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The least inhibitive, functionally effective (LIFE) model: A new framework for ethical animal training practices☆

Eduardo J. Fernandez *,[1]

School of Animal and Veterinary Sciences, University of Adelaide, Adelaide, South Australia, Australia

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ABSTRACT

The ethics of animal training procedures have seen dramatic changes in the last few decades, with a movement toward reward-based training methods. These reward-based training practices have also been directly impacted by the behavioral and animal welfare sciences, including their research outputs. In the last couple of decades, the least intrusive, minimally aversive (LIMA) model of animal training has been used to describe reward-based animal training methods. However, a number of problems were built into the creation of LIMA and continue to exist today, including (a) a lack of clarity in its terminology, (b) ambiguity in desired training approaches, and (c) a history of aversive training methods justification. An alternative approach is therefore proposed, and one that specifies (1) increasing choices by inhibiting less, (2) the importance of function, and (3) defining success as more than simply being effective. The result is the least inhibitive, functionally effective (LIFE) approach to ethical animal training methods. LIFE is discussed in terms of its connection to established terminology, behavioral principles, and training practices, as well as its ability to promote optimal welfare for the animals under our care and in our lives.

Introduction

In the last few decades, we have observed major changes in the ethics and application of modern animal training practices. For instance, we have seen formalized descriptions of reward-based or force-free training methods, including detailed plans to use such procedures (Millikan, 2012; Ziv, 2017; Todd, 2018). Researchers have examined and compared the use of reinforcement-based training protocols to traditional training methods that rely on aversive tools, such as shock collars, with the former more typically outperforming the latter (Cooper et al., 2014; China et al., 2020; de Castro et al., 2020). We have seen documented demonstrations of the ability with which reward-based principles can be applied to modify animal behavior ethically, reliably, and voluntarily, including with exotic animals in zoos (Grandin et al., 1995; Fernandez and Timberlake, 2008; Melfi et al., 2020).

While clear changes in both the practices and philosophy of modern animal training procedures have occurred, there have also been two major hurdles for continued progress: (1) resistance from traditional or "balanced" trainers that regularly rely on aversive tools, and (2) a lack of a coherent and concise model to detail the important features of ethical animal training practices. The former problem is expected, as resistance to change is a common obstacle for any proposed modification to any field. The latter, however, can create considerable problems, particularly if a proposed model to describe some philosophical approach is not simple and clear enough to convey the important and necessary information (Popper, 1985; Refsgaard and Henriksen, 2004). Therefore, a critical feature for effectively describing modern animal training and behavior change procedures should be a simple framework that connects theory, science, and practice. In other words, the framework should accurately detail both how to think about and do ethical animal training.

This paper introduces a new model or approach for thinking about ethical animal training practices. This is accomplished in three sections: (1) a brief history of animal welfare and training (i.e., important features about how we arrived at the current animal training ethics state of affairs), (2) a critical inspection of one of the more common approaches used to describe force-free training: the least intrusive, minimally aversive (LIMA) model, and (3) the premise for a new approach: the least inhibitive, functionally effective (LIFE)

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* Address for reprints and correspondence: Eduardo J. Fernandez, School of Animal and Veterinary Sciences, University of Adelaide, Adelaide, SA 5005, Australia.
E-mail address: eduardo.fernandez@adelaide.edu.au.
[1] https://orcid.org/0000-0001-5444-6604.

