

PREVALENCE OF THE EXTINCTION BURST AND ITS ATTENUATION DURING TREATMENT

Dorothea C. Lerman and Brian A. Iwata
The University of Florida

Although extinction has been an effective treatment for a variety of behavior disorders, its use may be associated with several adverse side effects, the most common being an initial increase in the frequency of the target response, called an "extinction burst." We attempted to determine the prevalence of the extinction burst in applied research and its possible attenuation with other operant procedures. An analysis of 113 sets of extinction data indicated that bursting may not be as common as previously assumed (it occurred in 24% of the cases) and may be less likely when extinction is implemented with alternative procedures rather than as the sole intervention (bursting was evident in 12% of the former cases and 36% of the latter).

DESCRIPTORS: extinction, extinction burst, side effects, behavior disorders

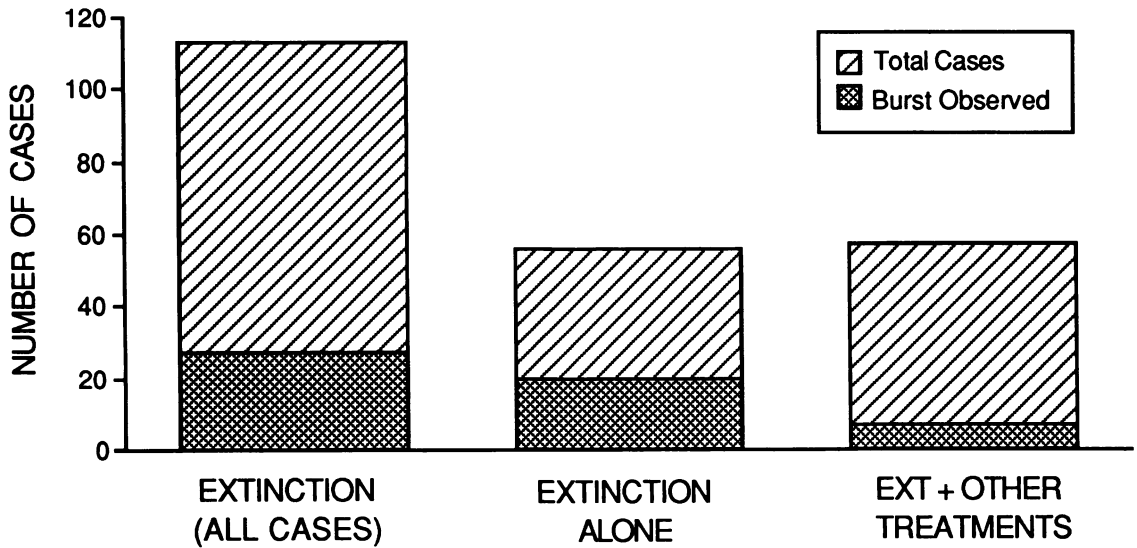
Extinction, which involves eliminating the reinforcement contingency maintaining a response, has been used successfully to reduce the frequency of a variety of behavior disorders. However, the procedure may be associated with several undesirable side effects, the most common of which is a temporary increase in the frequency, intensity, or duration of the target response, also called an "extinction burst" (Cooper, Heron, & Heward, 1987). Some authors have suggested that, due to the potential occurrence of an extinction burst, extinction should not be used as treatment for severe behavior disorders (e.g., LaVigna & Donnellan, 1986), whereas others have suggested that the burst might be attenuated or eliminated by combining extinction with other procedures such as differential reinforcement (e.g., Ducharme & Van Houten, 1994; Kazdin, 1994). However, it is not clear how often extinction procedures result in bursting or if reinforcement or other operant procedures mitigate this side effect, because prevalence data have not been reported on either phenomenon. Furthermore, with the exception of a recent study in which it was found that implementing extinction in conjunction with a fading procedure eliminated the burst for 2 subjects who engaged in self-injurious behavior (Zarcone et al., 1993), few investigations have examined ways to minimize the occurrence of the extinction burst. In this study, we examined data from a large number of treatment cases to determine the prevalence of the extinction burst when extinction was implemented as the sole intervention and when it was combined with other treatment procedures.

METHOD: A literature search was conducted using *Psychological Abstracts*, *Current Contents*, *PsychInfo* (a computerized bibliographic database), indices of behavioral journals, and reviews of the treatment literature (texts or chapters). The reference lists of all studies acquired during this search were also examined for relevant articles. Published treatment cases meeting the following criteria were included in the analysis: (a) The target response was reported as an aberrant behavior; (b) treatment was reported to be effective; (c) baseline data were collected prior to the subject's first exposure to treatment; (d) the transition from baseline to treatment involved withholding the identified or hypothesized reinforcer(s) maintaining the target response; (e) data were displayed as session-by-session values to allow examination of data at the end of baseline and beginning of treatment; and (f) procedures implemented in conjunction with extinction included differential reinforcement, noncontingent reinforcement, or antecedent manipulations (e.g., stimulus fading) but excluded punishment (e.g., time-out, response cost), which would typically obscure the effects of extinction. In addition to published data, unpublished treatment data collected in our laboratory from 1989 to 1994 were included in the analysis if they met the above criteria.

