

## Why Animals Need Trainers Who Adhere to the Least Intrusive Principle: Improving Animal Welfare and Honing Trainers' Skills

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A typical debate about negative reinforcement is something like a train wreck – you don't want to stare but you can't look away. Some trainers argue negative reinforcement has a place in animal training; others say it does not. With some recent interest in the animal training community in the basic research on negative reinforcement, it's a good time to check our understanding of why animals need trainers who adhere to the least intrusive principle. This principle has inspired development of procedural hierarchies in our field (see Friedman, 2008) and others (e.g., bioethics, see Byskov, 2019) that provide a framework for discussing negative reinforcement in the larger, applied context.

Let's review what negative reinforcement is *in this context* because this particular combination of words can easily trip us up. Negative reinforcement is the process that strengthens escape and avoidance behavior. Looking at each word separately may help keep it straight. Reinforcement always means one thing – the process by which consequences strengthen behavior. Negative always means one thing – removal (think subtraction as in arithmetic; do not think unpleasant as in value). For example, when you steer clear of a snake on the trail, that's escape behavior. When you hike on a different trail from then on, that's avoidance (prevention) behavior. Distance from the snake is the negative reinforcer. The snake is the aversive stimulus – the change in the environment that we behave to escape on the path and avoid in the future.

On one hand, the natural world is full of examples of negative reinforcement influencing animals' behavior (and at least some plants; see Appel & Cocroft, 2014). On the other hand, the natural world is also full of aversive stimuli so the naturalness of something may not be the best rationale for our training decisions. Still, no doubt about it – life is full of aversive stimuli, and it is an essential life skill to escape and avoid them. We know that when escape behavior is repeatedly blocked, learned helplessness can follow (e.g., Overmier & Seligman, 1967).

It is self-evident that animals' welfare increases as the number of aversive stimuli in their environment decreases. My hope for the animals in our care is that they don't have occasion to use escape or avoidance behavior very often, even though they are equipped to do so.

### **Ethics**

I was privileged to work on a project with Dr. Bernard Rollin, one of the world's foremost experts on animal ethics and ethics in veterinary medicine. During this collaboration, I learned I will need another lifetime to gain a thimble full of what this field offers. So, when it comes to ethics, I'd say I am a simple thinker. The Merriam-Webster dictionary states, "ethics tends to suggest aspects of universal fairness and the question of whether or not an action is responsible."

Ethical considerations are about value judgments; science is not. Einstein (1941) said, “For science can only ascertain what is, but not what should be, and outside of its domain value judgments of all kinds remain necessary.” Of course, there will always be debates about rules of professional behavior. But, this by itself does not discount the need for them. Rather, it confirms the need to continue civil, informed discussion if we are to inch closer to compromise and consensus. The challenge is to balance trainers’ individual freedom to change behavior by any means and a professional standard built on the least intrusive, effective means.

We have a full toolbox of effective, science-based training procedures, but from an ethical perspective, *effectiveness is not enough*.

### **Least Intrusive Principle**

Every profession has ethical standards followed by members in good standing, and many of them include the least intrusive principle (aka least invasive principle, least restrictive alternative, least intrusive intervention/mandate/doctrine/means). Across the board, *intrusiveness refers to the degree of counter-control, choice and consent, for the learner (client, patient, etc)* – a concept as relevant to the welfare of non-human animals as to people. Let’s connect the dots: If we were to change the name of the least-to-most intrusive hierarchy to the most-to-least control hierarchy, it would be the same concept. Of course, all codes can be abused and as with any living document the hierarchy can evolve over time. Nonetheless, professional standards are generally protective of both the provider and the receiver of professional expertise.

Mental health, special education, medicine, bioethics and law are just a few examples of professions that recognize the least intrusive principle. In special education there is the Individuals with Disabilities Education Act [IDEA], 20 U.S.C. § 1400 *et seq.* (2010). In bioethics there is the Nuffield Council of Bioethics intervention ladder (cited in Byskov, 2019). And, in constitutional law there is *Florida. v. Royer*, 460 U.S. 491, 500 (1983), in which the U.S. Supreme Court ruled that “the investigative methods employed should be the least intrusive means reasonably available to verify or dispel the [law enforcement] officer’s suspicion in a short period of time.” It is a pressing issue when the least intrusive principle is not adhered to as intended in any of these professions. That said, this problem won’t be solved by having no procedural guidance at all. Imagine the malpractice that would occur without the least intrusive principle. In fact, we don’t have to imagine, we know what a lack of professional accountability looks like and it is horrific.

