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A METHODOLOGY FOR DISTINGUISHING BETWEEN EXTINCTION AND PUNISHMENT EFFECTS ASSOCIATED WITH RESPONSE BLOCKING

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We present one method for distinguishing between extinction and punishment effects. The proportion of responses that produced a consequence (blocking) was varied while hand mouthing was treated in a man diagnosed with profound mental retardation. Response patterns across the schedule changes suggested that the blocking procedure functioned as a punishing event.

DESCRIPTORS: response blocking, sensory extinction, punishment

Some variations of a procedure called *sensory extinction* (e.g., use of goggles, gloves, helmets, vibrators, and wrist weights) may suppress behavior through processes other than the termination of reinforcement (see Mazaleski, Iwata, Rodgers, Vollmer, & Zarcone, 1994, for a more detailed discussion of this issue). For example, self-injurious hand mouthing of 2 individuals was treated by blocking the hand from entering the mouth, and reductions in behavior were attributed to sensory extinction (Reid, Parsons, Phillips, & Green, 1993). Response blocking, however, is not typical of most extinction procedures, which allow the behavior to occur but prevent subsequent reinforcement. An alternative interpretation of the effects of blocking is that the physical contact associated with the procedure could function as a punishing stimulus.

This study demonstrates a potential methodology for distinguishing between punishment and extinction effects by varying the schedule of consequences (i.e., blocking). Depending on the mechanism through which behavior is reduced (extinction vs. punishment), different schedules of reinforcement or punishment are in effect when a given proportion of responses is blocked. For example, when every fourth response is blocked (.25), the behavior is exposed to either a fixed-ratio (FR) 1.3 schedule of reinforcement (if blocking functions as extinction) or an FR 4 schedule of punishment (if blocking functions as punishment); when three out of four responses are blocked (.75), the behavior is exposed to either an FR 4 schedule of reinforcement or an FR 1.3 schedule of punishment. Thus, as larger proportions of responses are blocked, the reinforcement schedule becomes leaner and the punishment schedule becomes richer. If response blocking produces extinction, response rates should increase or be maintained as more responses are blocked (i.e., as the reinforcement schedule is thinned), until extinction occurs at some point along the progression. Conversely, if the procedure

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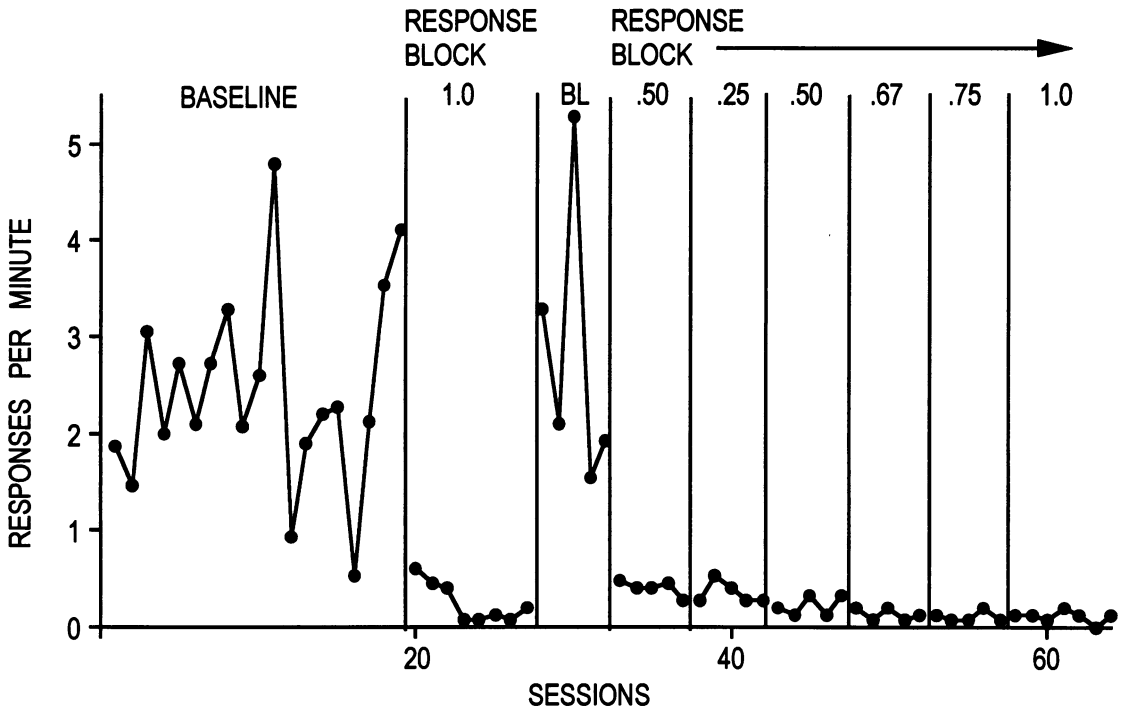