A great majority of extinction procedures were implemented in such a way that the exact mechanism responsible for behavior change could be subject to multiple interpretations. For example, the termination of ongoing social interaction contingent on attention-seeking behavior might be viewed as time-out in addition to extinction (EXT) (attention), presentation of additional instructions or physical guidance contingent on escape from instructional situations might constitute punishment in addition to EXT (escape), and the use of protective devices or response blocking to attenuate response-produced sensory stimulation could serve as time-out or punishment in addition to EXT (sensory). Because each of these procedural variations contained an obvious extinction component, all were included in the data sample.

For the present analysis, an extinction burst was defined as an increase in responding during any of the first three treatment sessions above that observed during all of the last five baseline sessions (or all of baseline if it was briefer than five sessions). In some cases, multiple behaviors were treated simultaneously, in multiple settings, or by multiple therapists, and data for each behavior, setting, or therapist were presented separately. If at least one of the data sets for a given subject met the burst criterion, a single occurrence of the extinction burst was scored for the case. The second author independently examined 47% of the data sets included in the analysis. Percentage agreement was 100% for the occurrence and nonoccurrence of an extinction burst.

RESULTS AND DISCUSSION: Of the data sets examined, 113 met the criteria for inclusion in the study. This sample included 99 treatment cases from 52 articles published in 19 journals and 14 unpublished sets of data from our laboratory. Procedures combined with extinction, which included differential reinforcement of alternative behavior (DRA), differential reinforcement of other behavior (DRO), noncontingent reinforcement (NCR), graduated extinction, and instructional manipulations (i.e., fading, high-probability sequences), were implemented in about 50% of the treatment cases. As shown in the figure, results indicated that only 27 (24%) of the data sets were characterized by the presence of an extinction burst.



However, a larger number of cases were associated with a burst when extinction was implemented as a single intervention (20 of 56, or 36%) than when it was combined with other treatment components (7 of 57, or 12%).

These findings indicate that the extinction burst, which occurred in about one third of the cases when extinction was implemented alone, may not be as prevalent as previously assumed. In addition, occurrence of the burst was reduced substantially when extinction was implemented in conjunction with other treatment components, suggesting that this side effect can be eliminated for many individuals by combining extinction with such procedures as differential reinforcement. This conclusion is somewhat tentative, because the differential effect of implementing extinction in combination with other procedures versus extinction alone was not assessed on a within-subject basis. For example, it is impossible to determine whether individuals who were exposed to extinction plus DRA and did not exhibit an extinction burst would have done so if exposed to extinction alone. Similarly, individuals who were exposed to extinction alone and exhibited a burst may or may not have exhibited a burst if they had been exposed to extinction plus DRA, and individuals who were exposed to extinction plus differential reinforcement procedures yet still exhibited a burst may have demonstrated an even greater burst with exposure to extinction alone.

The generality of these results is further limited by various methodological and procedural differences (e.g., specific reinforcement parameters, session length, data calculation and presentation) among the cases. Finally, the present analysis examined only one aspect of the extinction burst (i.e., an initial increase in response frequency) and may not generalize to other response characteristics (e.g., intensity). Thus, although a great deal of basic research has been conducted on both the direct and indirect effects of extinction, extension of these findings to applied work has been limited. Future studies should attempt to identify factors that affect the course of extinction, determine methods by which extinction can be used most effectively, and develop procedures that minimize the occurrence of potential side effects.

REFERENCES

- Cooper, J. O., Heron, T. E., & Heward, W. L. (1987). *Applied behavior analysis*. Columbus, OH: Merrill.
- Ducharme, J. M., & Van Houten, R. (1994). Operant extinction in the treatment of severe maladaptive behavior: Adapting research to practice. *Behavior Modification*, 18, 139-170.
- Kazdin, A. E. (1994). *Behavior modification in applied settings* (5th ed.). Pacific Grove, CA: Brooks/Cole.
- LaVigna, G. W., & Donnellan, A. M. (1986). *Alternatives to punishment: Solving behavior problems with non-aversive strategies*. New York: Irvington.
- Zarcone, J. R., Iwata, B. A., Vollmer, T. R., Jagtiani, S., Smith, R. G., & Mazaleski, J. R. (1993). Extinction of self-injurious escape behavior with and without instructional fading. *Journal of Applied Behavior Analysis*, 26, 353-360.

Reprints may be obtained from Brian A. Iwata, Department of Psychology, The University of Florida, Gainesville, Florida 32611. A listing of the articles containing data sets included in the present analysis, as well as the unpublished data sets, are also available upon request. Received June 17, 1994; final acceptance July 25, 1994; Action Editor, Wayne Fisher.