

INTERPRETING AND INFLUENCING ANIMAL BEHAVIOR: AN ESSENTIAL KEEPER'S TOOL

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Abstract:

Operant conditioning and positive reinforcement training are topics which have been on the forefront of the zoo keeping industry in the past several years. Not only can we use training to facilitate animal management and medical procedures; we can also use it to promote enrichment and train exhibit animals for interpretive keeper talks and education programs. Although many have presented training talks in the past, I plan to review the basics, but also to offer insight into a few concepts perhaps not as familiar to many in the field. The basics include a good understanding of positive reinforcement, negative reinforcement, punishment, repetition, cue, and bridge. Some of the less often used, but equally as important, concepts include window of opportunity, attention span, clear and honest communication, two-way communication, successive approximations, varying reinforcers, and motivation. A clear understanding of these concepts will empower keepers to use training for the betterment of the animals, the keepers, and the public. This paper will present information that will help animal caregivers use operant conditioning and positive reinforcement training to increase management efficiency, decrease animal stress associated with medical procedures, provide enrichment, and improve interpretive keeper talks and education programs.

Key words: positive reinforcement, negative reinforcement, varying reinforcers, punishment, cue, bridging stimulus (event marker), window of opportunity, successive approximations.

Introduction

Whether we realize it or not, as zoo keepers, we are all animal trainers. We are training or influencing behaviors, whether positively or negatively, every time we interact with our animals. Animals respond to the subtlest of cues, from our jingling keys stimulating some animals to approach and wait at an exhibit door, to the veterinarian's white coat stimulating some animals to perform fleeing behaviors. With the realization that we are trainers, we can begin to use this knowledge to train and influence animal behavior.

Training is beneficial in areas of management, enrichment, and public education. In many facilities, shifting animals on and off exhibit is already accomplished through training. Some keepers use positive reinforcement to shift their animals on or off exhibit for preferred food items, while others use negative reinforcement to shift animals on or off exhibit using things such as brooms, nets, or moving walls.

Another area of animal management where training is now being used is in medical procedures. Animals are being trained with positive reinforcement to voluntarily participate in many medical exams including weighing, full body exams, urine collection, hoof trims, and blood draws. Training has eliminated the need for some immobilizations and has, therefore, reduced the amount of animal stress that can be associated with some medical procedures. Additionally, the increased interactions between keepers and animals may help make it easier for keepers to notice subtle behavior changes in their animals,

which can be the first signs of illness.

Aside from the positive impact training has had on management, it has also added to animal enrichment. Enrichment can help animals mentally and physically and it can encourage the use of their senses and unique adaptations. Training animals can further enrichment by motivating them to explore and utilize their environment. When animals are placed in enclosures, their activity levels may be minimal. Often, their routines are static and they know exactly where the food will be presented and how much they will receive. Training with positive reinforcement gives those animals an enriching opportunity to actively use their senses, make decisions, and experience the consequences of those decisions.

In addition, by training natural behaviors and interpreting them to the public, not only can you enrich your animals, but you can help pursue the key components of most zoological institutions' mission statements; those being recreation, education, and conservation. Training accomplishes recreation in that visitors may have a better experience if the animals are moving around and actively using their exhibits. Interpretation of animals' trained natural behaviors to the public allows zoos to educate patrons about the animals and their natural habits and habitats. During interpretation sessions, the audience may be inspired to help conserve wild animals and wild places and the keeper/interpreter can then provide zoo guests with a variety of conservation options.

Discussion

So now that we have discussed why it is beneficial to train our animals, let's discuss how to train them. The key to successfully using operant conditioning and positive reinforcement training is to understand the tools and concepts involved. In my experience, the backbone of any successful training program requires that the keeper use clear and honest communication with the animal. The animal must clearly understand that the criteria for obtaining the reinforcer is the proper performance of the behavior.