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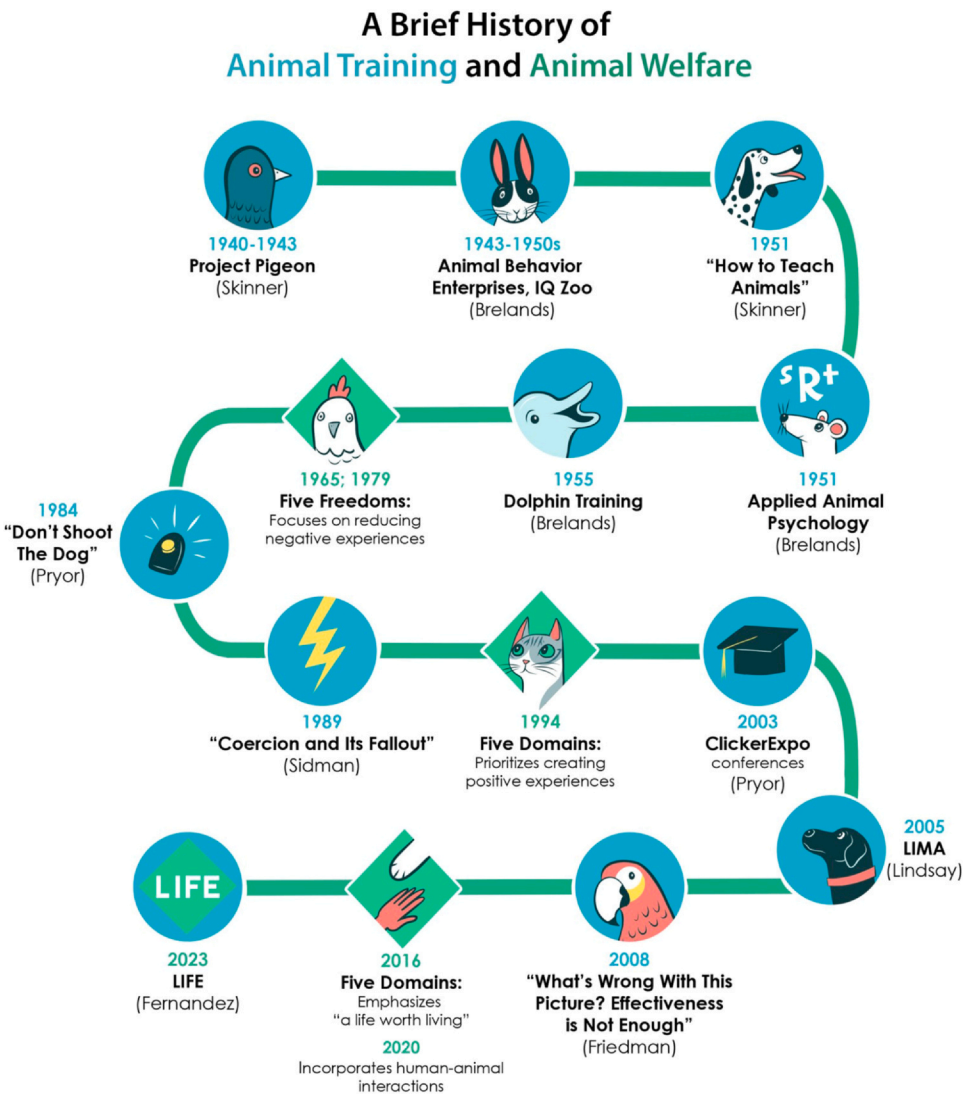

Figure 1. A brief history of some of the important events in both animal training and animal welfare that helped establish modern force-free animal training practices. Illustration courtesy of Lili Chin. LIFE, least inhibitive, functionally effective; LIMA, least intrusive, minimally aversive.

framework for animal training. The primary purpose of this paper is to detail the philosophy behind the LIFE approach to training practices, as well as provide a practical set of guidelines for applying this conceptual framework.

A Brief History of Welfare and Training

In the following section, I briefly describe some of the events that helped form both the modern animal welfare and force-free training movements. Other papers provide more detailed information on the history of animal welfare (Broom, 2011; Patterson-Kane and Golab, 2013; Fernandez and McWhorter, 2023) and animal training (Ramirez, 2012; Fernandez and Martin, 2021; Fernandez, 2022). In addition, Figure 1 outlines some of the intersection of major historical animal welfare and animal training events.

