

What's The Motivation?

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Abstract

In this presentation, the construct of motivation will be explored. A motivated animal is operationalized as one who engages in the training dialogue with quick response to discriminative stimuli. Historically, force and coercion were the tools used to motivate animals in zoological settings and even some birds performing in shows. Fortunately, those methods are being replaced with more positive approaches. But, even with the current ground swell of positive reinforcement training in the zoological field, there is much mythology and poor training practices surrounding the need to motivate animals. These include putting the blame on the animal, misrepresenting scientific principals, as well as lowering animals' weights to unacceptable levels. Fortunately, there is an emerging technology based on antecedent arrangement and positive reinforcement that allows trainers to successfully work with highly empowered animals. Key components of this technology include sensitive reading of body language, high rates of reinforcement, and clear communication of criteria. With these components, welfare is increased as animals learn to use their behavior more effectively to gain positive reinforcement.

Introduction

At the heart of all animal training is motivation. Motivation is created by a history of consequences, outcomes and effects that give animals reason to behave. Creating motivation in a training environment is a skill needed by all trainers and practiced at varying levels in the zoological world. Some keepers have a myriad of tools in their training toolbox to influence motivation. Other trainers have yet to learn the vast array of motivating operations available to them and often focus only on food reinforcers in their positive reinforcement-training program. But, even that is a big step forward from the historic training programs where a keeper's primary tools for motivating animals were force and coercion.

A motivating operation is something that changes the effectiveness of a consequence. When the motivating operation increases the effectiveness it is called an establishing operation and when it decreases the effectiveness it is called an abolishing operation (Chance , 2014). Nowadays, it is most common to refer to both operations with the general term, motivation operations (Langthorne, and McGill, 2009) Warming a peanut may increase the effectiveness of the reinforcer for some parrots, and feeding a frozen peanut may decrease the effectiveness of the reinforcer for some parrots. Withholding food can increase motivation and feeding an abundance of food can decrease motivation. Trainers in zoological settings have recently begun to understand and quantify an extensive list of motivating operations that influence training sessions with their animals.

Of the countless motivating operations that affect the behavioral choices of the animals we train, the following are among the most significant:

Relationship

A trusting relationship between animal and trainer is an important influence on motivation. Trust is a level of certainty that interactions will result in good outcomes so interaction increases (Martin and Friedman, 2012). Trainers see varying levels of trusting behavior in animals ranging from calm body language to solicitation of tactile interactions at the approach of a trusted person. Animals that lack trust in a particular individual may show behavior ranging from uncomfortable body language like leaning away, to escape/avoidance behavior such as leaving the area. The higher the level of trust an animal has in a human the more likely the animal is to participate in interactions with that person even in the presence of novel or ambiguous signals.

Trust levels are on a continuum specific to each animal and the conditions in which it behaves. Though we often focus on trust between animal and humans, trust is also built with various objects and situations, which is equally important to animals. Animals build trust in exhibit features, housing furniture, other animals, and even enrichment items in much a similar way that they build trust in humans. When a macaw lands on a one-inch thick branch in a tree and the branch supports its weight, the behavior is reinforced and the bird builds trust in similar sized branches it might land on in the future.

Past experiences become antecedents for future behavior. Keepers and trainers often wonder if they should be in the room with an animal they work with when there is a stressful situation such as a veterinarian immobilizing the animal. My response is almost always; "It depends. How is your trust account with that animal?" If a person has a high trust account with an animal, he or she may provide some level of comfort to the animal once it is darted, caught in a net, or otherwise put in a stressful situation. We often see animals with high trust accounts go directly to a keeper after a stressful experience and even participate in training sessions directly after being anesthetized. However, a stressful experience can completely bankrupt a keeper's tentative trust account simply by the trainer being in the room.

One of the best ways to build trust is through a high rate of positive reinforcement. With each positive reinforcement experience we make deposits in the trust account between the trainer and animal. When a person uses aversive stimuli - negative reinforcement or punishment - to influence behavior there is often a withdrawal from the trust account. The goal should be to build the highest trust account possible through a high rate of reinforcement, to improve training relationships and performance. A high trust account can withstand the occasional withdrawals that might occur in emergency situations, routine medical procedures or unexpected conditions.

