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Negative Effects of Positive Reinforcement

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Procedures classified as positive reinforcement are generally regarded as more desirable than those classified as aversive—those that involve negative reinforcement or punishment. This is a crude test of the desirability of a procedure to change or maintain behavior. The problems can be identified on the basis of theory, experimental analysis, and consideration of practical cases. Theoretically, the distinction between positive and negative reinforcement has proven difficult (some would say the distinction is untenable). When the distinction is made purely in operational terms, experiments reveal that positive reinforcement has aversive functions. On a practical level, positive reinforcement can lead to deleterious effects, and it is implicated in a range of personal and societal problems. These issues challenge us to identify other criteria for judging behavioral procedures.

Key words: negative reinforcement, punishment, positive reinforcement, aversive control

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The purpose of this article is to cause you to worry about the broad endorsement of positive reinforcement that can be found throughout the literature of behavior analysis. I hope to accomplish this by raising some questions about the nature of positive reinforcement. At issue is whether it is free of the negative effects commonly attributed to the methods of behavioral control known as ''aversive.''

The topic of aversive control makes many people uncomfortable, and relatively few people study it (Baron, 1991; Crosbie, 1998). Ferster (1967) expressed the common view when he wrote, ''It has been clear for some time that many of the ills of human behavior have come from aversive control'' (p. 341).

I believe that much of what has been said about aversive control is mistaken, or at least misleading. Aversive control, in and of itself, it is not necessarily bad; sometimes it is good. And, more to the point, the alternative—positive reinforcement—is not necessarily good; sometimes it is bad. Aversive control is an inherent part of our world, an inevitable feature of behavioral control, in both natural contingencies and contrived ones. When I say that aversive control is inevitable, I mean just that: Even the procedures that we regard as prototypes of positive reinforcement have elements of negative reinforcement or punishment imbedded within them.

DEFINING FEATURES OF AVERSIVE CONTROL

It is important to be clear about the narrow meaning of aversive control in scientific discourse. A stimulus is aversive if its contingent removal, prevention, or postponement maintains behavior—that constitutes negative reinforcement—or if its contingent presentation suppresses behavior—punishment. That is all there is to it. There is no mention in these definitions of pain, fear, anxiety, or distress, nor should there be. It is easy to cite instances of effective aversive control in which such negative reactions are absent. Aversive control is responsible for the fact that we button our coats when the temperature drops and loosen our ties when it rises. It leads us to come in out of the rain, to blow on our hot coffee before we drink it, and to keep our fingers out of electrical outlets. The presence of aversive control in these cases clearly works to the individual's advantage.

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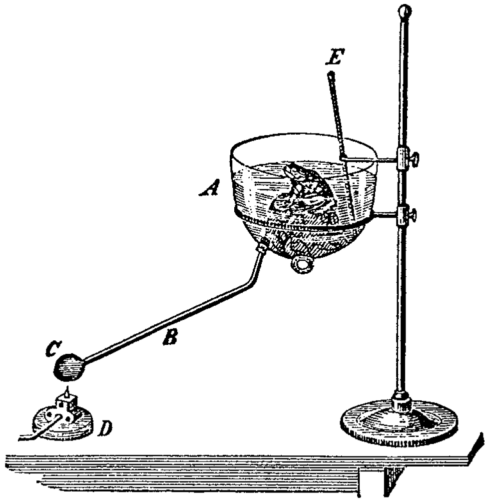

Figure 1. Scripture's arrangement for studying the effects of the rate of change in the intensity of a stimulus. Heat from a flame (D) was transferred via a ball (C) and rod (B) connected to a beaker of water (A) with a live frog inside. If the water was heated slowly enough, it could be brought to a boil without inducing the frog to escape. Scripture's caption read, ''Boiling a frog without his knowing it.'' (Figure 70 from Scripture, 1895)

By the same token, it is easy to cite cases in which the absence of aversive control is to the individual's disadvantage. Dramatic demonstrations are possible in laboratory settings. Figure 1 illustrates an experiment reported over 100 years ago by E. W. Scripture, director of the first psychological laboratory at Yale. A frog was placed in a beaker of water, which was then heated at a rate of 0.002°C per second. Scripture (1895) reported that ''the frog never moved and at the end of two and one half hours was found dead. He had evidently been boiled without noticing it'' (p. 120). It was not Scripture's intention to kill the frog; his goal was to study rate of stimulus change in sensory processes. We also should forgive Scripture for his unwarranted inference about the frog's awareness. For our purposes, it is enough to acknowledge that this particular environmental arrangement clearly was not in the frog's long-term best interest. Because the gradual rise in water temperature did not establish a change of scenery as a negative reinforcer, no escape behavior was generated. There just wasn't enough reinforcement—*negative* reinforcement—to control adaptive behavior.

It should be remembered that the definition of an aversive stimulus—or for that matter, a positive reinforcer—is based on function, not structure. Aversiveness is not an inherent property of a stimulus. It depends critically on the environmental context of the stimulus, and it cannot be measured apart from the effect of the stimulus on behavior. Consider electric shock, a stimulus so closely associated with the analysis of aversive control that we tend to think of it as inherently aversive. The error is understandable, but it is still an error. Illustrative data come from an experiment by de Souza, de Moraes, and Todorov (1984). These investigators studied rats responding on a signaled shock-postponement schedule. The independent variable was the intensity of the shock, which was varied across a wide range of values in a mixed order. Responding was stabilized at each intensity value. Figure 2 shows the results for 5 individual rats, along with the group average. When the intensity was below about 1 mA, the rats did not respond much, and as a result they avoided only a small percentage of the shocks. At intensities above 1 mA, however, the rats were more successful, avoiding between 80% and 100% of the shocks. By this measure, then, shocks below 1 mA are not aversive.

