

The Aversives Spectrum

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Misconceptions and Misinformation

Positive reinforcement-based animal training programs are expanding. They are visible in zoos and aquariums around the world, rehabilitation centers, humane societies, animal training consultation companies and in households with pets despite the recent rise in popularity of dominance (alpha dog) training. Animal trainers are, with good reason, proud of this movement as it provides the best possible environment for the animals entrusted to them to learn and live. Unfortunately, valuable information is lost as trainers are instructed to implement positive reinforcement-exclusive techniques. Although well intended, this mentality is flawed. It has become politically incorrect for animal trainers to admit to any use of positive punishment, negative reinforcement or even negative punishment in modifying the behavior of animals. However, a cursory review of any psychology text book and an honest assessment of any training program readily substantiates that aversives remain as constant in applied settings as they are ubiquitous in the unapplied “natural” world.

That isn't to infer that all aversives or even most aversives are appropriate strategies to recommend. Critical and honest analysis of the techniques applied by everyone in the field of animal training is the the surest route to enhancement and advancement of animal training standards. Denying the presence of aversives leaves positive reinforcement-focused trainers vulnerable to arguments posited by force-focused trainers and by the public, rapidly becoming more fluent in training methods via media exposure.

The Contingency Square

It is fundamental that every animal training professional understands fully the methods they enlist to elicit or to suppress behavior. In that spirit, a review of basic behavior modification procedures is in order.

The law of effect says that behavior is a function of its consequences. In operant procedures, there are four consequences that either increase or decrease behaviors in the future by being added or removed from the environment. The four consequences are: positive reinforcement, negative reinforcement, positive punishment and negative punishment. These concepts, especially positive punishment and negative reinforcement are often confused.

Positive reinforcement is the process of adding something to the environment that will increase the likelihood of a behavior in the future. For example, a bonobo is cued by a trainer to shift from one area of his enclosure to another and does so without hesitation. As a result, the bonobo is given a grape. The behavior of shifting from one area to another when asked resulted in something (the grape) being added (defined as positive) to the environment which will likely increase (defined as reinforcement) the behavior in the future.

Negative reinforcement is the process of removing something from the environment that will increase the likelihood of a behavior in the future. For example, an elephant is cued by a trainer to walk forward but the animal remains stationary. The trainer uses the hook on the end of his ankus to apply pressure to the sensitive area behind the elephants ear. To avoid the discomfort or pain (dependent on the amount of pressure) the elephant complies and moves forward. When the elephant moves forward, the pressure is released. In other words, the consequence of moving forward is the release of the uncomfortable pressure behind the elephant’s ear. The behavior of moving forward when asked is likely to increase (defined as reinforcement) in the future as a result of the removal (defined as negative) of the ankus’ pressure.

Positive punishment is the process of adding something to the environment that will decrease the likelihood of a behavior in the future. For example, an otter charges aggressively toward its trainer. The trainer strikes the otter with the target pole she is holding. In this example, the behavior of charging the trainer will likely decrease (defined as punishment) as a result of the blow by the target pole being added (defined as positive) to the environment.

Negative punishment is the process of removing something from the environment that will decrease the likelihood of a behavior in the future. For example, a dolphin is playing with a toy in its pool. A trainer approaches the side of the pool and calls the dolphin over. When the dolphin swims to the trainer who called him, a second trainer removes the dolphin’s toy from the pool. In this instance, the behavior of leaving the toy and going to the trainer when called may decrease (defined as punishment) as a result of the removal (defined as negative) of the toy.

In addition to fully understanding the strategies described above, it is essential to recognize that the only true way to determine which method is being implemented is to observe its effect on behavior. It is not uncommon for a trainer to assume they are delivering one type of consequence to an animal, when in fact the animal’s subsequent behavior concludes that the consequence was something else entirely. A trainer who walks away from an animal intending to negatively punish the animal for displaying aggression by giving the animal a time-out may find that the aggressive behavior increases. Since, by definition, any behavior that increases is reinforced, we can conclude that the actual consequence was negative reinforcement and not the intended negative punishment.

	Behavior Increases (Reinforcement)	Behavior Decreases (Punishment)
Something is Added (+)	Positive Reinforcement	Positive Punishment
Something is Removed (-)	Negative Reinforcement	Negative Punishment

Chance, P., Contingency Square. 1999.

