

*THE POSITIVE SIDE EFFECTS OF REINFORCEMENT:
A COMMENTARY ON BALSAM AND BONDY (1983)*

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Skinner was convinced by some of his earliest research that punishment was not very effective. He found, for example, that when lever pressing in rats had been suppressed by mild punishment and the punishment was then removed, the rate of pressing increased to such an extent that the total number of presses after some time had passed was about the same as it would have been had punishment never been presented (Skinner, 1938, p. 154).

Skinner (1953) also noted some "unfortunate by-products" of punishment: It produces a tendency to attack the individual who has dispensed the punisher. It may produce pathological behavior (for example, stuttering) as a result of conflict that it sets up between the punished behavior and behavior that avoids punishment. It may produce debilitating emotional reactions. He suggested various alternatives to punishment: waiting for time to pass according to some "developmental schedule" (p. 191), reinforcing incompatible behavior, extinguishing the behavior, and so on. It is a mark of civilization, he argued, that we turn to alternatives to punishment.

Subsequent developments have generally complemented Skinner's early views. The list of alternative ways to suppress behavior has grown tremendously, as he predicted it would. An examination of some recent texts on behavior analysis and therapy suggests at least 15 others, including time-out, modeling, instructions, differential reinforcement of any other behavior (as opposed simply to specific behaviors that are incompatible with the target behavior), differential reinforcement of an alternative behavior (as op-

posed to one that may be incompatible with the target behavior), differential reinforcement of low rate, sudden stimulus presentation (for example, a loud noise), adaptation, physical restraint, restitution, positive practice, fixed-time and variable-time schedules of reinforcement (which are response-independent), satiation, and stimulus change.

The list of unfortunate by-products has also grown. Therapists are warned about possible widespread suppression effects, negative modeling, escape and avoidance, and the establishment of inflexible, ritualistic behaviors. Subsequent research has also revealed what some consider to be "symmetries" between reinforcement and punishment—that is, they produce similar, but opposite, effects under some circumstances. A single punisher may produce only a temporary decrease in rate of responding, but a single reinforcer produces only a temporary increase, after all. Skinner's contention that the effect of punishment is only temporary does not apply to all cases: Severe or prolonged punishment can produce enduring effects (e.g., Azrin & Holz, 1966; Boe & Church, 1967).

Balsam and Bondy (1983) have recently summarized some of these developments and, in so doing, have drawn what I believe to be incorrect conclusions about the nature of reinforcement. Their major argument may be stated as follows: Reinforcement and punishment have been shown to be symmetrical in their effects on behavior. Because punishment produces negative side effects, reinforcement, too, should be expected to produce negative side effects, and the clinical literature provides examples of such effects. We should, therefore, be cautious in our use of reinforcement techniques.

I have two major objections to their arguments, as well as several minor ones.

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SYMMETRY AND CONTINGENCIES

The first problem is a matter of logic. If reinforcement and punishment produce similar but opposite effects, and if punishment produces *negative* side effects, then reinforcement should produce *positive* side effects. This conclusion is unavoidable as long as Balsam and Bondy insist that reinforcement and punishment produce *symmetrical* effects, as opposed to *similar* ones. Punishment weakens behavior; reinforcement strengthens it. Punished behavior may *reappear*; reinforced behavior may *disappear*. It follows that if punishment produces unpleasant emotions, reinforcement should produce pleasant ones (it usually does). If punishment produces a tendency to escape the source of punishment, reinforcement should produce a tendency to approach the source of reinforcement (it often does, as the authors note). If punishment produces aggression, reinforcement should produce signs of affection (again, it often does). If punishment can produce widespread suppression, then reinforcement should be able to produce an increase in the general level of activity. And so on.

I suggest that the symmetry argument should lead to a different paper than the one the authors wrote. Moreover, this argument may actually be irrelevant to what seems to be the substance of their paper. Balsam and Bondy describe, with justifiable concern, a number of reinforcement procedures that have produced troublesome behavior not anticipated by those who administered the reinforcers. Where did these behaviors come from, and was reinforcement the culprit?

The authors did not, for the most part, distinguish between the effects of reinforcers on the one hand and the effects of *contingencies of reinforcement* and *schedules of reinforcement* on the other. It is true that certain contingencies or schedules can produce behavior other than the behavior one may be attempting to reinforce. Fixed-interval schedules of food reinforcement in rats, for example, lead to excessive drinking when water is freely available, as the authors note. But is the drinking produced by the reinforcer itself or by the withdrawal of or unavailability of the reinforcer?

Aggression and ritualistic behaviors are indeed produced by certain *schedules* of reinforcement. But far from being an indictment of reinforcement per se, this is an indictment of the *lack* of reinforcement. Postreinforcement effects are produced by the *withdrawal* of reinforcement, an operation that is sometimes labeled "punishment" (e.g., Catania, 1968, p. 343). Interim and terminal effects are the result of the *unavailability* of reinforcement during the interreinforcement interval, a period resembling a period of extinction (Cohen & Looney, 1984; Gentry, Weiss, & Laties, 1983; Staddon, 1977).