Additionally, training involves two-way communication between the trainer and the animal. The keeper must be able to understand and interpret the animal's body language. Body language is a powerful means of communicating for all animals and it can help a trainer know if the animal may be apprehensive or disinterested in performing the behavior. For example, when using positive reinforcement training to help with shifting, it is important for the keeper to be aware of the animal's *entire* environment. An animal will only respond to a positive reinforcer if its desire for that reinforcer outweighs the other reinforcers in its environment. For example, an animal that will not enter its indoor enclosure may be motivated by a fear of others in its social grouping or something else making that enclosure an uncomfortable place. The answer may be to separate individuals, add visual barriers, or change the layout of the enclosure. In this case, the solution may lie in interpreting the animal's body language as it interacts with its entire environment. The key to operant conditioning is that the subject, the animal, is the operator. The animal chooses whether or not to participate and the keeper must, therefore, find a way to motivate the animal to want to participate. Thus, a good understanding of clear and honest communication and of two-way communication may be the most important tool in a successful training program.

Other basic training tools are positive reinforcement, negative reinforcement, punishment, cue, and bridge. For an animal to perform a behavior there must be motivation. At the base level, the motivation is almost always either to gain pleasure or avoid pain. This leads to whether we use positive reinforcement, negative reinforcement, or punishment to train the behavior.

Positive reinforcement is the procedure of adding something to the environment as a consequence of behavior that will increase or maintain the behavior. With positive reinforcement, the animal's behavior maintains or increases in order to gain something desirable. With positive reinforcement, behavior may be interpreted as the animal looking forward to the interactions and trying to find ways to earn the rewards. Although a favorite food item is often used, positive reinforcement can be *anything* the animal likes; for example a scratch on the head, comfort, security, or companionship. An example of using positive reinforcement would be to train an elephant to lift its leg by training it to target a pole. Held just above the leg, the elephant would get reinforced with an apple for lifting its leg to touch the pole. The higher the pole is raised, the higher the elephant may lift its leg.

Negative reinforcement is the procedure of removing something from the environment as a consequence of behavior that will increase or maintain the behavior. With negative reinforcement, the animal's behavior maintains or increases in order to remove something aversive, something the animal does not like or will behave to avoid. One liability of negative reinforcement is that the animal will often only behave at the level necessary to avoid the negative reinforcer. An example of using negative reinforcement would be to train an elephant to lift its leg by putting an elephant hook under the leg and lifting it up. The higher the hook is lifted, the higher the elephant will lift its leg. In this case however, the elephant may only lift its leg as much as is necessary to avoid the pressure of the elephant hook on its leg.

Finally, with punishment, behavior decreases either because something aversive was added to the environment or something desirable was removed. One major problem with punishment is that it focuses on decreasing or stopping a behavior and does not tell the animal what to do instead. At times, punishers may be applied long after the behavior has been performed and therefore are not as effective at modifying behavior. For example, you come home and find your dog has chewed up your favorite book, so you yell at it. The dog cannot stop chewing the book to avoid the punisher. Since animals live in the here and now, it may be difficult for the dog to connect the yelling now with the past book chewing. More likely, from the dog's perspective, the dog may associate the yelling with the behavior the dog was doing just before you yelled at it. There are also scientifically proven detrimental side effects associated with using aversives in training. Those include escape/avoidance, fear, increased aggression, and overgeneralized fear.

Some concepts to keep in mind while using these procedures are as follows. Once a behavior is performed, the consequence of the action will determine if it will be repeated. An action that is not reinforced, or ignored, may decrease. Any behavior that is repeated has been reinforced in some way, whether positively or negatively. That reinforcer can be *anything* the animal will behave to gain or avoid and, therefore, may not always be obvious to the keeper. This concept is important because it may be that the keeper is inadvertently reinforcing an unwanted or "problem" behavior.

Once we decide on a behavior to train, it is helpful to decide on a cue and a bridging stimulus (bridge or event marker). A cue is a sound or an action that tells the animal the behavior we want it to perform. For example, when a keeper says "foot", an elephant presents its foot. The word "foot" becomes the cue for the elephant to present its foot. There should be only one behavior per cue, but there can be multiple cues for that one behavior.

A bridging stimulus is a sound or an action that signals the animal it has just performed a behavior correctly. It gets its name because it bridges the gap in time between the

performance of the behavior and the delivery of the positive reinforcer. The bridging stimulus is a signal that a reward is coming. Examples of commonly used bridging stimuli include a clicker, a whistle, or the word “good”. Simply moving one’s hand to give an animal a treat may also be seen as a bridging stimulus by the animal.

