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EFFECTS OF REINFORCEMENT MAGNITUDE ON SPONTANEOUS RECOVERY

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Extinction of operant behavior has been associated with a number of undesirable effects. One such effect is the temporary reappearance of behavior after responding appears to be completely extinguished, known as spontaneous recovery. In this report, the occurrence of spontaneous recovery and its attenuation with large amounts of reinforcement were examined during the treatment of disruption.

DESCRIPTORS: extinction, functional communication training, side effects, spontaneous recovery

Treatment with operant extinction, which involves terminating the reinforcement contingency that maintains a response, has been effective in reducing a variety of severe behavior disorders. Nevertheless, results of basic and applied studies indicate that extinction can have a number of adverse effects. One undesirable characteristic of responding during extinction that has rarely been reported in applied studies is the temporary reappearance of behavior after responding appears to have been extinguished, an effect known as *spontaneous recovery.* Basic research findings on spontaneous recovery showed that a previously reinforced response decreased to pretraining levels by the end of the first extinction session; however, when the subject was later returned to the training environment for a second extinction session, responding reappeared at the start of the session and then decreased again to pretraining levels. Subsequent extinction sessions resulted in similar, but progressively smaller, response curves (Skinner, 1938).

Although potential problems with spontaneous recovery are frequently noted in applied texts and literature reviews, no clear demonstrations of this phenomenon exist in the applied literature because other variables (e.g., program inconsistency, lack of generalization) can account for instances of treatment relapse (see Lerman & Iwata, 1996, for a discussion of this issue). As such, further research is needed to determine whether spontaneous recovery occurs in clinical settings. If research findings suggest that spontaneous recovery might be problematic during treatment with extinction, strategies to mitigate this undesirable effect also should be examined. For example, results of studies indicate that certain reinforcement parameters (e.g., rich schedules) can reduce the likelihood of other adverse effects of extinction, such as response bursting and increases in aggression (e.g., Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). In this report, we examined an apparent case of spontaneous recovery and its attenuation with large amounts of reinforcement.

METHOD

Participant and Setting

Tacita, a 21-year-old woman who had been diagnosed with severe mental retardation, was referred for treatment of disruptive screaming. Sessions were conducted in an empty classroom at a school for students

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with developmental disabilities. The room contained several desks, chairs, and bookshelves, as well as a few toys necessary to conduct the sessions.

Response Measurement and Reliability

Screaming was defined as vocalization above conversation level, not including laughing. *Hand clapping* was defined as audibly striking the palms of the hands against each other. Data on screaming were collected via laptop computers using partial-interval recording, and the data were expressed as percentage of 10-s intervals scored. Data on clapping were collected using frequency recording but were expressed as percentage of 10-s intervals scored because the behavior occurred in rapid bursts of two to five responses. Data on the therapist's delivery of reinforcement were collected using duration recording, and reinforcement time was omitted from total session time when calculating data on screaming and clapping. A second observer simultaneously collected data on all target behaviors during 80% of sessions, and data records for the two observers were compared using the exact agreement method. Average percentage of agreement was 89% (range, 54% to 100%) for screaming and 89% (range, 50% to 100%) for unprompted claps.

Procedure

Three sessions were conducted each day, usually 5 days per week. A functional analysis of screaming, similar to that described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), was conducted prior to treatment. During baseline, Tacita had access to two toys (See & Say® and musical turtle) at the start of the session. The therapist then removed the toys and provided 20 s of access to them contingent on screaming. Hand claps were ignored. All baseline sessions lasted 10 min. During treatment (functional communication training), screaming no longer produced toys, and Tacita was prompted to engage in hand clapping to gain access to the toys. The therapist initially delivered the prompt within 5 s of toy removal and systematically lengthened the prompt delay across treatment. Two reinforcement conditions were alternated during treatment. Under the small reinforcement magnitude condition, Tacita received access to the toys for 10 s contingent on hand claps. Under the large reinforcement magnitude condition, Tacita received access to the toys for 60 s contingent on claps. Hand claps were reinforced on a continuous schedule under both conditions. Sessions ended after 10 reinforcer deliveries. Treatment conditions were alternated in a multielement design, and each condition was conducted with a different therapist. All sessions on a given day were implemented by a single therapist under one particular reinforcement condition. Sessions were separated by a few minutes.

RESULTS AND DISCUSSION

Results of Tacita's functional analysis indicated that screaming was maintained by positive reinforcement in the form of access to toys (results of the functional analysis can be found in Roane, Lerman, Kelley, & Van Camp, 1999). During baseline sessions, Tacita engaged in moderate levels of screaming (see top panel of Figure 1) and rarely clapped with either therapist (data not shown; $M = 0\%$). The 1st day of treatment under each reinforcement condition (i.e., Sessions 15 to 17 under large magnitude and Sessions 18 to 20 under small magnitude) was associated with a rapid decrease in screaming to zero levels and an immediate increase in unprompted hand clapping ($M = 57\%$ under large magnitude, and $M = 58\%$ under small magnitude). Across subsequent treatment days, unprompted claps