I first advocated for the least intrusive principle regarding the selection of training procedures in my animal learning seminars and conference presentations in the early 2000s. I had worked with this mandate for around 25 years prior to that time as a special educator, applied behavior analyst and psychology professor. The implementation of the least intrusive intervention that is likely to be effective is an ethical guideline recognized within the area of applied behavior analysis (Shook, 2002 as cited in Carter & Wheeler, 2005, p. 137). It’s also part of the code of ethics for board certified behavior analysts: “4.09 Least Restrictive Procedures. Behavior analysts review and appraise the restrictiveness of procedures and always recommend the least restrictive procedures likely to be effective.”

In time, I put pen to paper and wrote the article, “What’s Wrong with This Picture: Effectiveness Is Not Enough” (Friedman, 2008). Readers are encouraged to review this article at my website for behavioral examples at each level on the hierarchy and other details not repeated here—[behaviorworks.org](http://behaviorworks.org) (direct link to article: <https://tinyurl.com/y7fst3vf>).

As a tool for applying the least intrusive principle, I devised a figure in which operant training procedures were arranged hierarchically from the least intrusive to most intrusive intervention (see Figure 1 below for a recent version). The article and hierarchy graphic have been translated into 12 languages that I know of, presented at conferences by countless colleagues, and have been included in the ethical standards of professional animal training and behavior consulting organizations, and zoological facilities around the world. Clearly, the least intrusive principle and hierarchy tool filled a need among animal training professionals who found themselves at odds with the cultural legacy of indiscriminate force and coercion of animals in human care.

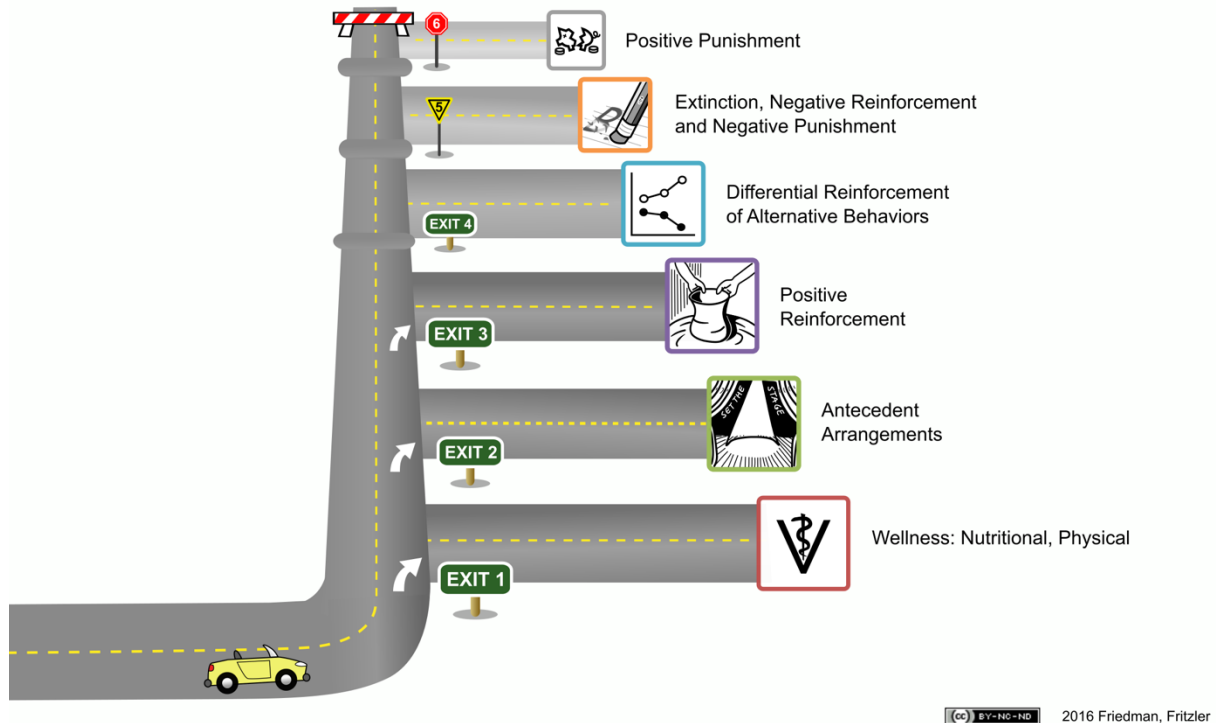


Figure 1. Suggested hierarchy of behavior change procedures according to the least intrusive, effective intervention principle.