Animal welfare can be thought of as a way of describing a measurable quality of a living animal (Broom, 2011). The modern animal welfare movement has been greatly influenced by two major events: (1) the creation of the Five Freedoms Model, and (2) the progression of the Freedoms model to become the Five Domains model. The Five Freedoms model was initially inspired by writings such as Harrison's (2013) "Animal Machines" (originally published in 1964) and from the Brambell Report of 1965, and later developed by the Farm Animal Welfare Council (FAWC, 1979; McCulloch, 2013; McCausland, 2014). While this was a major step forward for the welfare of animals, the primary focus of the Five Freedoms model was on avoiding negative experiences, or freedoms "from" events (Browning and Veit, 2021). It was the latter Five Domains model that would move to assessing welfare based on positive indicators, including "a life worth living" (Mellor and Reid, 1994; Mellor, 2016). The Five Domains model was updated in 2020 to include consideration of human-animal interactions, which necessarily incorporates how we manage the behavior of animals through training practices (Mellor et al., 2020).

Animal training can be defined by respondent and operant conditioning procedures used to elicit, evoke, or emit behavior (Fernandez, 2022). The modern animal training movement can also be said to have started from two major events: (1) Skinner's "discovery" of shaping (Skinner, 1951; Peterson, 2004), and (2) the creation of a field of Applied Animal Psychology by Keller and Marian Breland (Breland and Breland, 1951; Fernandez and Martin, 2021). Both of these events were directly connected to Project Pigeon, where between 1940 and 1943, Skinner and the Brelands trained pigeons to guide bombs as part of the war effort (Skinner, 1960; Capshew, 1993). Project Pigeon was so impactful that the Brelands left their academic studies to pursue animal training careers, which resulted in the

creation of Animal Behavior Enterprises, IQ Zoo (a roadside tourist attraction in Hot Springs, Arkansas), and some of the first dolphin training shows (Bailey and Gillaspy, 2005; Bihm et al., 2010; Gillaspy et al., 2014). Critical to the Brelands training efforts were their public demonstrations of how positive reinforcement could be used to train almost any behavior. The movement to select rewards over coercive teaching and training methods was made more public through the efforts of an ex-dolphin trainer, Karen Pryor, who would publish one of the most influential books on reinforcement principles to date: Don't Shoot the Dog (Pryor, 1984). Similarly, this preference for reward-based learning was also put forward in academic works such as Sidman's (1989) Coercion and Its Fallout. Following the turn of the century, other major historical events included Pryor's creation of ClickerExpo, one of the first conferences for reward-based animal trainers, Friedman's (2008) article on assessing training methods beyond being effective (see later LIFE section), and Lindsay's (2005) creation of the LIMA model.

The Least Intrusive, Minimally Aversive Model

LIMA was first described in Lindsay's (2005) third volume of his Handbook of Applied Dog Behavior and Training series. Over the last 18 years, LIMA has become one of the most commonly used ways for force-free trainers to describe their training practices. In addition, LIMA has been used to describe codes of ethics, industry standards, position statements, and standards of practice by the joint standards of training organizations, which include the Association for Pet Dog Trainers (APDT, 2017), the Certification Council for Pet Dog Trainers (CCPDT, 2019), the International Association for Animal Behavior Consultants (IAABC, n.d.), and the Karen Pryor Academy (KPA, 2019). LIMA has therefore come to represent a broad approach of training methods that minimize, if not altogether avoid, the use of aversive training tools, which would include shock, choke, and prong collars used in dog training practices (Fernandes et al., 2017; Ziv, 2017; Todd, 2018; Lattal and Fernandez, 2022). While LIMA has proven useful as a simple means for generally describing a force-free training philosophy, there are several concerns with this approach, which include: (1) a lack of clarity in the terminology used, (2) ambiguity in desired training approaches, and (3) a history of justifying aversive training methods.

Lack of clarity in the terminology used

Identifying procedures as being "least intrusive" is a focal point for proper LIMA-based training methods. However, "intrusive" is a term that tells us little about the effect of any event on behavior. To say that something is an intrusion or intrudes on an individual does not describe the impact on how they overtly respond. Likewise, to say that some event is intrusive on behavior still tells us next to nothing on how it changes those responses. At best, "intrusive" is a term that requires additional operationalization. While a handful of behaviorists have used the term "intrusive" procedurally (for instance, see Carter and Wheeler, 2005), it is still problematic for describing any procedural effect.

