The Yin and Yang of Positive Reinforcement Training

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The title of this article may seem a bit strange to some of you. How and why would I ever try to make a comparison between a philosophical principal, like yin and yang, and animal training? Well, this all started when one of my mentors sparked a sudden realization that helped me to understand a question that had bothered me for many years. This particular "epiphany" was different than those I had experienced earlier in my career. Most of you have probably experienced these enlightening moments, for instance, when someone explains a difficult operant concept to you in such a way that it becomes instantly clear for the first time. This particular realization became more important to me because it would ultimately change the way I view the purpose of my job and significantly alter my philosophies on training. The purpose of this paper is to spark this same realization in some of you who may have not thought about this particular slant on the process of positive reinforcement training.

Throughout my career, I had often wondered why some animals always responded enthusiastically to training while others did not. All of these animals were trained using positive reinforcement; why then were some of the animals less motivated by it? I believe that my inability to understand this phenomenon early on was due mostly to the fact that I saw positive reinforcement as a panacea. Armed with a bucket of fish, a whistle, and a target, I could do no harm. I was certainly not alone in this feeling of contentment. Modern trainers all over the world proudly proclaim their use of positive reinforcement. This pride is rightfully placed because the benefits of positive reinforcement are becoming widely recognized and these methods are the ethical high ground of our industry.

Although positive reinforcement is the best of all consequences, trainers cannot teach-- and animals cannot learn-- by this means alone. The wise trainer understands the delicate balance of consequences that control learning: the good and the bad, the yin and the yang.

Thousands of years ago, Chinese philosophers tried to find order in a complex universe. They noticed that nature appeared to group itself into mutually dependent but opposite concepts-- such as, night and day, hot and cold, soft and hard-- a duality where one concept could not exist without the other, and where order existed only when the two sides were in balance. From this understanding, they developed the philosophy of Yin and Yang. We in the West tend to look at things as black "or" white, right "or" wrong. There is separation and unrelatedness in the Western perspective, whereas the Chinese view these opposites as evolving and cycling. There is neither right nor wrong. Instead there is balance, transformation, interaction, and dependent opposition. The word "balance" here should not be misunderstood to mean equal in measure, but rather just the right amount of yin to yang to create order and function in the given setting. These same properties and processes exist in the consequences that control behavior and, if understood and applied properly, they enhance the animal training process.

Simply put, animals behave for one of two reasons: to acquire desirable outcomes or to avoid undesirable outcomes. These two basic motivations drive most behaviors. Operant scientists go further. They break these broad categories down and define more specific and distinct consequences: two consequences that decrease the frequency of behavior and two that cause behavior to increase. These four distinct consequences can also be grouped into desirable and undesirable events. Positive punishment, negative punishment and negative reinforcement can be considered undesirable events.
Positive reinforcement stands alone in the "desirable events" column. This is, of course, why we all choose to use this form of motivation to train our animals.

Modern trainers use positive reinforcement training to increase the frequency of desirable behavior, to forward their institution's mission, and to enhance animal care and wellbeing. Shaping, the process of reinforcing successive approximations, allows trainers to achieve these ends. It is in the shaping process where the concept of yin and yang become relevant. The operant principal of differential reinforcement is at the heart of the shaping process and, ultimately, animal learning. Differential reinforcement, as you know, is the act of reinforcing correct responses while not reinforcing incorrect ones. The animal learns "right" from "wrong", or which responses gain reinforcement and which ones that do not. Soon, the shaping process works its magic, and the animal has learned a new behavior: another victory for positive reinforcement. Are we sure?

Positive reinforcement (the Yin) certainly caused the correct responses to increase. But what is the significance of all those incorrect responses? Well, Skinner taught us that by withholding reinforcement, these responses would decrease through the process of extinction (the Yang). This, of course, makes perfect sense because we assume that animals, like us, want to avoid failure and will respond in a way that brings success. So, when we present that next cue, we expect our animal to respond correctly because it wants to gain reinforcement. However, isn't it just as possible that the animal responds correctly, or even at all, just to avoid failing? It would be nice if we could just ask the animal why it responds; unfortunately, this is not possible. Maybe, though, we can gain further insight into this question by asking an animal that can talk, like a child.

The nice thing about children is that they're often brutally honest. I was counting on this fact when I went to Edgewood Elementary school, in a suburb of Chicago. Mrs. Maureen Pacana, a 5th grade teacher at Edgewood, was kind enough to give me access to her students. I asked Mrs. Pacana to send me students that were performing well in class-- kids with average grades or better. These "good" students would best replicate the situation we experience as trainers with animals who we consider to be performing well. I planned to ask each of these students individually why they do their homework and study for tests. Knowing that in this learning environment, like our own training sessions, two motivations were present: to acquire desirable outcomes, such as good grades, success and praise, or to avoid undesirable consequences, like bad grades, failure, and disapproval. One at a time, each child entered the room I was in and promptly answered my two questions. I quickly learned what was really motivating these kids to perform each day.

Of the twenty students I surveyed, eight stated that they did their homework and studied for tests because they wanted to get good grades. Seven children stated that they wanted to avoid getting in trouble and receiving bad grades. The remaining five students were split in their answers to each question. As I suspected, outwardly, each of these children appeared to be the same to their teacher: good students. On the inside though, they were very different, choosing to perform for seemingly opposite reasons: Yin or Yang.

So, why should we care about the reasons why a child or an animal decides to perform a behavior or task? Isn't it good enough that they just respond correctly and that we provide positive reinforcement for their efforts? For some teachers and for some trainers, this is enough. I believe, though, that we have a larger obligation to our animals than just ensuring that they perform the desired behaviors that we ask of them. Training, like teaching, is also about developing and nurturing an animal's attitude.
towards learning. I believe that it is this area of the training process that requires a trainer's greatest attention.