As explained in the article, this hierarchy is an expanded conceptualization of a four-category hierarchy of behavior-reduction procedures introduced in early and current editions of a behavior analysis text written for teachers by Alberto & Troutman (e.g., 1982 and 2006) who wrote,

“When one is considering behavior reduction, the least intrusive intervention is the least aversive or lowest on the hierarchy. The teacher should determine, based on a hierarchy of procedures from the least intrusive to the most intrusive (most positive to most

aversive), an effective procedure that is in the positive range of available choices” (p. 260).

The authors also set forth these important implementation details:

- If a less intrusive procedure will accomplish the desired behavior change it is neither necessary nor ethical to use a more intrusive procedure.
- If the choice is between a less intrusive but ineffective procedure and a more aversive but effective procedure, then the effective procedure should be selected.
- Before a more intrusive procedure is employed data should be collected to substantiate the ineffectiveness of the less intrusive procedure.

Thus, the least intrusive principle doesn't preclude the use of negative reinforcement (or punishment for that matter) per se; rather, it limits the use of negative reinforcement when it isn't necessary (i.e., when less intrusive strategies will be equally effective). Progression along the continuum of intrusiveness should be databased and not based on convenience, authority or politics. Data collection needn't be exhaustive or burdensome. Just a few baseline repetitions or a retrospective report from a reliable observer may be all that is needed to justify moving along the intrusiveness continuum.

So, how can we know that, for any individual, positive reinforcement-based procedures will be equally effective and efficient? We try them – or at the least we provide a compelling rationale for why we will not that is consistent with the profession's ethical mandate (see the section below, *When the Function Is Escape*). At the same time, we should be alert for misleading arguments about the aversive properties of positive reinforcement that are better understood as the misuse of food reinforcers or just plain poor training (see the section below, *When Positive Reinforcement is Coercive*).

## **Control and Animal Welfare**

It is a small step from understanding that behavior is an evolved tool to achieve functional outcomes to realizing that control over outcomes matters in the lives of all animals. There is no dearth of scientific evidence across several different levels of analysis (e.g., behavioral, neuro, ethological) revealing the direct correlation between control over one's own outcomes and animal welfare (for more examples, see Friedman, 2005). As discussed in a review of literature by Leotti, Iyengar, and Ochsner (2010), “Converging evidence from animal research, clinical studies and neuroimaging work suggest that the *need for control is a biological imperative for survival*, and a corticostriatal network is implicated as the neural substrate of this adaptive behavior.” For animals in human care, control is often achieved through stimulus-rich environments and opportunities for choice and consent. With this understanding, it is sensible to add control to the list of so-called primary reinforcers. We are born to control outcomes – indeed, that is the adaptive function of behavior; we need to control outcomes to survive and thrive.

The commitment to using the least intrusive training procedures to provide animals more control has also led to some of our most innovative training advances to date, for example, replacing the traditional command-style monologue training with dialogue between trainer and learner by teaching “ready” signals (see Bertilsson & Johnson Vegh, 2020).

### **The Hierarchy and Trainers’ Skills**

In the 40-plus years I have been teaching parents, teachers and animal trainers how behavior works (i.e., applied behavior analysis), not one person has ever expressed to me concern over their own use of force and coercion. And yet, I have been asked many, many times if they should be concerned that teaching (or parenting) with mainly positive reinforcement and a high degree of learner autonomy would produce unruly children, animal anarchy or birdie bedlam.

Most of us are skilled at force and coercion due to a lifetime of personal experience with these approaches and too few models showing us less intrusive, effective means with which to influence behavior. Thus, for many people aversive procedures are the default solution to behavior challenges. It *will* always be easier (requiring little or no skill) and sometimes (but by no means always) faster to spray a troop of monkeys with a hose to shift them from one enclosure to another, to push an owl onto the glove with pressure on its abdomen, and to keep a dog in the heel position with a choke collar.