Now consider a study by Sizemore and Maxwell (1985), who used electric shock to study not avoidance, but punishment. In baseline conditions, rats' responding was maintained by variable-interval (VI) 40-s schedules of food reinforcement. In experimental conditions, some responses also produced an electric shock. Sizemore and Maxwell found that shocks as low as 0.3 to 0.4 mA completely, or almost completely, suppressed responding. The shaded bars in Figure 2 show where these values fall in relation to de Souza et al.'s (1984) avoidance func-

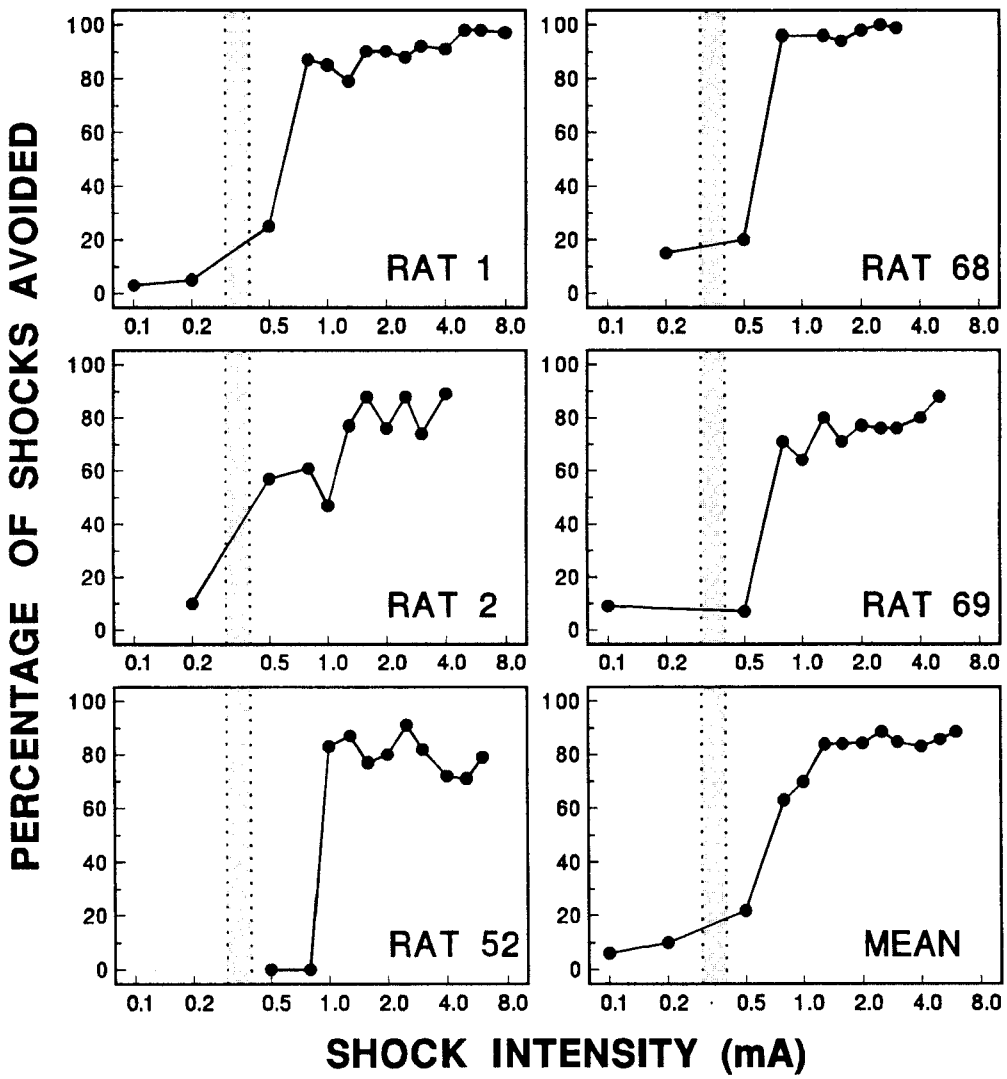

Figure 2. Proficiency of shock avoidance as a function of the intensity of the shock, as reported by de Souza et al. (1984). Note that shock intensity is represented on a logarithmic scale. Reliable avoidance required an intensity of at least 1 mA in this signaled-shock procedure. The shaded bars designate the range of shock intensities that were successful in suppressing rats' food-maintained responding in a punishment procedure by Sizemore and Maxwell (1985). Shocks as low as 0.3 mA were effective punishers.

tions. Even though a shock of 0.3 to 0.4 mA was effective as a punisher, such a shock did not reliably sustain avoidance. Put another way, in a punishment paradigm a shock intensity of 0.3 mA is aversive, but in an avoidance paradigm it is not aversive. The aversiveness of a stimulus cannot be separated from environmental contingencies. As Morse and Kelleher (1977) observed 25 years ago, in both punishment and reinforcement, contingencies—not stimuli—are fundamental.

The fact that aversiveness is a matter of function, not structure, is often overlooked. If you have young children in enlightened preschool settings, you may have heard teachers say, "We don't use punishment here. We use time-out." But if the time-out is contingent on some behavior and if it effectively reduces that behavior, then it *is* punishment. And, by definition, the more effective it is, the more aversive it is. But schoolteachers are not the only ones to forget this; even behavior analysts writing for professional audiences can be found to slip up. For example, an article advocating the use of time-out in parental discipline suggested that "through use of time-out, parents learn that punishment need not be aversive or painful."[1] The authors correctly classified time-out as a form of punishment, but erred by suggesting that it is not aversive. If time-out is not aversive, it could not possibly function as a punisher.