Ambiguity in desired training approaches

The focus of the LIMA model is on practices to limit. For instance, while it may not be clear what effect "intrusive" has, the LIMA acronym tells us to have less of it. Likewise, LIMA tells us to be minimal in our training method selection approach. What, then, should we do instead? For over half a century, the applied behavioral sciences have argued in favor of focusing on what individuals *should* do, not simply what they *should not* do (Winett and Winkler, 1972; Cooper et al., 2020). At least part of any force-free training philosophy should focus on criteria we ought to use. In other words, to be an effective and behaviorally friendly training model, it needs to inform what practices and behaviors to select for, not against.

History of aversive training methods justification

One of the biggest problems for the LIMA approach is the justification it has enabled for regularly using aversive stimuli or coercive training methods. Some of this is historical, which becomes more evident as we go back to Lindsay's original statements. For instance:

> "According to the least intrusive and minimally aversive (LIMA) model, aversives are ranked in terms of their relative severity and intrusiveness, requiring that the trainer apply a less aversive technique before advancing to a more aversive one." (p. 29).

Thus, Lindsay was making an argument for the use of coercive training techniques, with his handbook providing pictures and descriptions of various aversive training tools. For example, in another description, Lindsay states:

> "The proper use of the prong collar as a shaping and polishing tool requires significant instruction, but with respect to basic control uses novice trainers can rapidly master the prong collar." (p. 31).

What becomes clear in these statements is that LIMA was not intended to be an attempt to minimize the use of aversive stimuli, as many modern force-free trainers have conceptualized. Instead, Lindsay intended LIMA to be a framework to help trainers select their aversive stimuli and tools. As one of the latter statements in the handbook concludes:

> "Aversive procedures are legitimate and valuable tools for controlling undesirable behavior…" (p. 725).

While LIMA has been a useful, simple philosophy to help identify and describe a reward-based, force-free animal training approach, it also has the aforementioned drawbacks. Nonetheless, these criticisms should be viewed as ways to help the animal training field and force-free training philosophy move forward. All fields adjust their principles in order to advance, and progress is typically made by identification of what should be done next. Therefore, the section below details a potential new force-free training philosophy.

The Least Inhibitive, Functionally Effective Model

There are several factors that any description of a force-free animal training model should incorporate. Specifically, these should include using terminology that is both representative of current training methods and the science behind it, recognition of both desired and undesired training practices, and identification of how we define success. This is addressed in three parts: (1) increasing choice by inhibiting less, (2) the importance of function, and (3) defining success as more than being effective. All three points should facilitate connecting training practices and the LIFE model directly to modern animal welfare theory and evidence-based practice.

Increasing choice by inhibiting less

As discussed earlier, the use of the term "intrusive" tells us little about how any training method either affects the targeted animal or its behavior. Historically, behaviorists have relied on two terms to identify some type of reductive impact on behavior: (1) restriction, as specified in the least restrictive alternative (Johnston and Sherman, 1993) or the principle of least restrictiveness (Vollmer et al., 2011), and (2) inhibition, as detailed by the concept of conditioned inhibition (Rescorla, 1969) and inhibitory stimuli/effects (Domjan, 2020). Both terms, while abstractly tell us only that behavior was prevented in some way, can also inform us about a