Ability

Animals build skill and behavioral fluency through practice. Some behaviors require more effort than others and are therefore more difficult for the animal to learn and

perform. As a bird develops its skills and coordination associated with a behavior, the motivation to perform the behavior increases. For instance, a parrot learning to climb a rope may be poorly motivated to perform the behavior in the beginning stages of training. However as the bird acquires skill and coordination associated with rope-climbing its motivation to perform the behavior will usually increase. A hawk may be poorly motivated to fly from point A to point B if a breeze is blowing from its back toward the landing spot at point B. However, through practice, a bird can learn to start the flight in a crosswind angle to gain control, and then pass the perch and circle back to land in an up-wind approach. Having learned this flight strategy its ability to perform the behavior increases along with its motivation to make the flight in the future.

Many trainers have experienced the frustration associated with trying to teach a parrot with previously clipped wings the skill of flying from one place to another. If the bird's wings were clipped during its first year of life, its flight attempts will have been punished by repeated crashes to the floor or running into walls or other objects, thus reducing its motivation to attempt to fly later in life. It is certainly possible for a parrot to learn to fly later in life after its wing feathers have grown in. However, it will require much more time and effort for the bird to acquire the skills than it would have if it learned to fly in its first few months of life. Additionally, teaching an older bird to fly requires a very capable trainer to lead the bird through many repetitions of small approximations to acquire the ability and confidence in the action of flying.

Learning History

Past consequences become antecedent influences on motivation for future behavior. If the consequence of landing on a gloved hand involves the same small piece of meat every flight, the motivation for a hawk to make the flight in the future may decrease. However, if a trainer offers a variety of food items in varying sizes and quantities the motivation for the bird to fly to the glove in the future should increase. A baiting strategy can also reduce motivation. When a trainer shows the food before a bird flies to the glove or enters a crate, the bird can decide if that type and quantity of food is worth the effort. As with all prompts, it is best to fade out the baiting strategy quickly in the training plan to help the animal understand criteria and consequences associated with the behavior. When baiting is necessary, the trainer should also offer food hidden in the glove or added to the crate as an additional consequence reinforcer. The uncertainty of the type and quantity of food it will receive often increases a bird's motivation to fly to the glove or enter a crate.

Food reinforcers are just one of many consequences that increase behavior. What happens directly after receiving a food reinforcer for flying to a trainer may also influence the motivation of the bird to fly to the person in the future. When a parrot flies to a trainer's hand and receives a nut, then gets put in a cage only to lose the opportunity to fly more or work for additional nuts, the motivation for flying to the hand in the future may decrease. Some trainers hold the jesses of a hawk that has just landed on their glove and restrict the bird's flight off the glove. No matter how

reinforcing the food was to the behavior of landing on the glove, the loss of control and opportunity to leave the glove may punish future performance of the behavior of flying to the glove. Several years ago we discontinued holding the jesses of raptors in our shows and have observed a significant increase in their motivation to fly to our gloves. If we want the bird to stay on our glove longer, we simply shape that behavior using a variable duration schedule of reinforcement. Control has been shown to be a primary reinforcer for behavior (Watson, 1967, 1971 cited in Friedman, 2014). When trainers give animals the power to leave, the animals are more likely to stay.

Environmental influences

Training sessions occur in a variety of locations, from the relative quiet of indoor holding facilities to the noisy unpredictability of on-stage venues. No matter where the training occurs there will be opportunities for a wide variety of stimuli in the environment to interrupt training sessions and impact an animal's motivation to participate.

For social animals like macaws, a contact call can disrupt a session as a bird stops what it's doing to establish communication with conspecifics. An alarm call can send a parrot bolting from the session just as it would if it were in the wild where a predator might have just come into view. In some cases it is helpful to conduct training sessions in view of other animals in the group. For other animals, it might be distracting for one bird to see another during a training session. Every bird is an individual and the training environment should be adjusted according to the animal's behavior to maximize motivation.

Some trainers prefer to train in a quiet and controlled environment with few distractions. This enables the animal and trainer to increase focus on the session at hand and often creates better motivation for the animal to participate in training. However, it is possible to protect animals from distractions to the point that it actually hurts their motivation and performance in the future. What might be small distractions for most animals can be huge distractions for animals trained in tranquil settings. Quiet settings are helpful in establishing new behavior, but once an animal has learned to perform a behavior without hesitation in response to a cue, the next step should be to generalize that behavior to novel environments.

Where many trainers fear the worst and will ask all human activity to stop while they are training in an amphitheater, I generally encourage activity in the training environment when an animal's behavior shows distractions will not have a major impact on motivation. If I see the animal is too distracted to focus on the training session I might try to reduce distractions to increase motivation. Training in a distraction-filled environment prepares birds to deal with unforeseen events in the future.