Training Via Fear

Benjamin Franklin once said, “Those who are feared are hated.” Although a bit anthropomorphic for our application, there is some scientific credence to this statement. John B. Watson, with the help of his students, proved that most of our emotional reactions, including love, hate, fear, and disgust, are learned, and they are learned largely through Pavlovian

(classical) conditioning (Chance, P., 1999; Watson & Rayner, 1920; Watson & Watson, 1921). Watson effectively debunked the previously held assumption that fear was largely the result of instinctual reaction.

We can conclude then, that when an animal displays fear of an object such as a water bottle, a whip, an electric prod, an ankus or even a person's hand, the animal has been taught to fear the object. Perhaps the best way to teach fear is to inflict pain, high levels of discomfort or intimidation upon the animal (or person, for that matter) with the object.

Not All Aversives are Created Equal

Punishment works. Negative reinforcement works. Like positive reinforcement, however, there are many variables that determine the efficacy of aversives in animal behavior management.

Both Skinner and Thorndike concluded in the 1930s that punishment has little effect on behavior, that results were only temporary. This theory has been refuted and proven false as the intensity of punishers was analyzed more carefully in the 1960s. Several studies have shown a clear relationship between the intensity of a punisher and its effects (Chance, P., 1999).

If punishment is initiated at a low level, it will have little, if any, long term effects. The problem with this is that the intensity is often then elevated in another small increment, allowing the animal to desensitize to this level as well. To have an effective impact on behavioral modification via punishment, the intensity of the aversive must be delivered at a high enough level to stop the behavior in its tracks. "All studies of the intensity of punishment have found that the greater the intensity of the punishing stimulus, the greater is the reduction of the punished responses," (Azrin, N. and Holz, W.C., 1966). According to Paul Chance in 1999, that conclusion still stands today.

To fully understand this concept, consider an example to which most humans can easily relate: punishment for a crime such as vandalism. With the understanding that intensity of the punishment will determine the success of the punishing strategy, a conclusion can be drawn that that the more severe the consequence, the better. Therefore, for the crime of vandalism and theft, an appropriate consequence might be restraint and beating with canes. This was conducted amid much media attention in Singapore in 1994 on a young American who suffered the humiliating and painful consequences. In some countries, escalated punishers such as severing of the hand may be delivered for crimes such as theft. Such punishers are not permitted in most countries however. Why is that? Most countries and individuals would deem beatings and the like as inhumane treatment, torture and socially unacceptable in civilized society.

What's the alternative then? The mistake people most often make is to begin punishing a behavior with a mild punisher. If they do not achieve the results they desire, they increase the intensity. As studies have shown, weak-intensity punishers have little lasting effect on behavior. This often causes the person delivering the punishment to increase the intensity to higher and higher levels as the animal or person either ignores the punishment or desensitizes to it. This was proven by both Jules Masserman and Neal Miller in the 1940s and 1960s during experiments with rats and cats in which the animals would continue to display behaviors despite very high levels of punishment if the intensity level of the punishment was raised in small increments.

We have stated already that aversives are present in the natural and captive environments in which animals live. Aversives come in the form of hotwire fences designed to train cattle or dogs to remain inside a determined perimeter; it is present in shock collars and shock-sticks; it is present in the grass-hotwire used in animal exhibits in zoos; in using an animal's flight response as keepers slowly walk behind animals to herd them into a paddock. Aversives can be found in the use of jesses with birds of prey, in throwing filled water bottles at dolphins to punish aggression among sexually mature males, in punching a tiger in the face with a fist, in yelling at a co-worker, in beating an elephant with an ankus or tugging on its sensitive skin with a pointed tool and it is present in over-used time-outs among a million other punishers and negative reinforcers.

Because these many consequences are all lumped under the heading "aversive," many individuals argue that they are equal. Not so. There is a vast ethical space between the ends of the aversives spectrum, between denying an animal your attention or a toy for a particular period of time and striking the animal with a rod. While there may be arguments over where exactly many consequences lie on the continuum, there is no question that the continuum exists and its breadth is wide.

Frequent Stumbling Blocks

There are a couple of additional crucial points which must be made regarding the reliance on or over-use of punishment and negative reinforcement in modifying behaviors. One point involves acknowledging the reinforcement of the undesirable behavior that is also being punished. The other is the potential side effects that arise from fear-based tactics as well as the present danger to punishment-focused trainers who find themselves unprepared or unable to deliver severe punishment in a system that demands it.