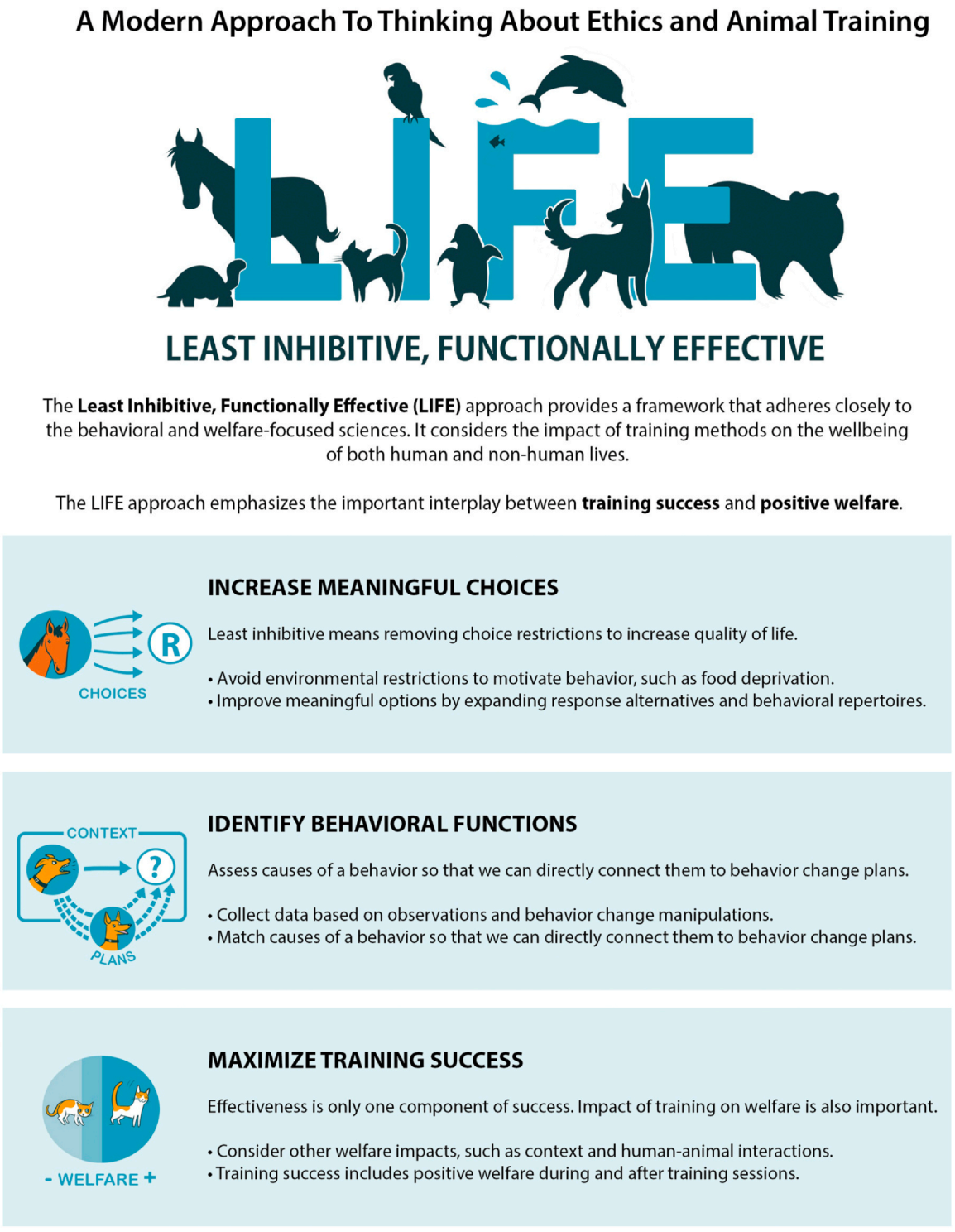

Figure 2. Critical features of the least inhibitive, functionally effective model, including examples of how to adhere to the approach. Illustration courtesy of Lili Chin.

reduction in available and meaningful choices. Our goal, from a welfare perspective, should be to maximize available choices that are beneficial to any animal. Additionally, behaviorists have used a similar concept in "degrees of freedom" (Goldiamond, 1976; de Fernandes and Dittrich, 2018) to identify genuine choices. The concept of degrees of freedom, as presented within Goldiamond's (1974) constructional approach (see also Layng, 2009), can more generally be described as specifying the restriction or inhibition of behavioral repertoires, either through a lack of options (i.e., absence of alternative contingencies) or through force or coercion. We could equally provide a more inhibitive environment by reducing meaningful choices (e.g., environmental restriction through social isolation or food deprivation) or by applying aversive stimuli to force some response(s) (i.e., the use of choke, prong, or shock collars). Note that, in the first example, a trainer could say, "but I only use positive reinforcement!," even though their training practice may be inhibitive through environmental restriction. Choice, context, and function are all equally important parts of the LIFE model.