For the student, and likely the animal, that performs to avoid undesirable consequences, their attitude towards learning is often less than favorable. How would I know? I was one of those students. I never enjoyed learning when I was a child and went to school only because I had to. Of course, my early teachers would reinforce me when I performed correctly, but because I had experienced a significant amount of failure as well, my fear of failing was my primary motivation. Ultimately, I learned. Nevertheless, because of the imbalance of failure over success, I did so without a positive attitude towards the learning process.

Although our animals can't tell us in words how they feel about learning, they still communicate their attitude towards the training process in many, but often subtle, ways. There are a few questions that trainers can ask themselves to help understand an animal's attitude towards training.

- Is the animal waiting for me at the start of a session or does it just slowly show up?
- Does it respond to cues enthusiastically or is it sluggish in its response?
- Does it respond to the bridge with vigor and return immediately to station or does it take its sweet time and seem indifferent when receiving reinforcement?
- When your animal makes a mistake is it quickly back to try again or does it seem to "pout" and stall before returning?
- Does it exceed criteria or does it just squeak by?

While certainly not an objective or exhaustive measure of attitude, if the majority of your answers tend towards the latter part of these questions, your animal may have experienced an improper balance of failure and success during training.

It would be naïve or irresponsible to believe that an animal's attitude is just an unchangeable part of their personality. Attitudes develop early in life and are the result of each and every experience. At the moment of birth, and maybe even before, every animal begins to accumulate experiences: a history of both desirable and undesirable events. They begin to understand the relationship between these consequences as one defines the other: the yin and the yang. They begin to realize how their behavior can often affect the outcome of events. They are learning. This natural process changes, though, once training begins. The responsibility to develop and care for the animal's attitude towards this specific learning process now sits squarely on the trainer's shoulders.

We have all heard the trainers' creed: "Always set the animal up to succeed." Make no mistake, this does not mean just succeeding in conditioning the final behavior. This statement means that a trainer must strive for success on EVERY approximation and with EVERY requested behavior. Although failure is part of the shaping process, the trainer must try to keep this failure to a bare minimum. Success should outweigh failure by a significant margin- a balanced yin to yang.

To develop and maintain an animal's positive attitude towards learning, a trainer must first realize that a good attitude is critical to the process. This means that the trainer cares about the overall learning experience of the animal and considers it just as important, if not more so, than the end behavioral product. It is important to remember that no single behavior has ever, or will ever, define the success of any training program. The animal's welfare and the success of the overall program is better served when
a trainer takes the emphasis off the target behavior and focuses more on creating and maintaining a positive learning experience. When a trainer creates an environment where an animal enjoys learning, behavior is acquired with greater ease. An animal's behavioral repertoire can then grow, without side effects, and the training program succeeds.

A caring and thoughtful trainer can do many things to ensure a good learning experience for their animals.

- A thoughtful trainer does not care about speed. They care only about creating success by communicating with the animal to the greatest degree possible. This, of course, always starts with a detailed shaping plan.
- Training is not golf! The trainer with the fewest approximations does not win this game. A good shaping plan has as many approximations as necessary to clearly communicate the trainer's goal. One approximation should lead seamlessly and logically to the next.
- A trainer's primary goal is always to maximize success by minimizing failure. When there is failure, trainers look first to themselves when searching for the problem and the solution.
- A thoughtful trainer is never stingy with reinforcers; they keep their rate and variety of reinforcement high.
- The thoughtful trainer's ego never enters the equation; the trainer takes pride in the animal's accomplishments, not their own.
- The thoughtful trainer knows that even the most experienced trainer has something to learn and can always enhance their skills.
- The thoughtful trainer measures success not by what was learned but by the overall quality of the learning experience.

Training supervisors have a more difficult and crucial responsibility: to ensure the quality of the learning experience for both the animals and their trainers. Supervisors must select and assign behaviors with just the right amount of complexity to allow each of their trainers the opportunity to grow but not at the expense of the animals they train. A developing trainer, like an animal in training, will make mistakes that produce learning. It is up to the supervisor to create and ensure the right balance of success to failure.

The concept of yin and yang outlines the balance and harmony of opposite forces in nature. Our animals experience desirable and undesirable events throughout their lives, and much of this experience is out of our control. But as we begin to train, this changes dramatically. The trainer now holds the power and the responsibility to bring a balance and harmony to the training process. It is said that a good teacher is marked by the ability to create good students not just good lessons. This holds true for animal trainers, too, because the merits of a good trainer are clearly reflected in an animal that enjoys learning. Please, for the animal's sake, be a good trainer!

About the Author

Tim has been at Brookfield Zoo for the last 23 years. He spent 13 years as a keeper at the Seven Seas Panorama training and caring for the Zoo's dolphins, walrus, sea lions and seals. In 1997, Tim was asked to develop the present elephant protected-contact behavior management program in the Pachyderm department. Tim was able to successfully apply positive reinforcement training techniques to enhance the care of the elephants, rhinos and hippopotamus. In 1998, he was offered his present position as the
Zoo's Behavioral Husbandry Manager. Tim's primary responsibility is to manage the animal training and environmental enrichment components of the Zoo's Behavioral Husbandry and Research Program. Tim is very active in international animal training organizations. He was one of the co-founders the Animal Behavior Management Alliance (ABMA) serving as its President and has also served on the board of the International Marine Animal Trainers Association (IMATA).