One year we arrived at our show site at the State Fair of Texas to find a construction project adjacent to our show. The project included a huge crane that would often

project over our amphitheater. The management of the fair asked if they should stop the construction during our show. Our experience with similar situations in the past caused us to believe stopping the work wouldn't happen even if we asked, so I told the President of the fair that we would deal with it. We trained birds in the amphitheater with construction crane and heavy equipment everyday for the two weeks leading up to the show. We opened the show with birds that had well-generalized behavior to hugely distracting situations and experiences. We did the entire 24-day run of the show with construction equipment 200 feet from the stage and that amazing crane traveling over our amphitheater occasionally during the show. Though some of the birds were nervous enough to stop their behavior as the crane moved overhead, none of the birds flew away and we never altered any shows. Had we protected the birds by stopping the construction during training sessions, our birds would have missed the important experience of generalizing their behavior to this novel environment. Plus, if a worker did happen to move the crane during our show I am sure most of the birds would have flown off if they did not have the experience of seeing it move early in training. When chaos is the norm, animals adjust and become calm and resilient. When calm and controlled is the norm, any small distraction can cause chaos.

Clear, honest, two-way communication

Through careful observation of an animal's body language a trainer can empower the animal with a level of control in its environment where its "voice" (through its body language) is as meaningful as the trainer's voice. A trainer gives a cue for the animal to perform a specific behavior, then the animal's body language feeds back information to let the trainer know if it is motivated to participate or not. If the body language shows the animal is not motivated, the trainer can change the antecedents to encourage the animal or stop the training session and try again later. When cues and criteria for behavior are clear, animals learn quicker, rates of reinforcement go up and motivation increases.

Motivation is often diminished when trainers do the "old bait and switch," i.e., show one type or quantity of food and then provide a different type or quantity of food when the animal performs the behavior. Tricking an animal into a behavior by baiting them through a door way and closing the door behind them, or distracting a bird with one hand so you can grab the jesses with the other are two examples of dishonest communication that lead to withdrawals from the trust account. A trainer is honest with an animal when he or she acts in ways the animal expects, given the animal's learning history with the situation.

Our primary tools for communicating with animals in a training environment are cues (discriminative stimuli, S^D) and bridging stimuli (event markers). The cue is a signal to the animal that if it performs a behavior at a specific level of criteria it will earn reinforcement. The cue is different from a command in that an animal can choose to respond to the cue with the expectation of reinforcement for correct performance; or, the animal can simply ignore the cue with no fear of aversive consequences (Friedman, 2010). The command is often associated with negative

reinforcement and punishment if the animal fails to perform the desired behavior. For instance, a command for a dog to sit may be associated with pressure on the collar or pushing of the dog's rear end to force the behavior. The dog is required to perform the behavior to avoid the aversive consequence. Though animals can be motivated to respond to cues or commands, cues are the tool of choice for contemporary animal trainers committed to the most positive and least intrusive training practices.

Event Markers/Bridging Stimuli

Behavior analysts use the term "event marker" to refer to a stimulus that marks a specific level of performance of a behavior. Animal trainers more often use the term "bridging Stimulus," or "bridge" for short. Both terms describe the same operation: a conditioned reinforcer that signals to an animal that it has just performed a specific behavior to criterion and should expect back-up reinforcement. This conditioned reinforcer gains its behavior increasing strength from its pairing history with a back-up reinforcer such as food, tactile contact, toys, or any other stimulus the animal will work to gain. The reinforcer has meaning "conditional" on being paired with a back-up reinforcer, either primary or secondary.

For some reason trainers around the world often thin the pairing of the bridge with the back-up reinforcer by sounding the bridging stimulus after each correct performance of a behavior but only providing a back-up reinforcer for some of the behaviors. For instance, the animal may perform three behaviors at the desired criteria and receive a bridging stimulus for each behavior but receive food only after the third behavior. This is a strategy explored in laboratory settings and sometimes used in marine mammal training programs where systematic thinning of the backup reinforcer over time allows the bridging stimulus to maintain its reinforcing properties. However, without a systematic thinning procedure, the bridging stimuli quickly lose their reinforcing strength. This has become one of the most common weaknesses in the implementation of positive reinforcement training programs in the zoological field, as keepers and trainers haphazardly thin the pairing between the bridging stimulus and the reinforcer.