The bridging stimulus is established by associating it with a positive reinforcer. At first, the reinforcer should come *directly* after the bridge. Once the subject learns to associate the bridge with the reinforcer, the time between the bridge and the reinforcer can be lengthened to several seconds. Once an animal understands the chosen bridge, the same bridge can be used to train any behavior. Bridges are essential in training behaviors where timing is critical and the keeper cannot *immediately* deliver a reinforcer for a behavior.

Other important training tools and concepts include successive approximations, repetition, window of opportunity, varying reinforcers, attention span, motivation, and responsibility. To train a behavior, we first take the entire behavior and break it down into smaller steps, or successive approximations. Then, we begin training each step one at a time. Repetition builds confidence and creates a reinforcement history, which strengthens the behavior. It is important, therefore, to do several repetitions at each step before moving onto the next successive step. Once the animal performs one step without hesitation, it is time to move on to the next step. This is important because, if too much time is spent on one step when the animal is ready to move on, the animal may get stuck at that particular step, possibly thinking that step is the entire behavior. In this case, moving onto the next step may be more challenging in that it may be like learning a completely new behavior.

It is important, again, to remember the importance of clear two-way communication. Pay attention to the animal’s body language. Progress at the animal’s pace. And, remember that each animal is an individual. One individual may be ready to move on after 2 or 3 repetitions, whereas another individual of the same species may need several repetitions to understand the concept. If the animal you are training begins to move ahead of you and anticipate the next step, you are probably moving too slowly and your steps may be too small. Additionally, if you make too big a jump, be comfortable to relax your criteria and move back a step or two if the animal’s performance is inconsistent at a certain step. Behaviors broken down and trained in steps are often stronger than those behaviors captured in their entirety. This reinforcement history allows the trainer to back up a step or two if the behavior begins to break down, rather than waiting to catch the entire behavior again.

The next important tool is the window of opportunity. The window of opportunity is the time frame in which the animal has the opportunity to perform the behavior in response to the cue. Again, in operant conditioning training, the operator, or animal, is in control. Therefore, we want to avoid making an animal do anything it does not want to do. If the animal does not perform the behavior as quickly as you want, close its window of opportunity. Stop offering the cue and the positive reinforcer, probably its favorite food item, and let the animal experience the consequence of its actions; in this case, losing the opportunity to earn the reward. A few moments later, perhaps 3-5 seconds depending on the individual animal, try offering the cue again. When the animal performs the behavior, give it a highly valued reinforcer so that it clearly knows that it has just performed the correct behavior.

This leads to the next important tool, varying reinforcers. This goes back to the initial question of what is the animal’s motivation to perform the behavior. If the animal can predict exactly what reinforcer and how much of that reinforcer it will receive for

performing the behavior, its motivation to perform the behavior may be low. It may be that the reinforcer is not worth performing the behavior quickly for. Varying the type and quantity of reinforcers may help keep the animal motivated to continue performing the behavior at a high level. An example of how varying reinforcers works is flying a hawk to your glove for different food treats. If every time the hawk lands on your glove it receives 5 grams of mouse, the behavior of flying to your glove may decrease. However, if sometimes the hawk receives 5 grams of mouse and other times it receives a half of a mouse or a whole mouse or a different food item, it may be more likely to continue flying to your glove quickly to discover what reinforcer may be there.

It is important to vary both the type and quantity of the reinforcer. If food is used for the reinforcer, remember that an individual's favorite food may change or there may be several favorites. The quantity of reinforcer can vary between very little and a large amount. As stated previously, a behavior that is not reinforced at all will eventually decrease. Likewise, if the animal receives too large a reinforcer too many times in a row, it may become satiated and the behavior may decrease.

For this reason, it is advantageous to use smaller food reinforcers as opposed to larger ones during training sessions. Smaller reinforcers take less time for the animal to eat, thus cutting down on the time the keeper must wait between repetitions. Smaller reinforcers thus allow for more repetitions per training session. Additionally, as stated above, smaller reinforcers can keep the animal motivated longer. With large reinforcers, the animal can become satiated quicker and, thus, lose its motivation to work. Food may not be as reinforcing if you are full or if the item is not palatable enough. The reinforcer should be large enough to motivate the animal to perform the desired behavior but small enough to keep its attention for several repetitions.