The importance of function

A cornerstone of many applied behavioral sciences, including animal welfare research and practice, has been a reliance on understanding and addressing the function of some behavior. In the field of applied behavior analysis, this has typically been done through the use of functional behavior assessments (Cooper et al., 2020), which have included functional analyses (Iwata et al., 1982; Mace, 1994; Hanley, 2012). The critical feature here is that understanding of the function of some behavior is connected to our proposed behavior change plans, so that newly trained behaviors can serve the same function as the originally offered responses. In other words, our ability to identify what causes some behavior means we are also more likely to successfully change it through appropriately matched contingencies. For example, if a trainer knows that a dog gets attention for barking when the doorbell rings, they can both stop giving attention for barking in the presence of a ringing doorbell, and just as important, give attention for an alternative response, such as sitting quietly on a mat (for instance, see Yin et al., 2008). Interventions such as rewarding an alternative response are reliant on matching our understanding of function to changing behavior: we know what causes the response, so we can choose to deliver similar contingencies for different actions. It also illustrates why emphasizing the importance of function in our model is imperative, since knowledge of function means we are more likely to change behavior successfully and ethically. For instance, it moves us beyond a "just ignore it" protocol, which, in the absence of rewarding other behaviors, may not help. Extinction alone does not provide functional alternatives and has been associated with problem behaviors, such as extinction bursts and aggression (Looney and Cohen, 1982; Lerman and Iwata, 1995).

Defining success as more than being effective

How we define success needs to be more than simply being effective (Friedman, 2008). If we only define the success of any training procedure by whether it changes behavior or not, then any practice, ethical or not, can be deemed successful. Therefore, effectiveness should only be one component of training success, in addition to connection to the function of behavior (Van Houten et al., 1988). We can think of the latter part of the LIFE model as both independently important terms (i.e., function and effect), as well as essential when combined. In other words,

(1) **function** = identification of cause
(2) **effect** = behavior change (through training)
(3) **functionally effective** = training ethically matching behavior change to its cause.

Therefore, being "functionally effective" means identifying behavioral function and using that knowledge to have an effect. Training success is defined by both being effective with our procedure and basing our procedure on an understanding and implementation of changes to the causal events. In addition, where ethics becomes critical, is how any training procedure considers the effect of training on the animal. "Functionally effective" also means how training affects overall animal welfare, including animal-trainer interactions. This can and should include all welfare considerations, including affective states, natural histories, and the physical health of the animal (Fraser, 2008; Novack et al., 2023). Force-free training, as a philosophy, should connect to our understanding of animal welfare, which, as a result, means having a better understanding of the animals with which we interact.

Conclusions

In the last few decades, we have witnessed a greater concern for the ethics of animal training procedures, which is likely generated by and generates continued welfare-minded animal training research. Our goal in driving future ethical animal training practices should be to provide models that directly connect to both science and practice. The new LIFE framework fosters such a connection between the animal welfare and behavioral sciences, as well as current reward-based training practices. Another important component of the LIFE model is to rely on a simple yet accurate description of the critical features of modern ethical animal training practices. The acronym emphasizes the important points, including (1) increasing meaningful choices, (2) identifying behavioral functions, and (3) maximizing training success. Parsimony in the model is reached by keeping the concepts as simple yet as accurate as possible. Finally, continued research should be used to modify and expand any modern animal training models and applications. Scientific theory and practice are reliant on regular change, and ethical animal training practices should follow a similar path. It is up to us as welfare scientists and practitioners to adjust our training knowledge accordingly.

Ethical considerations

As a narrative review article/discussion, there is no ethics approval to report.

Conflict of Interest

The authors declare no conflict of interest.

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