Animals trained with this type of inconsistent pairing of bridge and back-up reinforcer often lose motivation to participate in the training session, exhibit a high level of incorrect responses to cues, and even show frustration-induced aggression. When this happens trainers often blame the animal for the poor performance, labeling the animal as distracted, aloof, messing with their minds, obstinate and more. By placing the blame on the animal, trainers relieve themselves of responsibility, but miss valuable information about how to increase motivation through clear communication and high rates of reinforcement.

Some trainers believe since the bridge is a reinforcer for behavior they don't have to provide a back-up reinforcer. They incorrectly call this a "variable schedule of reinforcement." However, if the bridge is truly a secondary reinforcer (as evidenced by its ability to increase or maintain behavior), the trainer is using a continuous

schedule of reinforcement. The inconsistent pairing of the bridge and backup reinforcer can result in respondent extinction trial (i.e., delivery of the conditional stimulus without the subsequent unconditional stimulus). Just as Pavlov paired the bell ring with meat powder to elicit salivation in the dog at the sound of the bell, trainers pair the sound of a clicker or whistle to create similar reflexive behavior in animals they train. When Pavlov stopped giving meat powder after the ringing of the bell, the dogs eventually stopped salivating at the sound of the the bell. Similarly, when trainers unpair the bridge and the back-up reinforcer, animals eventually stop listening to the clicker, whistle or other audible marker, and begin to focus on the most salient information associated with impending reinforcement, which is the action of the trainer's hand moving to the reinforcer. This visual bridging stimulus often replaces the audible marker and keeps the animal in the training environment a bit longer, usually only until the low rate of backup reinforcement reduces motivation and the animal either leaves the session, shows aggression, or the behavioral response deteriorates to the point the trainer ends the session.

Food Reinforcers

Most contemporary animal training involves the use of food items to reinforce behavior. By adjusting the amount and type of food, and method of feeding, a trainer can increase or decrease the level of motivation for the animal to participate in training. As with any reinforcer, some level of reduced access to the item is usually required to maintain its strong reinforcing properties. Between overfeeding and underfeeding is a range of the healthful provision of diet a keeper can use in various ways to create, or augment, motivation to engage in the training dialogue. Feeding the diet at different times of day may increase its reinforcing properties, e.g., delaying the training time by two hours might increase an animal's motivation to participate in the session. Changing the temperature, consistency, or smell of food items are just a few more of the countless motivating operations available to trainers to increase motivation of animals in training programs.

It is important to know the weight of the animal before starting a training program that includes reducing the animal's diet. Maintaining an animal at its free-feed, or ad lib, weight should be a goal for training programs, however reducing an animal's weight by no more than 10% is generally an acceptable practice in most training programs if it does not compromise the health or welfare of the animal.. This is especially true when the plan is to bring the animal's weight back up as close to ad lib weight as possible.

Weighing the food they feed their animals helps trainers calculate the healthful diet for the animals and provides a range of normal weight-to-food ratio to aid them in determining an animal's health status. Loosing weight while eating a consistent amount of food may be the first sign of illness for an animal. Monitoring the weight of an animal and quantifying the food it eats is one valuable tool to monitor the overall health of the animal.

Training programs that incorporate the use of weight management are incomplete without gauging the behavior of the animal being managed, as well. As training progresses and animal behavior reaches higher levels of stimulus control the animal's diet should increase over time until the animal reaches ad lib weight. Occasionally an animal's weight will increase to above ad lib and the animal will still show high motivation for training. In this case a trainer should be careful to avoid letting the animal's weight rise to unhealthy levels. Trainers should also be careful to not let an animal's weight decrease to unhealthy levels. Following the points described in this paper will help many trainers work animals at higher weights.

Secondary Reinforcers

Secondary reinforcers (AKA, conditioned or conditional reinforcers) can play an important role in motivating some animals to perform behavior. Generally speaking, secondary reinforcers are things other than food that trainers use to reinforce behavior of animals, which depend on a pairing history with other well-established reinforcers. Secondary reinforcers include things like toys, play and companionship. Skilled trainers use a wide variety of secondary reinforcers to increase variety and motivation during training sessions.