Alternatively, it takes skill – the result of knowledge and experience – to use positive reinforcement to shape behaviors like shifting from one space to another, stepping onto a glove, and heeling on cue. *This is where contemporary trainers excel; this is the deep expertise offered by our profession. We are expert at changing behavior by changing conditions with a minimum of force and coercion.*

The ever-improving science and technology of behavior change have been available for well over half a century. With the abundance of internet courses, workshops, conferences and mentors, gaining these skills has never been more possible. To adhere to the least intrusive principle, trainers must have expertise identifying unwell animals, and using antecedent arrangement and positive reinforcement, prompting and fading, shaping new behaviors, strengthening appropriate alternative behaviors, and functional assessment.

We have a choice to make about the means by which we accomplish our behavior goals that should be represented field-wide to improve accountability, as has been done in so many other professions. Frankly, I just cannot figure out why, in this day and age, animals in human care should not be afforded the same ethical considerations and accountability as children in special education, medical patients or law enforcement. Can you?

### **When the Function Is Escape**

The ethics and efficacy of teaching new behaviors with skilled use of less intrusive procedures (antecedent arrangement and positive reinforcement) is clear to most contemporary trainers. But what about behavior problems? In applied behavior analysis, the first step is assessing why the behavior occurs by asking, WTF? (What’s the function?) What does the animal get, or get away

from, by behaving this way in these conditions? Possible functional outcomes include consequential stimuli and events such as attention, tangible items, escaping aversive stimuli, and sensory reinforcement.

There is inherent value in solving a behavior problem by providing the same functional outcomes produced by the problem behavior with an acceptable alternative behavior instead. After all, if the outcomes were not important to the individual, it would not be behaving to achieve those outcomes in the first place. New skills should also be taught with positive reinforcement to expand the learner's repertoire as freedom is about big skill repertoires (WISABA, 2016).

For example, a parrot who lunges to remove the caregiver's hand can be taught that the hand will be removed contingent (dependent) on the parrot leaning back instead (an acceptable alternative behavior to escape the hand). At the same time, or soon after, a positive reinforcement shaping program can be implemented to teach enthusiastic stepping onto the hand (building new skills).

The reason I bring up this example is to illustrate a case in which negative reinforcement might be a reasonable first choice. The above intervention follows the least intrusive principle by increasing leaning back (the alternative behavior) with negative reinforcement rather than decreasing lunging with punishment. As the function of escaping the hand is accomplished by leaning back, lunging often decreases without direct intervention. It appears that the freedom to *effectively say no* is an abolishing operation for (i.e., demotivates) escape behavior.

But are there less intrusive procedures than negative reinforcement that we can use to solve the problem of the lunging parrot? One approach would be to use a stimulus-stimulus procedure (S-S) in which food immediately follows the presentation of the hand independent of a behavioral criterion (non-contingently). Starting at a distance at which the parrot remains calm (a criterion requiring operationalization) we could gradually close the distance between the bird and the hand with this strategy.

However, two problems with this solution may arise: First is how to get the food to the parrot before it has learned to be calm in close proximity to the hand. Perhaps this could be readily solved with a very long perch and a mounted food cup. Second, and more relevant to my point, is that many animals will not eat food in the same conditions that evoke escape. Pushing them to eat by shoving food into their mouths can be inadvertently coercive. Even for those animals that willingly eat food when escape is the functional reinforcer, food is an arbitrary consequence to offer the learner. That is, the bird isn't lunging to get food; the bird is lunging to remove the hand.

It goes without saying that many trainers have had great success using food reinforcers within a differential reinforcement of alternative (or incompatible) behavior intervention even when the function of the problem behavior was not food. For example, we often replace a puppy's unwanted behavior of biting shoes by differentially reinforcing with treats the behavior of stationing on a mat (see Kiki Yablon training Frieda at <https://www.instagram.com/p/B8kXjfulMk2/>). Once the unwanted behavior is replaced with an appropriate alternative, the playful biting can be reintroduced under appropriate conditions

(brought under stimulus control) such as when a tug toy is offered, and reinforced with attention and the tug activity.

However, especially in the case of escape behavior (which the dog example is not), food consequences may result in weaker or slower progress than that observed by starting with negative reinforcement. As negative reinforcement is more closely aligned with the escape function of the original problem behavior, it may, in the case of the lunging parrot, be the least intrusive, effective starting point.

We should also consider variations of a negative reinforcement procedure for escape-maintained behavior that allow animals can escape *to* something (appetitive) rather than only *away from* something (aversive). Ramirez (2017) tested this idea when he and his training team taught a beluga whale that it could say no to a cue by touching a nearby target instead for the same fish it would have gotten if it responded to the cue. This approach for escape-maintained behaviors has been investigated in special education as well (e.g., Morlino, 2020; Lalli, 1996).