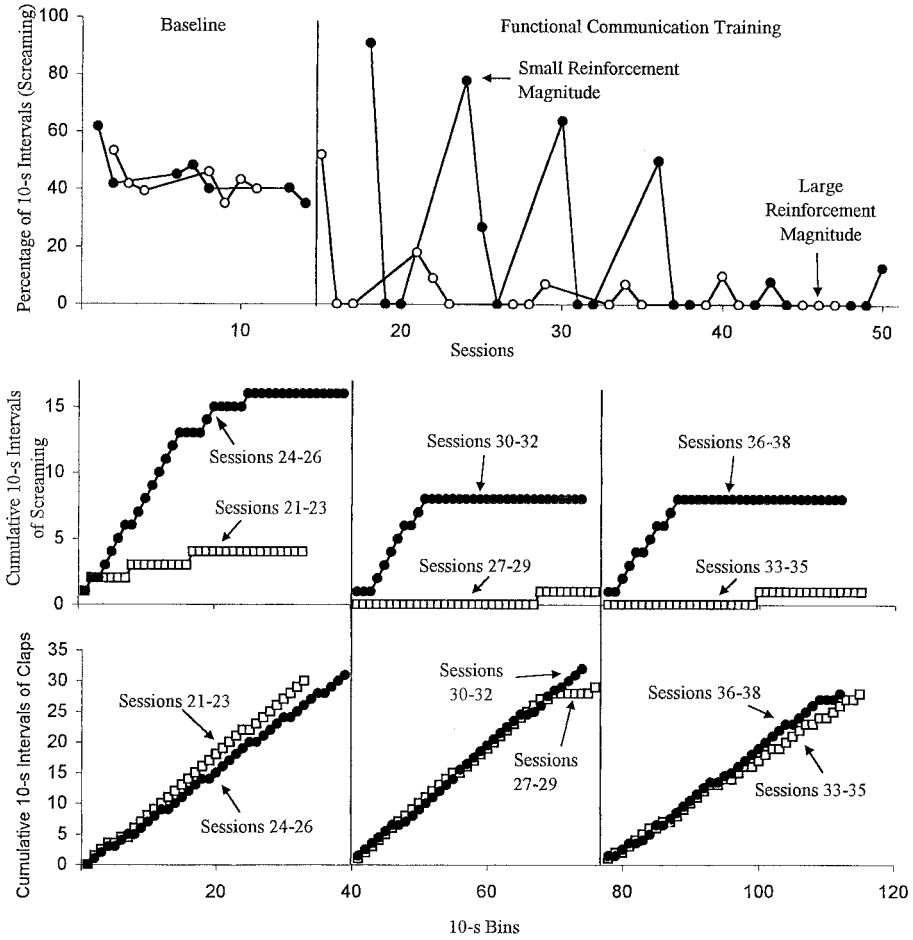

Figure 1. Percentage of intervals of screaming during baseline and functional communication training with small and large reinforcement magnitudes (top panel). Cumulative intervals with screaming (middle panel) and unprompted hand claps (bottom panel) across three treatment days with small and large reinforcement magnitudes.

occurred at high levels under both conditions (M = 85% under large magnitude, and M = 88% under small magnitude). However, levels of screaming were higher and more variable under the small magnitude condition than under the large magnitude condition. Furthermore, when treatment with the small magnitude was implemented, daily response patterns appeared to be similar to that observed in basic research studies on spontaneous recovery. That is, the highest levels of screaming typically occurred during the first session of the day, whereas no screaming occurred during the last session of the day. Daily cumulative records of screaming and clapping were constructed to examine response patterns under each reinforcement condition.

The bottom two panels of Figure 1 show the results of the within-session analysis for the 2nd, 3rd, and 4th days of treatment under each reinforcement condition (response patterns on the 5th and 6th days were not indicative of spontaneous recovery). Cumulative 10-s intervals of screaming and unprompted hand clapping were examined across the three daily sessions under either small or large reinforcement magnitude. Re-

sults showed that, on days in which the small reinforcement magnitude was used, responding initially reappeared at the start of the first session and gradually decreased to zero by the end of the last session. Conversely, responding did not recover on days in which the large reinforcement magnitude was used. Results also showed that cumulative intervals with clapping were nearly equivalent across all daily sessions, regardless of reinforcement magnitude.

These findings extend previous research by demonstrating that spontaneous recovery, a phenomenon that has been examined only in the basic research laboratory, might occur when treatment for problem behavior includes an extinction component. Furthermore, results show that this adverse side effect can be reduced by using large amounts of reinforcement in differential reinforcement procedures. Both reinforcement conditions were adequate to establish and maintain high levels of an alternative behavior during functional communication training. As such, the large magnitude appeared to influence spontaneous recovery by altering Tacita's motivation to scream rather than by strengthening a competing response more effectively than the smaller magnitude.

Generalization of these findings is limited because only 1 individual participated in the study. In addition, interaction effects between the small and large reinforcement magnitude conditions might have influenced the results. Thus, although response patterns resembled those shown in basic research studies on spontaneous recovery, it is not clear whether the findings reflected the phenomenon of spontaneous recovery or a different behavioral process. For example, contrast effects may have been responsible for the initial increase in responding under the small magnitude condition because exposure to the large reinforcement magnitude always preceded exposure to the small magnitude. As such, further research is needed to determine the prevalence and characteristics of spontaneous recovery, as well as variables that alter the likelihood of this undesirable effect, when treating problem behavior with extinction.

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