As with primary reinforcers, secondary reinforcers generally maintain their value through some degree of reduced access, that is, a motivating operation. If a bird has a toy in its cage all day long, that particular toy may lose its value as a reinforcer. However, a toy that the animal has not seen for a day or two will likely have greater strength as a reinforcer. Additionally, a toy that a bird has never seen may frighten the bird and actually punish active behavior. A lure for a hawk, and target stick for a parrot, both have secondary reinforcing properties because of their pairing with food or other back-up reinforcers. Clickers and whistles used as bridging stimuli also have value because of their pairing with back-up reinforcers. But, it is important to note that, like confederate money, these items can lose their strength as reinforcers if they are not paired with food or other well-established reinforcers.

Secondary reinforcers are practical training tools in some environments, such as an animal's normal housing environment, a confined and static training area, and a lab setting. When the environment is consistent and distractions are limited, animals tend to have a higher motivation for secondary reinforcers. Our birds are strong and reliable performers in their enclosures and even in settings where they have flown free for periods of time. However, once they move out of their familiar environment, their motivation to return to us decreases dramatically. When animals are trained in novel environments, especially when a bird is flown free, there are a myriad of competing reinforcers tugging at the behavior of the bird that quite often out-compete with secondary reinforcers and in some cases even high value primary reinforcers.

When we first fly our young birds free outside many of them are on free-feed and they return to us for social reinforcers. Just being with us is reinforcing for the behavior of flying to us. However, after a few days of flying outside other elements

in the environment catch the birds' attention and investigating these novel stimuli becomes more reinforcing than the social reinforcers that originally maintained the behavior of flying to us. This is when birds sit in trees exploring branches, good views, and other interesting environmental stimuli. This is also when a raptor or vulture flying nearby might easily frighten birds, and when an alarm call from a conspecific at the holding area can send the bird into a long distance flight that can be dangerous to its welfare. At this time, we begin to focus more on food as a reinforcer and shift over to a weight management program, to protect the bird from harm and to increase its performance in these more challenging conditions.,

Flying birds free requires expert skills and is a very serious matter that should never be taken lightly. It is our ethical responsibility to provide for the welfare of our animals and do all we can to protect them from harm. Every time we fly a bird free we take risks. We can mitigate those risks by creating levels of motivation that increase the likelihood the bird will return safely. Creating motivation should never mean starving a bird but rather skillfully using motivating operations to increase motivation while keeping the bird's weight at healthy levels.

For birds that perform in two or three shows every day, secondary reinforcers will very likely lose their value and birds may reduce their performance in shows or may even fly away. The best approach to motivating birds' behavior is to use a combination of primary and secondary reinforcers. Just as returning to family, a favorite TV show, and a delicious meal, can add value to coming home for some people, secondary reinforcers such as puzzle feeders, toys, social interactions, etc., can add value to the behavior of returning to a holding area at a bird show. To use only secondary reinforcers with free-flight birds is potentially dangerous as it puts birds at risk of fly offs.

Conclusion

Through thoughtful antecedent and consequence arrangement, skilled trainers create motivation for animals to participate in training sessions. These motivating operations are as important to animal learning as husbandry and veterinary care are to animal health. Clear, honest communication and a high rate of positive reinforcement lead to trusting relationships where animals are motivated to use their behavior to earn reinforcers from trainers. With best practices that comprise contemporary training technology, animals' skills and abilities to manage their own outcomes will increase, which necessarily increases the welfare of animals in human care.

Motivation and welfare form the foundation for contemporary animal training programs. Some trainers inadvertently weaken one pillar in their attempt to strengthen the other in pursuit of their behavioral goals. Motivation and welfare should work in balance where an adjustment to one should not cause a decrease in the other. Reducing a bird's weight can increase motivation but taken too far, this will compromise welfare. Attempting to increase welfare by feeding birds a diet that

keeps them at or above ad lib weight can reduce their motivation to work for food and increase their likelihood of flying off, thus compromising their welfare.

Our goal, as professional animal trainers, is to find the balance, i.e., to create motivation in ways that protect and enhance an animal's welfare. Through careful use of both secondary and primary reinforcers, and skillful application of motivating operations, we can motivate animals to perform in our shows while creating a more enriching and safe environment for our animals.

Chance, P. Learning and Behavior, 2014

Friedman, S.G. (2014). Living and Learning with Animals [Class handout].
www.behaviorworks.org.

Friedman, S.G. (2010), Contemporary Animal Training Workshop,

Langthorne, P and McGill, P. A Tutorial on the Concept of the Motivating Operation and its Importance to Application. Journal of Applied Behavior Analysis., 2009

Martin, S., and Friedman, S.G.. "The Power of Trust". Animal Behavior Management Alliance, paper presentation, 2012