And yet, it bears repeating that even in the case where the functional reinforcer for the problem behavior is escape, data should be collected to substantiate the need to move along the hierarchy to negative reinforcement. The question to consider is always, “Is it necessary?”

### **When Positive Reinforcement Is Coercive**

Regarding children’s learning, some have argued that extrinsic rewards reduce intrinsic motivation. This myth was dispelled by Cameron, Banko, and Pierce (2001) who found that the detrimental effects of “rewards” on motivation only occur in a specific, restricted set of conditions that can, and should, be easily avoided (e.g., lacked contingency; provided for one session only and then arbitrarily withdrawn in the next, which may have produced a negative reaction; measured by activities during only free time; investigated only in a laboratory setting).

There are, however, a couple of ways positive reinforcement would not fit the spirit of the least intrusive principle and can produce problematic results. One case is the use of a severe motivating operation to increase the value of the reinforcers. Depriving animals of food or social contact with conspecifics and people with whom they have relationships are examples of unnecessary and unacceptable strategies, all of which we know are in use by some “trainers.”

It’s an interesting commentary on how thick the cultural fog can be when we consider how many people earnestly believe that only severe hunger can account for the animal training we are doing so successfully nowadays. When your knowledge of behavior and learning is mainly conventional wisdom, it can be hard to imagine that an amply nourished hyena will willingly and enthusiastically stand at the mesh with its neck stretched up for a blood draw or a satiated service dog will intelligently disobey its vision impaired handler’s cue to go forward when a low-hanging branch is blocking the path. We have a lot of disseminating and demonstrating ahead to blow this fog out to sea.

Another consideration is the superimposition of consequences. For example, an aversive stimulus can become a positive reinforcer when it is closely and repeatedly followed by a

positive reinforcer. Consider the case where a trainer jerks the dog's leash to punish running out of the heel position, and then immediately follows the leash pop with food, intending to reinforce coming back into position. This stimulus-stimulus pairing of the leash pop (aversive stimulus) followed by food (appetitive stimulus) may result in some dogs behaving for leash pops – the predictor of food to follow. This is exactly the way clicks or whistle peeps become conditioned positive reinforcers. Behavior on this planet is incredibly flexible (see for example, the seminal work of Holz & Azrin, 1961, where pigeons learned to work for shock).

The superimposition of consequences works in reverse as well. If food closely and repeatedly precedes an aversive stimulus, the food can become aversive and we (and the learner) lose a reinforcer for training. For example, feeding an animal before or while an injection is administered may result in the animal refusing food in those conditions, as food predicts discomfort. See Sdao (2016) for a more in-depth discussion of these consequence traps. At the same time, we know of many examples of successful positive reinforcement training programs (and classical conditioning programs) that changed animals' behavior from aggressive to calm in the presence of aversive stimuli (see Emma Parsons' updated book *The Click to Calm Primer*).

What can I say? Sometimes the more you know about how behavior works, the more you feel like staying in bed! However, gaining a better understanding of these intricacies helps us make better training decisions and meet our goal of using least intrusive, effective procedures.

### **Diving Into the Deep End of the Discussion: Acknowledging Dissent**

In the 20 years or so that I have been disseminating the least intrusive principle to the animal training community, I have heard dissent – sometimes absurd, but most often thought provoking and worthy of consideration. So, I share several of those opinions and my responses here as well.

1. “The hierarchy is not supported by science.” The rationale for arranging the hierarchy from most intrusive to least intrusive procedures is most certainly supported by science as evidenced by the sources I provided above, which span several levels of analysis (e.g., Leotti, et al, 2010; Overmier & Seligman, 1967; Carter & Wheeler, 2005). For more examples, see Friedman (2005). In addition, as noted, ethics is not the domain of science, although it may be informed by science. The least intrusive principle is one case in which science and ethics converge on the same conclusion.
2. “Given my experience training this species, I am able to quickly surmise what procedures will and will not work, so why take the time to step through less intrusive procedures?” I must admit to my own hubris here as I too have boasted that I can predict what a kid will do from 20 feet away. However, this is really profiling what a learner will do in the future based on what *other animals* have done in the past. The risk of a self-fulfilling prophecy is too great (for a discussion of how others' expectations of an individual affect that individual's performance, see Rosenthal, 1998). We know well that in our work, *behavior is always a study of one* and thus, we would do better to predict what an animal is likely to do based on that animal's own data (a shameless plug for taking baseline data before intervening on a learner's functional behavior).