The verbal behavior of these authors may be under control of some dimension of the stimulus events besides their aversiveness—perhaps some events are mistakenly described as nonaversive because they are aesthetically inoffensive, or because they do not leave welts or bruises. Granted, it may well be that some forms of aversive control should be preferred over others. Teachers and parents might be right to prefer time-out over spanking. But the justification for the preference cannot be that one is aversive and the other is not.

POSITIVE REINFORCEMENT AS AN ALTERNATIVE TO AVERSIVE CONTROL

Some commentators have serious reservations about any form of aversive control. In *Coercion and Its Fallout,* Sidman (1989) worried about the negative *side effects* of aversive control. "People who use punishment become conditioned punishers themselves. . . . Others will fear, hate, and avoid them. Anyone who uses shock becomes a shock" (p. 79).

This is a powerful indictment of punishment. But Sidman was concerned with aversive control more broadly, and he extended his treatment to negative reinforcement. According to Sidman (1989), punishment and negative reinforcement constitute "coercion." Control by positive reinforcement is given dispensation.

The problem is that the distinction between positive and negative reinforcement is often unclear, even in laboratory procedures. Michael (1975) suggested that the distinction be abandoned altogether, not only in scientific discourse but also as a rough and ready guide to humane practice. A portion of Michael's essay is especially relevant:

> [It might be argued] that by maintaining this distinction we can more effectively warn behavior controllers against the use of an undesirable technique. "Use positive rather than negative reinforcement." But if the distinction is quite difficult to make in many cases of human behavior the warning will not be easy to follow; and it is an empirical question at the present time whether such a warning is reasonable—a question which many feel has not been answered. (pp. 41–42)

To illustrate the empirical difficulties in distinguishing between positive and negative reinforcement, consider a pair of experiments conducted by Baron, Williams, and Posner (unpublished data). They studied the responding of rats on progressive-ratio schedules in which the required number of responses increases, with each reinforcer, over the course of the session. The effectiveness of the reinforcer is gauged by the terminal ratio: the highest ratio the animal will complete before responding ceases. The left panel of Figure 3 shows results from 3 rats whose responding produced a signaled time-out from an avoidance schedule that operated on another lever. As the duration of the time-out was raised, the terminal ratio increased, showing that longer time-outs are more effective negative reinforcers. The right panel shows results from rats working for sweetened condensed milk mixed with water.

[1] Although this quote does come from a published source in general circulation, the source is not identified because no purpose would be served other than perhaps to embarrass the authors. Equivalent errors are easy to find in the literature, and it would be unfair to single out any particular error for special attention.

