of the study. After completion of the study, each child received \$2 regardless of the number of tokens received.

Interobserver agreement. For each of the 4 participants, one segment of each of the three conditions was scored by a second observer. Interobserver agreement was calculated by dividing the number of intervals in which there was agreement on occurrence or nonoccurrence by the total number of intervals and multiplying by 100%. Overall agreement across all participants and all conditions was 87.8% (range, 80% to 100%).

RESULTS AND DISCUSSION

The results presented in Figure 1 show that DRO-enhanced instruction produced a greater reduction in tics than verbal instruction alone for all participants. The verbal instruction condition produced a 10.3% reduction in tic occurrence from baseline levels across all children compared to a 76.3% reduction from baseline in the DRO-enhanced instructions condition.

This study demonstrated that reinforcement may alter symptom presentation in a disorder primarily believed to be neurologically based. Should this finding be replicated, what is currently considered to be the sole result of biological processes or innate ability may be alternatively construed as a behavior at least partially controlled by operant contingencies (cf. Woods, Twohig, Flessner, & Roloff, 2003) (note that this ap-

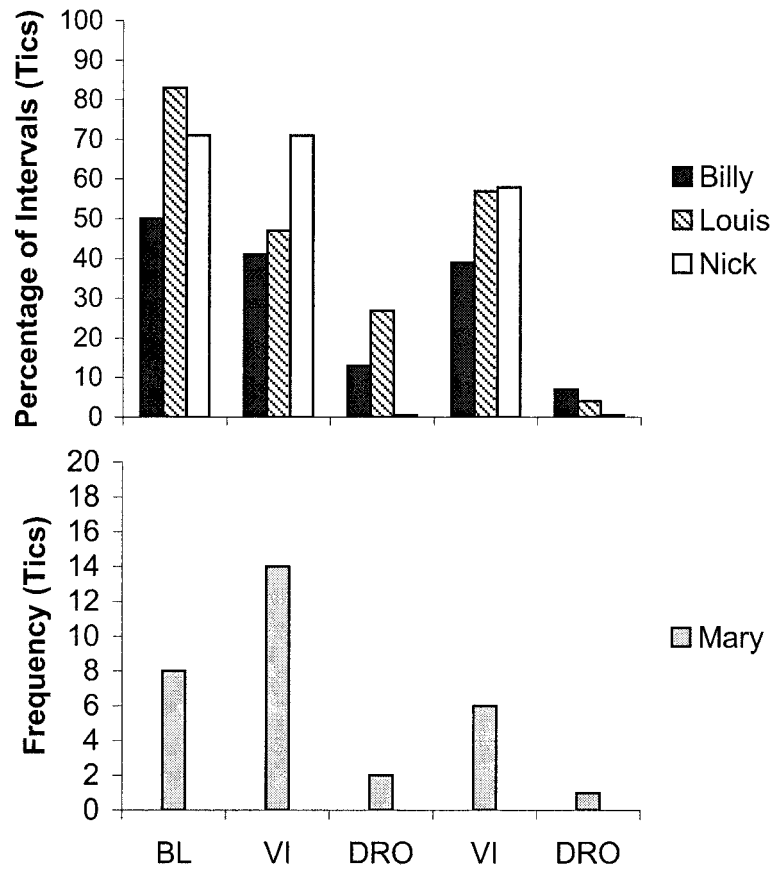


Figure 1. The top panel shows the percentage of 10-s intervals with tics across baseline (BL), verbal instruction (VI), and DRO-enhanced instruction (DRO) conditions for Billy, Louis, and Nick. The bottom panel shows the frequency of tics across each condition for Mary.

plies to tic suppression but not necessarily to tic genesis). Such a perspective is important because it suggests that failure to exhibit control over tic expression may not entirely be a result of a dysfunctional biological system or a psychological deficit. Rather it suggests that insufficient control may have been obtained over the environmental events that affect tic occurrence. Furthermore, the methods used in this study provide an experimental preparation that can reliably produce tic reduction. Such a preparation may be useful in future research on the effects of other variables that influence tic expression. Finally, the negative side effects of contingency-controlled tic reduction are unclear. Some researchers have suggested that periods

of externally induced tic reduction are followed by transient exponential increases in tic frequency (Bagheri, Kerbeshian, & Burd, 1999), although such a phenomenon has yet to be experimentally confirmed (e.g., Meindinger et al., in press).

In this study, all participants received the back-up reinforcer (\$2) regardless of the actual number of tokens they had received because it was deemed unethical to withhold the financial reward had tic reduction actually been impossible. Although not necessarily a concern in this study given the brevity and structure (i.e., all sessions were consecutive) of the evaluation, it is possible that the effectiveness of the DRO-enhanced instruction intervention would have subsided

as the participants came into contact with the token exchange contingency, given that all participants received the same back-up reinforcer regardless of their performance.

Finally, the brevity of this treatment evaluation may limit the generality of these findings. That is, the comparison between verbal instruction and DRO-enhanced instruction was conducted in a relatively brief period—25 min for each participant. Therefore, this study should serve as a foundation for future research examining the operant control of tics exhibited by individuals with Tourette's syndrome.

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