If a teacher told me that, based on experience with 100 other children, they wanted to start with negative reinforcement to change my child's behavior, I would find a different teacher. It's not that I don't trust or value professional experience or the latent database it produces (aka intuition). My objection is that no one should predict the limits of a learner's behavior until we have data from that individual; and even then, caution is warranted. The detrimental fallout of aversive procedures is too costly to rely on such fortune-telling (see Sidman, 1989).

3. "Positive reinforcement can be coercive and negative reinforcement can be just information (a discriminative stimulus)." Agreed, and this is an important consideration. Nature is messy. A too-hungry cat can be taught to go into a crate with food reinforcers – is the cat behaving to get food (positive reinforcement) or to escape hunger (negative reinforcement)? A tug on the left rein can cue a galloping horse to turn back toward the stable – is the horse behaving to get home or escape pressure from the rein? Or is it both processes at once? In such cases, where multiple alternative analyses exist, we have to ask: How can we know? What are the criteria? How will we measure it?

Sometimes the difference between positive and negative reinforcement can be inferred from the learner's body language, which is typically very different in approach conditions than escape or avoidance conditions. We need to assess the whole picture, patterns of behavior and conditions, to shine a light on the processes influencing behavior in any given case. This requires that we become detailed observers of behavior and conditions (note – not just behavior).

4. "Common applications of negative reinforcement are so aversive (e.g., shock collars and ear pinches) that the procedure should be on a level of its own, closer to positive punishment." Indeed, the continuum of aversiveness is long, ranging from mild to strong. One argument for leaving the hierarchy as it stands is that before a highly aversive event functions as a negative reinforcer, it likely punishes the preceding behavior. Positive punishment is, generally speaking, the most intrusive intervention.

It's a complicated planet. There will always be exceptions that prove (or proof) the rule. These interesting branches off the main trunk of the hierarchy provide welcome opportunities for further discussion, clarification and revision to improve animal welfare through our training choices.

### **Conclusion: Asking the Right Questions**

There is abundant evidence that animals are learners who share with humans the fundamental principles of behavior change. Animals are neither commodities nor stimulus-response reflex machines. This understanding has blown the lid off the relevance of training to animal welfare. Still, there is so much more to discover about the procedures we use to teach our learners. As I wrote in the original 2008 article, the commitment to using the least intrusive, effective intervention encourages us to *think before we act*, so that we make choices about the *means* by which we accomplish our behavior goals and not just the outcomes. When more intrusive

procedures are not necessary, we should not use them, regardless of rationales based on personal recipes or canned protocols.

When we do find it necessary to escalate to more intrusive procedures, it should be done with a big enough bank account of positive reinforcers to withstand the withdrawal. Big bank accounts are the result of providing animals with a lifestyle of control over outcomes, freedom to choose, and a voice to say no (see Friedman, 2012). Trainers should continue to improve their behavior science knowledge and their observation, analysis and training skills, so that it is never the case that animals pay the price for our deficits. This will require a new infrastructure in which new trainers have access to information and supervision by experienced, knowledgeable mentors in both behavior analysis and training.

Sometimes addressing the function of a behavior (i.e., escape behavior) leads us to negative reinforcement interventions. In this case, data should be collected first that substantiates the need for moving along the hierarchy. Sometimes the lack of effectiveness of a procedure is due to the animal's lack of the prerequisite skills necessary to meet the target criterion. This possibility should be evaluated and addressed instead of defaulting to more intrusive procedures. Even the most effective trainers have occasion to ask, "Why is this animal failing to meet an appropriate criterion?" *The answer should be sought in the conditions we, the trainers, provide, not inside the animal.*

As defined by Sidman (1993), coercion is the control of behavior through punishment (or the threat of punishment) or negative reinforcement (the removal of punishment). In his advocacy of positive reinforcement methods, he wrote:

"The occasional need to use coercion to deal with emergencies does not justify the advocacy of coercion as a principle of therapy. What basic and applied behavior analysts can offer that is new and constructive are positive reinforcement techniques for teaching new behavior and stimulus-control techniques for establishing cognitive repertoires" (p. 95).

Ultimately, applying the least intrusive principle to animal training requires a good understanding of how the fundamental principles of learning work (*the world as it is*) and how we choose to use them (*the world as we want it to be*); that is, both science and ethics. A profession-wide standard based on the least intrusive principle moves us closer to that goal.

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