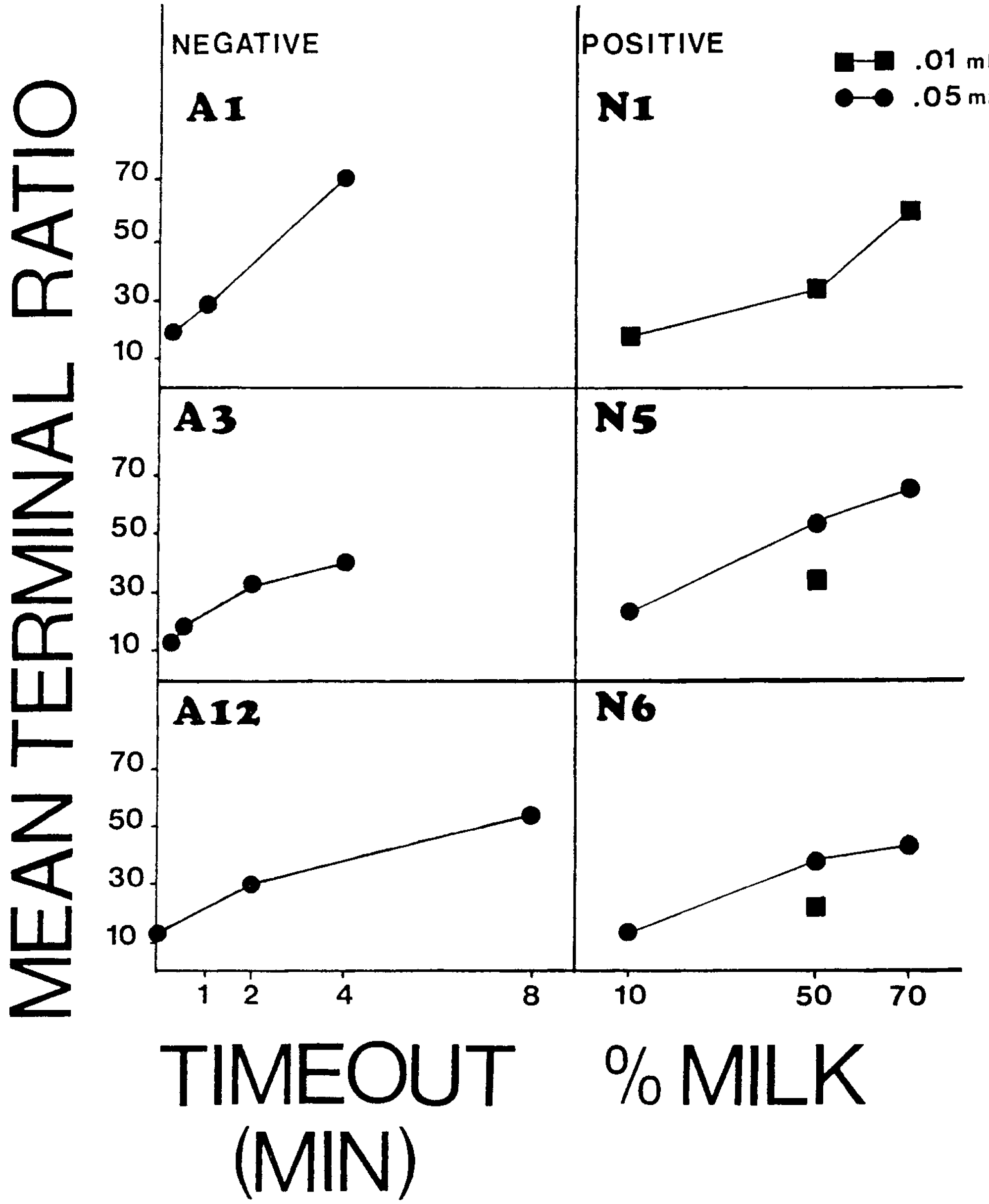

Figure 3. Effectiveness of negative and positive reinforcers as shown by the highest ratio completed by rats on a progressive-ratio schedule. Left: Responding produced a signaled time-out from an avoidance schedule; reinforcer magnitude was manipulated by changing the duration of the time-out. Right: Responding produced a solution of sweetened condensed milk in water (0.01-ml or 0.05-ml cups); magnitude was manipulated by changing the concentration of the milk. (Unpublished data collected at the University of Wisconsin–Milwaukee by Baron, Williams, and Posner)

Raising the concentration of the milk increased the terminal ratio in much the same way as raising the duration of the timeout from avoidance. The contingencies in these two experiments—presenting milk or removing an avoidance schedule—can be distinguished as positive and negative. But the functional relation between responding and reinforcer magnitude appears to be the same.

Despite Michael's (1975) arguments,

few behavior analysts seem willing to give up the distinction between positive and negative reinforcement (for rejoinders to Michael, see Hineline, 1984, pp. 496–497; Perone & Galizio, 1987, p. 112). Still, it should be recognized that at least in some instances the differences can be subtle, with the consequence that it may be difficult to identify coercive practices on this basis.

Nevertheless, for Sidman, positive reinforcement can free society of the misery engendered by our current reliance on negative reinforcement and punishment. As he says, "a person who is largely sustained by positive reinforcement, frequently producing 'good things,' will feel quite differently about life than will a person who comes into contact most often with negative reinforcement, frequently having to escape from or prevent 'bad things' " (Sidman, 1989, p. 37).

In my view, Sidman's endorsement of positive reinforcement is too broad. There are plenty of bad things to say about positive reinforcement. In fact, many of them were said by Skinner himself, despite his position as the foremost advocate of positive reinforcement in the service of humankind. As Skinner (1971) observed in *Beyond Freedom and Dignity*, behavior generated by positive reinforcement may have aversive consequences that occur after a delay. These aversive consequences are difficult to deal with effectively, said Skinner, "because they do not occur at a time when escape or attack is feasible—when, for example, the controller can be identified or is within reach. But the *immediate* [italics added] reinforcement is positive and goes unchallenged" (p. 35).

Skinner summarized the problem and its solution this way: "A problem arises . . . when the behavior generated by positive reinforcement has deferred aversive consequences. The problem to be solved by those concerned with freedom is to create immediate aversive consequences" (1971, p. 33). There is irony here: Not only is positive reinforcement seen as bad, but the antidote is to override the positive with some form of aversive control.

You may wonder if I have quoted Skinner out of context. I do not think so. He repeats the general point many times. In his autobiography, for example, Skinner (1983) comments with dismay that some activities are so reinforcing that they exhaust him. He worries about having enough energy to do the things that are really important (even if they might not be as reinforcing in the short run). Veterans of professional conferences, with their abundant opportunities for well-lubricated, late-night social interaction, will appreciate the phrase Skinner turns here: "Fatigue is a ridiculous hangover from too much reinforcement" (p. 79). To prevent this deleterious side effect of positive reinforcement, Skinner laid down draconian rules prohibiting himself from engaging in the reinforced activities: "Exhausting avocations are a danger. No more chess. No more bridge problems. No more detective stories" (p. 79).

In *Beyond Freedom and Dignity*, Skinner (1971) alerted us to the dangers that may accompany positive reinforcement. Positive contingencies can be dangerous specifically because they do *not* generate avoidance, escape, or their emotional counterparts, even when the contingencies are ultimately detrimental. Skinner went on to identify examples of detrimental contingencies, both contrived and natural, that may be accepted and even defended by the people who are controlled by them; in other words, by people who are exploited by governments, employers, gambling casinos, pornographers, drug dealers, and pimps. To take one example, gambling may prevent other behavior that would be more beneficial in the long run, but countercontrol in the form of avoidance, escape, or legal prohibition tends to be weak and ineffective, simply because behavior is more susceptible to control by short-term gains than long-term losses. Thus, the very people who can least afford lottery tickets may be the first to object to proposals to ban the lottery.

Other examples may seem more mundane, but they are just as socially significant. Positive reinforcement is implicated in eating junk food instead of a balanced meal, watching television instead of exercising, buying instead of saving, playing instead of working, and working instead of spending time with one's family. Positive reinforcement underlies our propensity towards heart disease, cancer, and other diseases that are related more to maladaptive lifestyles than to purely physiological or anatomical weaknesses.

CAN AVERSIVE CONTROL BE AVOIDED?

I hope you are beginning to share my concerns. If so, you might be thinking something along these lines: If contingencies of positive reinforcement can be so bad, is it possible to avoid aversive control? The answer is "no."