First, one must understand what causes behaviors to increase. Going back to the contingency square, it is clear that if a behavior persists, it is reinforced in some manner. Therefore, the behaviors that trainers often work so hard to eliminate must, by definition, receive reinforcement. Otherwise, the behavior would decrease. It is often forgotten when trying to eliminate a behavior to consider why the behavior occurred in the first place. It makes sense then that not only does the severity of the punisher control how quickly the undesired behavior persists, but also the intensity, amount and quality of the reinforcement will play a role as well.

For example, a chimpanzee who has the habit of rushing and throwing gates in order to be with his mate rather than be separated may continue to throw gates when the keepers attempt to close them even when the consequence is being sprayed by water from a bottle (then a garden hose, then a fire hose) if the reinforcement he receives from being with his female has a high value for him. Experiments have shown that if behavior produces reinforcement, it may persist despite its aversive consequences (Azrin & Holz, 1961; Camp et al., 1967).

It is also of substantial importance to remember that what may be perceived as a punisher may also be a source of reinforcing consequences. Consider a dog that barks incessantly and never learns to be quiet despite the frequent yelling of the dog's owner. The dog may quiet for a short period of time, she may even drop her ears and tuck her tail in anticipation of the occasional swat that accompanies the yell. She received the attention of her owner, however, which is a highly desired reinforcer.

In fully understanding punishment application, one must recognize that there are several potential problems that often accompany over-use or mis-use of this strategy (Skinner, 1953; Sidman, 1989b): escape, aggression, apathy, abuse and imitation of the punisher.

Escape is perhaps the most common and expected reaction to aversives. A frightened gazelle sprints away from a cheetah, a dog squeezes under the bed to avoid the owner who is swatting him with a rolled up newspaper, and a criminal flees the country after committing a bank robbery. As humans, we have an added complexity level and can also escape or avoid punishment by lying or committing the ultimate escape, suicide (Chance, P., 1999; Sidman, 1989b). Although an extreme illustration, suicide is a reality in humans and a stark reminder of the sometimes intense desire to escape or avoid punishment.

Aggression is another undesirable side-effect of punishment and is often directed at those who punish. An elephant that is struck or backed into a corner by a person may charge the person. When the punisher is not reachable, animals and people aggress toward others. A macaque may attack an exhibit-mate after being punished by a trainer; a trainer may snap at a co-worker after being reprimanded by a superior. And when there isn't another living organism on which to aggress, inanimate objects are sometime aggressed upon. Animals may bite or destroy items in their enclosure just as people sometimes punch a wall, slam a door or throw breakable objects. The risk for aggression is escalated when the organism does not have the opportunity for escape.

Apathy is another problem with punishment. When animals or people are in highly punishing environments, a general decrease in behavior may occur. If responding produces only punishment, we are apt to do as little as possible (Chance, P., 1999).

Punishment, especially physical punishment, has a high potential for abuse. What may begin as relatively mild punishment can quickly spiral to extreme consequences that cause bodily injury to the recipient. The use of corporal punishment in schools has resulted in broken bones, ruptured blood vessels, hematomas, muscle and nerve damage, whiplash, spinal injuries, and even death (Gursky, 1992).

Another very important consideration in training animals in a fear-based system, particularly when working with large animals such as elephants is varying experience levels and the ability to combine all of the concepts discussed thus far. This topic deserves more elaborate attention due to the severity of the potential consequences for both animals and trainers.

Elephants are not inherently afraid of an ankus. They are classically conditioned to be afraid of the ankus through repeated pairing of the ankus with pain and/or discomfort. With enough pairing, the fear from the elephant will likely extend beyond the ankus to the keepers routinely carrying and/or using the ankus. Here's where one of the major problems come in. Elephants that were trained in a traditional free-contact setting were likely trained in a fear-based system where the negatives outweighed the positives, where the animals were taught to respect, a.k.a. fear, the keepers. This period of initial training of an elephant is often referred to as "breaking" the elephant. As our field has progressed and positive reinforcement training has moved to the forefront, more trainers/keepers have embraced it. Many of the elephants in facilities today have trainers that want to be more positive with their animals, even if they occasionally use the ankus more often or more intensely than they are comfortable with. Even the Association of Zoos and Aquariums (AZA) has guidelines for accredited institutions

declaring that no elephant trainer may use “excessive force” with the ankus. Setting aside the fact that “excessive force” means vastly different things to different people, there is a huge flaw in this approach.