Particular *contingencies* of reinforcement can strengthen and maintain "lying, cheating, stealing, and conniving," but reinforcement itself is not the culprit. It is, rather, poor contingencies that are at fault. Zeiler (1977) notes that in setting up one contingency we often inadvertently arrange other, "indirect" contingencies. For example, on a variable-interval schedule of reinforcement, the explicit contingency has to do only with the time that has passed since the last reinforcer: The first response after this interval has elapsed will be reinforced. But this contingency also differentially reinforces pauses between responses: Long pauses are more likely to pay off than short pauses. A variable-ratio schedule, however, provides no advantage for pausing between responses; hence, it produces a higher response rate than a variable-interval schedule when the two schedules yield the same rate of reinforcement (Ferster & Skinner, 1957).

Some of the "negative side effects" described by Balsam and Bondy involve troublesome behavior supported by contingencies that have been set up inadvertently. They note, for example:

Operant aggression may be directed at others in the vicinity of a reinforcing agent. That is, if dispensing reinforcers to others reduces the availability . . . of reinforcers for a particular individual, that individual will be rewarded for preventing the dispersal of the reinforcers. (p. 291)

In this case, an explicit contingency has been arranged: Say, sitting in one's seat produces tokens.

But, because the tokens are in short supply, another contingency is also in effect: Inciting one's neighbors to misbehave maintains the token supply. By no means is the latter behavior a "negative side effect." It is simply the case that several contingencies are in effect, one of which produces troublesome behavior.

Balsam and Bondy also identify the failure of training to transfer from one setting to another as a "negative side effect." Transfer of training is a function of many factors, such as the similarity of the settings, the prevailing contingencies in the new setting, and the schedule of reinforcement used in the original training—and it can be preprogrammed to some extent—for example, by providing training in self-management (Baer, 1981; Epstein & Goss, 1978; Rhode, Morgan, & Young, 1983; Rincover & Koegel, 1975; Stokes & Baer, 1977; Walker & Buckley, 1972). But the failure to transfer is not a "negative side effect"; it is not even a "side effect." It is yet another engineering problem (and a challenging one).

The authors note, furthermore, that reinforcers can suppress the very response they were meant to support. It is true that conditioned and unconditioned reinforcers can act as conditional and unconditional stimuli (and, for that matter, it is true that discriminative stimuli that have been part of more than one contingency can increase the probability of more than one behavior). The presentation of a particular reinforcer might indeed interfere with conditioning, but this is at best a complication of its dual role as reinforcer and elicitor. Again, I suggest that the label "negative side effect" is misleading.

Balsam and Bondy have included imitation in their list of negative side effects of reinforcement, and, this, too, seems inappropriate. Imitating undesirable behavior could, I suppose, be called a negative side effect of imitation, but it has nothing to do with reinforcement. (It is true that a repertoire of generalized imitation could have been acquired through reinforcement, but to blame subsequent instances of the imitation of undesirable behavior on reinforcement is stretching things.)

Finally, the authors have not made the best use of Herrnstein's (1970) matching law. The law pre-

dicts, they say, that a high density of reinforcement during a therapy session may produce lethargy and depression outside of therapy (no supporting data are given). But a therapy session does not take place simultaneously with the rest of one's life; that is, the two situations are not "concurrent." They are closer to components in a multiple schedule, for which the unadorned matching law works poorly. "Undermatching" is the rule on such schedules—which is to say that the components are more independent than the law predicts—except when they are only a few seconds long (Charman & Davison, 1982; Lander & Irwin, 1968; Lobb & Davison, 1977). It would be a mistake to say that the law could predict a significant decrease in responding during 167 hours outside of therapy just because extra reinforcers were introduced during the 168th (cf. McDowell, 1982). The reasons for depression after therapy are surely more complex than the authors acknowledge. And, anyway, there must be at least a few cases in which patients emerge from therapy *less* "withdrawn, obsessed, or monotonous."

Contingencies of reinforcement can be arranged to support almost any behavior, "negative" or "positive." Reinforcement should not be considered suspect simply because it can strengthen aggressive behavior or crying, or because poor contingencies may produce behavior that does not immediately generalize to new surroundings, or because inadequate contingencies may fail to establish a discrimination. We should conclude instead that some contingencies are better than others.