Aversive control is inevitable because every positive contingency can be construed in negative terms. The point can be made many ways. As Baum (1974) has noted, reinforcement can be understood as a transition from one situation to another. The transition involved in positive reinforcement presumably represents an improvement. But the production of improved conditions may also be regarded as an escape from relatively aversive conditions. Thus, we may say that the rat presses a lever because such behavior produces food (a positive reinforcer) or because it reduces food deprivation (a negative reinforcer).

The issue may be one of perspective. But outside the laboratory, I cannot help but be impressed with the propensity of people to respond to the negative side of positive contingencies. Consider college students. In my large undergraduate courses I have tried a variety of contingencies to encourage class attendance. Early on, I simply scored attendance and gave the score a weighting of 10% of the course grade. There were lots of complaints. The students clearly saw this system as punitive: Each absence represents a loss of points towards the course grade. So I switched to a system to positively reinforce attendance. When students come to class on time, they earn a point above and beyond the points needed to earn a perfect score in the course. Thus, a student with perfect attendance, and a perfect course performance, would earn 103% of the so-called maximum. A student who never came to class, but otherwise performed flawlessly, would earn 100%. If course points function as reinforcers, then this surely is a positive contingency. But the students reacted pretty much the same as before. They saw this as another form of punishment: With each absence I was denying them a bonus point. Of course the students are right. Whenever a reinforcer is contingent on behavior, it must be denied in the absence of that behavior.

Perhaps the propensity to see the negative side of positive contingencies depends on sophisticated verbal and symbolic repertoires that may filter the impact of contingencies on human behavior. Certainly college students can—and often do—convert course contingencies to symbolic terms, then proceed to manipulate those terms: They calculate the number of points attainable, including bonus points, and label 103% as the maximum. They keep a running tally as the maximum they can attain drops below 103%—thus, they calculate a reduced maximum after each absence. It would appear, then, that when they miss class they deliver the punishing stimulus themselves! So it might be argued that the punishment contingency is an indirect by-product of a certain kind of problem-solving repertoire unique to humans.

AVERSIVE FUNCTIONS OF POSITIVE REINFORCEMENT

Is verbal or symbolic sophistication necessary for schedules of positive re-

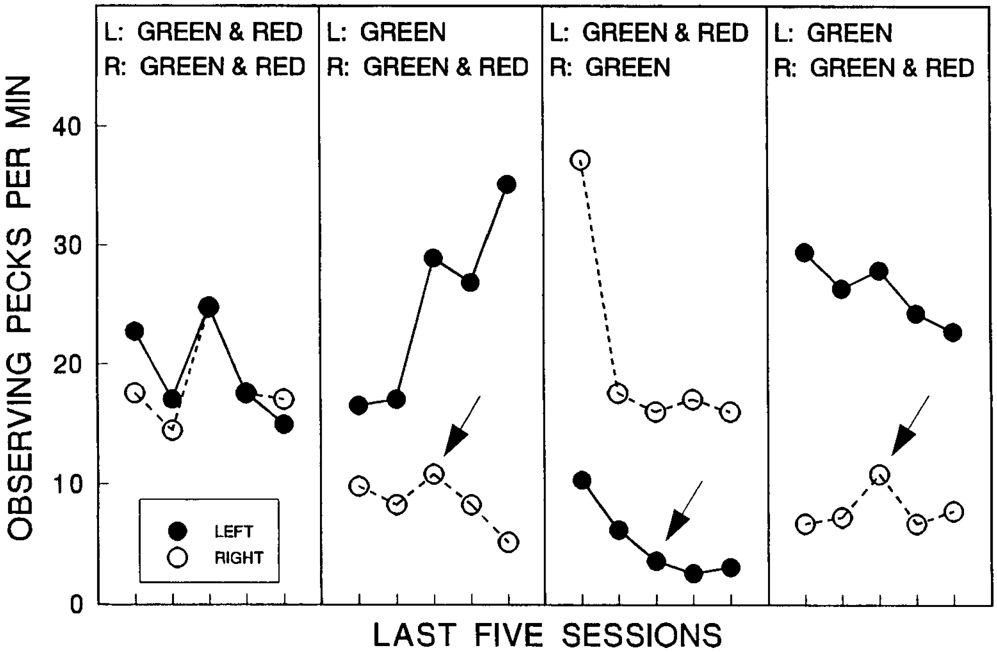

Figure 4. Rates at which a pigeon pecked concurrently available observing keys to produce colors correlated with the VI 30-s and VI 120-s components of a compound schedule of food reinforcement, as reported by Jwaideh and Mulvaney (1976). Responding on the key that produced red (correlated with VI 120 s) as well as green (correlated with VI 30 s) was suppressed relative to responding on the key that produced only green.

inforcement to manifest aversive functions, or is it possible that a more basic process is at work? One answer comes from research on the conditioned properties of discriminative stimuli associated with the components of multiple schedules.

Working in Dinsmoor's laboratory at Indiana University, Jwaideh and Mulvaney (1976) trained pigeons on a multiple schedule with alternating VI components of food reinforcement. When the pecking key was green, a rich schedule was in effect, one that allowed the bird to earn food every 30 s on average. When the key was red, a leaner schedule was in effect; the bird could earn food every 120 s. In the next phase, the colors signaling the VI schedule components were withheld unless the bird pecked side keys. This arrangement is called an *observing response* procedure because pecking the side keys allows the bird to see the color correlated with the VI schedule underway on the main key. The experimental question is this: Will the colors correlated with the VI schedules of food reinforcement serve as reinforcers themselves? That is, will they maintain responding on the observing keys? To answer this question, Jwaideh and Mulvaney manipulated the consequences of pecking the two observing keys.