The length of time that an animal is motivated to behave for the particular reinforcer is referred to as the animal's attention span. Each individual animal in each individual situation has a different attention span. It is important to recognize this and try not to exceed the animal's attention span. Again, this brings up the importance of clear two-way communication, in that the keeper must be able to interpret, through the animal's body language, when the animal's attention span is diminishing. For example, an individual's attention span may be anywhere from less than 5 minutes to 25 minutes or more, depending on the situation and on the reinforcer being used. For example, our hawk may have a longer attention span for mice than for chick. If the animal's attention span is exceeded by the trainer, the behavior may begin to break down. As a result, the following training session may have to begin by relaxing your criteria to a previous step where the animal performed the behavior correctly before moving on to the next step.

In my experience, the keeper should attempt to do two training sessions per day, one in the morning and one in the afternoon. This allows for more repetitions per day without exhausting the animal's attention span. It has also been my experience that training sessions are often short, perhaps approximately 15 minutes each, depending on the individual's attention span. One trainer is best for training a new behavior so that communication is clear and consistent between the animal and the trainer. If there will be many keepers training an animal the same behavior, the goals, procedures, and how to clearly communicate with the animal should be taught and practiced consistently by all keepers. A good strategy is to have one individual train a new behavior and then generalize the behavior to other trainers after the behavior is consistent. Additionally, good record keeping is extremely important. Records of training sessions should be clear and detailed so anyone reading them knows exactly what has been accomplished, how it was accomplished, and how to proceed in the next session.

Finally, be honest and clear when communicating with and training your animals and utilize two-way communication to interpret and respond to your animals' behavior. Avoid anthropomorphism and avoid letting your personal feelings affect your interpretation. Realize that animals pick up on subtle cues. And, lastly, take responsibility for your actions. If an animal does not perform a behavior correctly or exhibits "problem" behavior, review the entire situation and ask yourself how *you* may have influenced the behavior. And, ask yourself empowering questions. What is the animal's motivation to perform or not perform the behavior? How does the behavior relate to that species in the wild? Just like their wild counterparts, animals born in captivity are born with certain innate behaviors. Their motivation may be related to territorial behavior, defense behavior, season (breeding, migrating, hibernating), weather (heat, cold), social behavior, or illness. Additionally, any change in an animal's environment, whether inside or outside the enclosure, no matter how subtle, could potentially affect that animal's behavior. Keeping all of these things in mind, and with a clear understanding of all of the training tools and concepts discussed in this paper, operant conditioning and positive reinforcement training can have amazing results.

Conclusion

With a clear understanding of the tools and concepts of operant conditioning and positive reinforcement training, zoo keepers can incorporate training into many aspects of zoo keeping and see tremendous results. As zoo keepers, we are all animal trainers. We can use these training tools and concepts to increase animal management efficiency, decrease animal stress associated with medical procedures, provide enrichment, and achieve the components of many institution's mission statements; those being recreation, education, and conservation.

Operant conditioning training can be used to facilitate medical procedures such as full body exams and blood draws, thus sometimes removing the need for immobilization. Training can assist with animal management procedures from simple husbandry to shifting. It can enhance animal enrichment by giving animals the opportunity explore and use their environment as they would in the wild. Training animals to perform natural behaviors such as climbing trees or digging holes to find rewards, as they would in the wild, can be excellent enrichment. Not only can it be enrichment, but, when supplemented with public keeper interpretations, it can become a tool for public recreation, education, and conservation. Trained animals exhibiting natural behaviors with an interpreter there to explain the behaviors to the public can be helpful to promoting conservation. Training can help gain the public's attention and offer you the forum to educate people on wildlife and wild lands and how they can help save all these special animals and special places for future generations.

SUMMARY OF TOOLS AND CONCEPTS

Tools:

- Clear and honest communication
- Two-way communication
- Positive reinforcement
- Negative reinforcement
- Punishment
- Cue
- Bridge
- Successive approximations
- Repetition
- Window of opportunity

Varying reinforcers
Attention span

Concepts:

The consequence of the action will determine if the action will be repeated.

An action that is not reinforced will decrease.

Any behavior that is repeated has been reinforced in some way.

Repetition builds confidence and creates a reinforcement history.

Once one step is performed without hesitation, it is time to move on to the next step.

A behavior trained in successive approximations may be more resilient than one captured in its entirety.

Take responsibility for your actions.

Ask empowering questions.

What is the animal's motivation to perform the behavior?

How does that motivation relate to that species in the wild?

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