COMPLEXITY AND ETHICS

I suggest another approach to the general concerns Balsam and Bondy (1983) have raised: Rather than talk about "side effects," we should look more generally at the *effects* our interventions produce—in all their complexity. The physical appearance, mannerisms, and verbal and nonverbal behavior of the therapist undoubtedly affect patients in ways that are more complex than our concepts can now capture. For example, it seems safe to say that one cannot affect any single response class without affecting others; response

classes seem to interact in orderly ways (Dunham & Grantmyre, 1982; Epstein, 1983, in press; Herbert et al., 1973; Kazdin, 1982; Nordquist, 1971; Sajwaj, Twardosz, & Burke, 1972). A stimulus that serves as a reinforcer for one organism on one occasion may not do so on another. It also may not serve as a reinforcer for another member of the species or for members of another species. The delivery of a single bit of food, even under laboratory conditions, produces multiple effects: It may increase the probability of that behavior under similar (what does that mean?) stimulus conditions; it may elicit behaviors of phylogenetic origin; it may make other stimuli effective in the future as discriminative stimuli or conditional stimuli or both; its ingestion may reduce the effectiveness of the delivery of the next bit of food. Moreover, both reinforcers and punishers are known to have discriminative properties (e.g., Azrin & Holz, 1966; Reid, 1958).

When, as a result of conditioning, a stimulus acquires controlling properties over some behavior, other stimuli become effective in controlling that behavior; there is a spread of effect from one stimulus to other stimuli. We cannot predict where the spread will occur, except perhaps when, in the laboratory, we are using simple stimuli that fall neatly along some continuum. In the real world, the problem is more difficult.

The simple withholding of reinforcement is also not so simple. It leads, eventually, to a decrement in the response that had been producing reinforcement. But it also produces increases in response force, variability in responding, emotional behavior, and, it seems, a resurgence of behaviors that were previously reinforced under similar stimulus conditions, a phenomenon that has profound implications for therapy (Armsel, 1958; Antonitis, 1951; Epstein, 1983, in press; Masserman, 1943; Notterman, 1970; Sajwaj et al., 1972; Sears, 1943; Yates, 1970). As Balsam and Bondy have noted, punishment, too, produces complicated effects (also see Hutchinson, 1977; Walters & Grusec, 1977). Schedules of reinforcement and punishment, multiple consequences, and response-independent events introduce further complications (e.g.,

Church, 1969; Epstein, 1984; Morse & Kelleher, 1977). And, of course, all of these operations are simplifications of the kinds of events that occur in the real world, where multiple determination is the rule.

Finally, the history of the organism makes a profound difference in the effectiveness of any of these operations and of any others. Previous conditioning is critically important in the emergence of problem-solving behavior, for example (Epstein, Kirshnit, Lanza, & Rubin, 1984). The effect of any intervention should be determined in large part by previously established behaviors, previously established discriminative stimuli and conditional stimuli, and so on. The conditioning history is only one small part of an organism's total environmental history. Other factors are critical in the analysis of behavior in clinical settings, such as an individual's medical problems, nutritional history, history of physical trauma, and history of exposure to allergens and drugs.

This may sound depressing, but it shouldn't. As Ferster so often pointed out, we should recognize how little we know and be prepared to see effects that we cannot yet predict. Effective intervention requires a sophisticated knowledge of many factors; the better one's analytical skills, the more effective one will be.

In any comparison between punishment and reinforcement, ethical issues should be considered. Reinforcement, by definition, is something organisms seek, and, more often than not, it produces pleasant emotional reactions. Punishment, at least by some definitions, is something organisms avoid. It produces discomfort, suffering, and even pain. A single presentation of a severe shock, entirely independent of behavior, can cause severe suppression, signs of withdrawal and depression, cries and other signs of distress, frantic attempts to escape from an experimental chamber, and even death. Misapplied, the administration of punishment is a serious crime. In some states, even the potentially therapeutic administration of punishment is a crime. When reinforcement and punishment are both possible in the treatment of some maladaptive be-

havior, reinforcement should be the treatment of choice, if only for ethical reasons.

A standard guideline in medical practice is pertinent: When several remedies are possible for a given patient and problem, *try the least intrusive one first*, and then, if necessary, the more intrusive ones. If you complain of knee pain, a physician might first recommend rest and a hot compress; if that doesn't work, physical therapy, then perhaps drugs, and, finally, as a last resort, surgery (what could be more intrusive?). Punishment techniques are potentially far more harmful than reinforcement techniques; they, too, should be used only as a last resort. I have no doubt that Balsam and Bondy would agree, but the point was not made clearly in their paper, and their title alone—"The Negative Side Effects of Reward"—might lead someone to a different conclusion.

The authors began their paper with a story, presumably apocryphal, about one Dr. B., who turned a quiet student into a garrulous nudge by praising some of the student's comments. Dr. B. panicked; he had produced more behavior than he had intended to, and he didn't know how to turn it off. Balsam and Bondy would call the extra behavior a "side effect" of reinforcement. They conclude their paper, "As for Dr. B., he has learned a lesson that Emerson (1883) so aptly phrased, 'Every sweet hath its sour [presumably they mean reinforcement], every evil its good [could this mean punishment?]' " (p. 294). I suggest a more conservative conclusion: As for Dr. B., he was a poor behavior modifier; he knew how to reinforce but not how to shape or how to establish a discrimination. He was the victim, not of what someone once called "the negative side effects of reward," but merely of inadequate training in the analysis of behavior.

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