Figure 4 shows the experimental manipulations as well as the results from 1 bird. Response rates on the two observing keys are shown across four experimental conditions. In the first panel, both keys produced green or red, depending on which schedule was in effect on the main key; response rates on the two keys were about equal. In the remaining three panels, pecks on one key continued to produce green or red, but pecks on the other key could produce only green, the color correlated with the rich schedule. The two response rates differed under these conditions. The bird pecked at high rates on the key that produced green (the "rich" color) and low rates on the key that produced red (the "lean" color) as well as green. This pattern held up across several reversals.

In other words, the color red—the stimulus correlated with the leaner of the two schedules of food reinforcement—suppressed responding relative to responding on a key that did not produce this color. Let me underscore the significance of this result. Red was correlated with positive reinforcement in a prototypical arrangement for demonstrating positive reinforcement: a food-deprived pigeon pecking a key for grain on an intermittent schedule. One might expect a stimulus correlated with a VI schedule of food reinforcement to be a good thing. Nevertheless, the red stimulus functioned as a conditioned punisher: It suppressed the observing response that produced it.

This result is not an oddity. It poses no difficulty whatsoever for contemporary theories of conditioning and learning. Indeed, the experiment fits quite nicely with current understanding of Pavlovian conditioning and its role in imbuing otherwise neutral stimuli with conditioned reinforcing or aversive properties (e.g., Dinsmoor, 1983; Fantino, 1977). The result does pose a problem for simplistic conceptions that assign the label "good" to positive reinforcement and "bad" to negative reinforcement. Jwaideh and Mulvaney's (1976) experiment suggests that whether a schedule (or stimuli correlated with it) will be good or bad depends on the broader environmental context in which the schedule or stimulus is embedded. In alternation with a rich VI 30-s schedule, a relatively lean VI 120-s schedule constitutes an aversive condition.

Like Jwaideh and Mulvaney (1976), Metzger and I also considered the aversive aspects of positive reinforcement, although we approached the problem a bit differently. Our research was patterned after a classic study by Azrin (1961). Azrin gave pigeons the opportunity to remove stimuli correlated with a fixed-ratio (FR) schedule. Two response keys were available; pecks on one key (the "food" key) were reinforced according to an FR schedule, and one peck on the other key (the "escape" key) initiated a time-out. During a time-out, the colors of the response keys were changed, the color and intensity of the houselight were changed, and pecks on the food key were ineffective. A second peck on the escape key reinstated the original stimuli and the FR schedule. The birds usually escaped during the period following reinforcement, suggesting that this was the most aversive part of the schedule.

It is important to recognize that animals can escape from a schedule even when the experimenter has not arranged explicit contingencies. When no explicit escape option is made available, animals may pause for extended periods after reinforcement; during this time, birds typically turn or move away from stimuli correlated with the schedule (Cohen & Campagnoni, 1989; Thompson, 1965). Because pausing provides a way to reduce contact with the schedule and the stimuli correlated with it, it may function as a form of escape. To test this idea, Metzger and I wanted to see if factors known to affect pausing would affect escape in a similar way.

Following a procedure developed by Perone and Courtney (1992), we trained pigeons on multiple schedules with two FR components. The only difference was the reinforcer magnitude; ratios in one component ended in a small reinforcer, and ratios in the other ended in a large reinforcer. We were interested in the behavior that occurred between the end of one reinforcer and the start of the ratio leading to the next reinforcer. There were 40 such transitions during each session. The escape key was available during half of these transitions.

Figure 5 shows the four kinds of transitions that occurred each session. A ratio ending in a small reinforcer could be followed by another ending in a small reinforcer or by one ending in a large reinforcer. Likewise, a ratio

Past Reinforcer	Upcoming Reinforcer: Small	Upcoming Reinforcer: Large
Small	5 regular 5 w/ escape	5 regular 5 w/ escape
Large	5 regular 5 w/ escape	5 regular 5 w/ escape

Figure 5. Metzger and Perone's method for comparing pausing and escape in the four possible transitions between fixed ratios ending in small or large food reinforcers. Over the course of a session, half of the transitions included the activation of an escape key that could be pecked to suspend the schedule. Pausing was measured in the transitions without the escape option.

ending in a large reinforcer could be followed by one ending in a small reinforcer or a large reinforcer. The four types of transitions were programmed in an irregular sequence. Each occurred 10 times per session, five times with the escape key available to initiate time-out and five times without it.

When the escape key was available, both the food and escape keys were lit. A single peck on the escape key initiated a time-out, during which the houselight and food key were turned off and the escape key was dimmed. Another peck on the escape key turned on the houselight and food key and reinstated the FR schedule so that pecks on the food key led eventually to reinforcement. The escape key was turned off.

The bird did not have to peck the escape key. If it pecked the food key first, the escape key was simply turned off. Pecks on the food key led eventually to reinforcement.

Figure 6 shows results from 1 bird. The upper panels show the pauses that occurred during the transitions without the escape option. These data come from the last 10 sessions at each of several FR sizes. In each panel, pauses in the four transitions are shown separately. Pausing is a joint function of the FR size, the magnitude of the past reinforcer, and the magnitude of the upcoming reinforcer. Most important, however, is the general pattern in the functions across the six conditions in the upper panel. Note also that highest data point is always the open circle to the right. This represents pausing in the transition after a large reinforcer and before a small one.

The middle panels in Figure 6 show the escapes that occurred in the same sessions, but in the other half of the transitions—the ones with the escape option available. The general pattern of escape behavior is strikingly similar to the pattern of pausing. Indeed the probability of escape is highest under the same conditions that produce the longest pauses: in the transition after a large reinforcer and before a small one.