We have learned through scientific studies that punishment-based training is brimmed with problematic side effects, most significant for this example, aggression. Also established is the fact that when punishment is applied in mild forms (the opposite of excessive force), it is virtually ineffective. This is a no-win situation for elephant trainers to find themselves in. If an elephant charges a new trainer, or even an experienced trainer who doesn’t believe in delivering life-threatening punishment to the elephant to stop an attack or even the precursors to a charge or attack, or the trainer is simply trying to follow AZA recommendations, that trainer is now in a more dangerous position than ever.

The Future of Aversives in Animal Training and Management

So, where do we go from here? Today, there is a greater awareness of both classical and operant conditioning and how to appropriately care for and train animals. For animal training professionals, that awareness has been disseminated through organizations such as the Animal Behavior Management Alliance (ABMA), the International Marine Animal Trainers Association (IMATA), the Association of Zoos and Aquariums (AZA), the American Veterinary Society of Animal Behavior (AVSAB), the American Association of Zoo Keepers (AAZK), the International Association of Avian Trainers and Educators (IAATE) and many others. Our colleagues have taken this information and built upon it, have learned to apply it to the varied species we work with, and in some cases, literally formed the organizations around those standards, as is the case with the ABMA. Most of these organizations have bylaws and ethical codes dictating that our charges are cared for in a respectful and humane way.

The general public is also far more savvy regarding animal care and training methodology. This is due in part by the visibility of behavior management in zoological facilities and the outstanding efforts that many education programs have made to share this important information with park guests. It’s also due to the rise in canine training around the world. People are no longer content to have a badly behaved pet and as a result, canine training centers and consultants are abundant. The media has also played an enormous role in disseminating information about the animal training world through books, television and movies. Some of the information is accurate and beneficial, some of the information is completely false and some of the information is merely a repackaging of outdated methodology.

The public is also influenced (I resist using the word educated) by organizations that strive to malign our reputations as a stepping stone to closing our facilities. Their work is easily visible on billboards, staged demonstrations and protests, youtube videos, magazine ads and televised commercials and publicity stunts. Unfortunately, their marketing is far superior to most zoos due to their large coffers for advertising.

The education, research and conservation work undertaken daily in zoological institutions, humane societies, rehabilitation centers, as well as in domestic animal facilities and consultation companies is important. It is work to be proud of.

It is the responsibility, however, of every single individual who works with animals or in the animal industry to look beyond the doors of their barns or the gates of their pools. We have to

begin looking at our industry as a whole. The days of “live and let live” or “train and let train” are vanishing. We must have standards, not just as individuals, but as members of our institutions, as members of our professional organizations, and as leaders in this field.

Trainers must fully understand the wide spectrum of behavior modification techniques that are employed to both elicit and suppress behaviors. They must make decisions regarding their personal views, limits and what they are willing to support and/or participate in. They must know that lack of action is often interpreted as consent or support. When faced with a task that a trainer feels conflicted about regarding animal training strategies, a good rule of thumb is to employ the “Six O’Clock News Test.” The trainer can ask himself if he would be comfortable defending a video of his actions on the six o’clock news to his friends, colleagues and family. Every individual’s decisions impacts the person, the animals in their care, their institution and our field as a whole.

If working with large dangerous animals that have been trained in an aversive system, thought must be given not only the methods currently employed, but what may be required if the animal aggresses. Should we support a method of training with any animal where the animals are physically hurt or intimidated as a component of the training program? Do dominance methods belong in zoos, aquariums or in training with domestic animals when there are alternatives?

Yes, aversives will always be present in animal management programs just as they are always present in the animals’ natural environment. It is fundamental, however, that we honestly analyze the techniques in use with the animals in our care and we continually move toward the most humane, most respectable methods of animal management. We must recognize the difference between negative punishment and the mild side effects that have been documented with time-outs and removal of desired items and the detrimental side effects of applying physical punishments and negative reinforcement. There is a difference.

“Nothing is more despicable than respect based on fear.” (Albert Camus, 1957)

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