Figure 1. Rates of hand mouthing during baseline and across varying schedules of response blocking.

functions as punishment, response rates should decrease as more responses are blocked (i.e., as the punishment schedule becomes richer).

METHOD

The participant (Paul) was a 32-year-old man who had been diagnosed with profound mental retardation. He lived in a facility for individuals with developmental disabilities and engaged in chronic hand mouthing (defined as contact between any part of the hand and the lips or mouth). Sessions were conducted two to three times per day, 5 days per week, at a day program located on the grounds of the facility. During 15-min sessions, data were collected using hand-held computers on the frequency of hand mouthing (response duration was typically less than 10 s). A second observer independently scored hand mouthing during 23% of the sessions, and mean interobserver agreement (calculated on an interval-by-interval basis) was 98.8%. Results of a functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) conducted prior to the study indicated that Paul's hand mouthing was not maintained by social reinforcement. Specifically, high levels of hand mouthing occurred in the alone condition, whereas little or no hand mouthing occurred in the other conditions.

During baseline, Paul was seated in a chair. No one interacted with him, and no activities or leisure materials were available. During response blocking, sessions were conducted as described by Reid et al. (1993). A therapist was seated behind Paul and blocked some or all of Paul's attempts to put his hand in his mouth. Paul was not prevented from bringing his hand to his mouth; however, the therapist blocked the hand from entering the mouth by placing the palm of her hand about 2 cm in front of Paul's mouth. During the blocking con-

ditions, a response was scored each time Paul's hand contacted the back of the therapist's hand.

RESULTS AND DISCUSSION

Paul's hand mouthing (or attempts) was maintained at moderate levels during baseline, decreased rapidly to near zero levels during the Response Block 1.0 condition, and increased to pretreatment levels during the second baseline condition (Figure 1). Because rates of hand mouthing under Response Block .50 were similar to those under Response Block 1.0, fewer responses were blocked in the next condition. During Response Block .25, response rates were comparable to those under both Response Block .50 and Response Block 1.0. During subsequent schedule changes (Response Block .50, .67, .75, and 1.0), responding decreased further.

Results indicated that response blocking functioned as punishment. If the reduction in hand mouthing produced by Response Block 1.0 represented an extinction effect, responding probably would have been maintained under both Response Block .25 and Response Block .50 (i.e., under FR 1.3 and FR 2 schedules of reinforcement). Instead, rates of hand mouthing remained low under both schedules and decreased further as more responses were blocked, a pattern of responding that is more consistent with a punishment interpretation of the data. These findings suggest that for some individuals, sensory extinction procedures such as response blocking may suppress behavior through punishment rather than through extinction and that these processes may be differentiated in individual cases by manipulating the proportion of responses that is followed by the consequence. Although not generally crucial to effective treatment, such information contributes to the development of a comprehensive technology of behavior change by relating treatment procedures to their underlying mechanisms.

REFERENCES

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27,* 197–209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2,* 3–20, 1982)

Mazaleski, J. L., Iwata, B. A., Rodgers, T. A., Vollmer, T. R., & Zarcone, J. R. (1994). Protective equipment as treatment for stereotypic hand mouthing: Sensory extinction or punishment effects? *Journal of Applied Behavior Analysis, 27,* 345–355.

Reid, D. J., Parsons, M. B., Phillips, J. F., & Green, C. W. (1993). Reduction of self-injurious hand mouthing using response blocking. *Journal of Applied Behavior Analysis, 26,* 139–140.

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