The bottom panels present an alternative measure of escape behavior: the percentage of the session the bird spent in the self-imposed time-outs. These data are not as pretty as the others, but they do fall into line.

My students and I have replicated this experiment with fixed-interval schedules leading to different reinforcer magnitudes, and with transitions involving large and small FR sizes. The results are pretty much the same: Pausing and escape change in tandem. Both forms of behavior are influenced by the same variables in the same ways.

Figure 7 shows data from an experiment in which escape was studied with mixed schedules as well as multiple schedules. In both cases, an FR led to either small or large reinforcers. In the mixed-schedule condition, however, no key colors signaled the upcoming reinforcer magnitude. Pauses were relatively brief on the mixed schedule, and escape behavior was absent. In the multiple-schedule condition (when the upcoming magnitude was signaled), pausing increased, particularly in the large-to-small transition, and the pattern of escape behavior resembled the pattern of pausing.

The clear parallels in the data on pausing and escape suggest that pausing functions as a means of escape from the aversive aspects of the schedule. It seems likely that the pause–respond pattern that typifies performance on FR (and fixed-interval) schedules

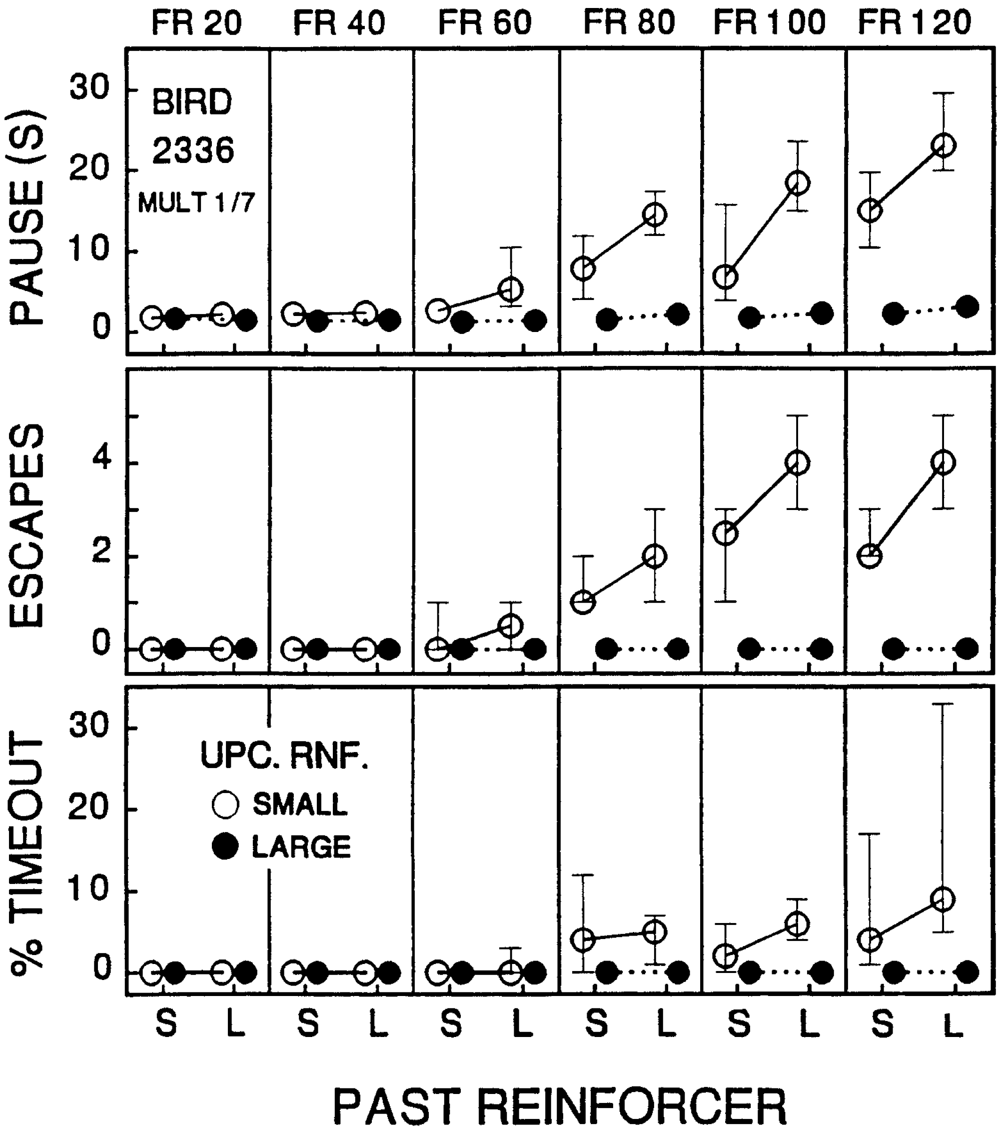

Figure 6. One pigeon's pausing and escape in the transitions between fixed ratios ending in small or large food reinforcers (1-s or 7-s access to grain). The reinforcer magnitudes were signaled by distinctive key colors. Data are medians (and interquartile ranges) over 10 sessions. The ratio size was manipulated across conditions. Top: pausing. Middle: number of escapes; the session maximum was five per transition. Bottom: percentage of the session spent in the escape-produced time-out. (Unpublished data)

represents a combination of positive and negative reinforcement.

THE UBIQUITY OF AVERSIVE CONTROL

This observation brings me back to the general theme of this paper. Inside and outside the laboratory, aversive control is ubiquitous. Indeed, it seems to be unavoidable. Given this state of affairs, perhaps it would be worth considering whether aversive control is desirable or at least acceptable.

In a book on teaching, Michael (1993) observed that "College learning is largely under aversive control, and it

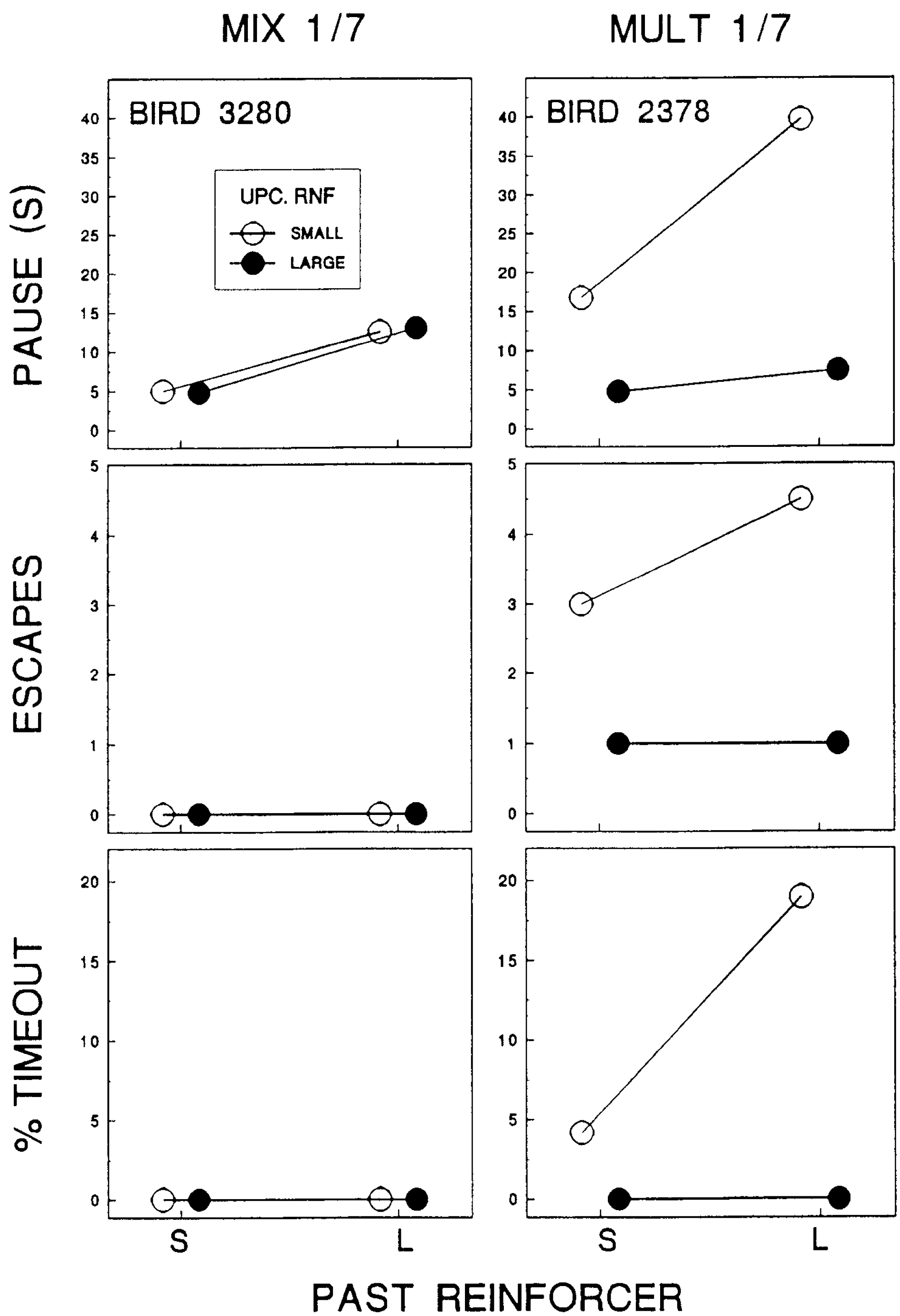

Figure 7. Pausing and escape in the transitions between fixed ratios ending in small or large food reinforcers (1-s or 7-s access to grain). Left: The reinforcer magnitudes were unsignaled (mixed schedule). Right: The magnitudes were signaled by distinctive key colors (multiple schedule). (Unpublished data)

is our task to make such control effective, in which case it becomes a form of gentle persuasion'' (p. 120). The idea is that aversive control might be acceptable if it generates behavior of some long-term utility. Think for a moment what it means to have a truly effective contingency of punishment or negative reinforcement. When a punishment contingency is effective, undesirable behavior is decreased and the aversive stimulus is almost never contacted. When an avoidance contingency is effective, desirable behavior is increased, and again there is minimal contact with the aversive stimulus. In my classes I impose rather stiff penalties when assignments are submitted late. Without this aversive contingency, late papers abound. With it, however, late papers are so rare that I doubt that I impose the penalty more often than once in a hundred opportunities. In short, Michael is right: A well-designed program of aversive control *is* gentle, and a lot of good can come of it.

That is fortunate, because it is impossible to construct a behavioral system free of aversive control. The forms of behavioral control we call ''positive'' and ''negative'' are inextricably linked. Thus, decisions about ''good'' and ''bad'' methods of control must be decided quite apart from the questions of whether the methods meet the technical specification of ''positive reinforcement'' or ''aversive'' control. We need to seek a higher standard, one that emphasizes outcomes more than procedures. Our chief concern should *not* be whether the contingencies involve the processes of positive reinforcement, negative reinforcement, or punishment. Instead, we should emphasize the ability of the contingencies to foster behavior in the long-term interest of the individual. Of course, this is all we can ask of any behavioral intervention, regardless of its classification.

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