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Chapter 18

From Parrots to Pigs to Pythons: Universal Principles and Procedures of Learning

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Ms. Jones calls your clinic asking for help with her 7- year-old daughter's rabbit, Peaches. Peaches kicks and scratches when the daughter goes to put Peaches back into the cage after being let out to play. Ms. Jones is not sure what to do. The local pet store told her Peaches was too dominant and she should find another rabbit. Ms. Jones is distraught because her daughter is very attached to Peaches despite Peaches aggressive behavior. (See Case Study 1 at the end of the chapter for resolution of Peaches' problem.)

Introduction

Behavior is at the top of the list of problems that people have with their pets. As the number of exotic pets grows, so does the need for veterinarians who can help clients prevent and solve behavior problems effectively and humanely. As medical practitioners, veterinarians are trained to solve behavior problems that are symptoms of underlying physiological dysfunction associated with aging, injury or disease. The medical model is used to categorically diagnosis, treat and cure these problems. However, a substantial number of behavior problems are independent of physical health. These problems are due to the process of learning and the behavioral model is needed to help clients understand, predict and solve them.

From a behavioral perspective, learning is defined as a change in behavior due to experience, i.e., certain types of interactions between an individual and the environment. Given the age-old debate regarding nature vs. nurture, it is easy to overlook the fact that it is the nature of all animals to change what they do based on the experience of doing it. Chance explains, "Learning does not give the species the tendency to behave a certain way in a particular situation; rather it gives the individual the tendency to modify its behavior to suit a situation. It is an evolved modifiability."[1]

Unfortunately, much of what clients know about learning and behavior is based on conventional wisdom that persists mainly because it is repeated so often (e.g., dropping a parrot reduces biting because the parrot concedes the dominant alpha role to its human owner). However, conventional wisdom lacks the reliability that results from systematic observation and experimentation. Without scientifically validated information, caregivers inadvertently create persistent behavior problems that lead to needless suffering for themselves and their pet.

Learning has been studied with the scientific method for well over 100 years, and the general principles that describe how specific types of interaction with the environment affect behavior are well documented. Over the last 50 years, these principles have been honed into a technology to solve practical behavior problems in real world settings. This is the foundation of contemporary applied behavior analysis (ABA), the technology of behavior change.

The goal of this chapter is to disseminate to veterinarians the basic principles and select procedures of ABA. However, this is an introductory chapter and many fascinating and essential topics have been treated cursorily or not at all. It is our hope that this relatively brief discussion serves to inspire veterinarians to seek more in-depth information and deepen their expertise with the science and technology of behavior change. With that in mind, the objectives of this chapter are to 1) review the fundamental, universal principles of animals learning, 2) describe the essential procedures needed for your behavior-change toolbox, and 3) demonstrate, with two case studies, how clients can use these principles and procedures to solve behavior problems with their exotic pets.

How Animals Learn

Behavior: what is it?

Most clients never consider how their descriptions of behavior are really just value labels of what they think an animal *is* rather than what it *does*. They wish for a ferret that is friendly, a degu that is docile, and a toad that is tame. Veterinarians can explain that no one can teach animals what to *be*; rather, we teach them what to *do* and when to do it. For example, we can train a ferret to approach people, relax while being touched, and take food from hands. When a ferret is observed to do these behaviors, we then call it friendly.

Among professionals, there is a tendency to describe behavior in terms of diagnostic labels that are often hypothetical, psychological constructs. Ostensibly, these constructs tell us what an animal *has* or *lacks*, such as anxiety, dominance, or motivation. A construct is a concept that is inferred from commonalities among observed phenomena and used to explain those phenomena. However, constructs are abstractions by definition, and abstractions cannot cause behavior.

Although constructs can have a place in theory building, and conveniently summarize behaviors with a single word, they lack the specific information we need for the objective analysis of behavior.

The key to solving problem behaviors is to describe what an animal actually does and to place that behavior in a context, not inside the animal. Behavior does not occur in a vacuum or spray out of animals haphazardly. There are always conditions on which behavior depends. Therefore, changing conditions necessarily changes behavior. This is good news because, although clients do not have direct control over their pets' neural processes, they do have direct control over the conditions in which their pets behave.

For our purposes then, behavior is what an animal does in certain conditions, which can be measured. Behavior can be overt, i.e., public (chewing, scratching, running) or covert, i.e., private (thought and emotions). Likewise, the conditions that affect behavior can be inside and outside the skin. However, the focus in this chapter is the behavioral level of analysis, the level at which observable behavior and observable conditions act upon one another. It is one piece of the behavior puzzle without which no accounting of behavior is complete.

Two types of behavior: two learning processes

Traditionally, behavior is classified in one of two ways – respondent and operant, which roughly corresponds to involuntary and voluntary behavior, respectively. Briefly, respondent behaviors include simple reflexes (jumping at a loud sound) and certain inherited, species-typical behavior sequences (nest building onset by seasonal changes). Respondent behaviors depend on particular events that occur immediately before the behavior to automatically elicit them. Thus, respondent behaviors are characterized as stimulus-response (S-R) relations. In contrast, operant behaviors depend on consequences, i.e., particular events that follow the behavior. Operant behaviors occur in some form, at some frequency, and increase or decrease depending on the outcomes they produce. Thus, operant behaviors are characterized as response-stimulus (R-S) relations, whereby the stimulus that follows the response influences (increases or decreases) future responses. For example, a hamster will continue to shimmy (response) down a tube that leads to food (consequent stimulus). Operant antecedent stimuli do not automatically trigger operant behavior in the same sense that a reflexive response is elicited by an antecedent stimulus. Between an operant antecedent and an operant behavior is choice, discussed further below.

Learning occurs with both respondent and operant behavior but what is learned is different. With respondent learning (also known as classical conditioning), new eliciting stimuli, not new behaviors, are learned. This occurs through the process of repeated, contiguous pairing of a neutral stimulus with an existing eliciting stimulus. This is stimulus-stimulus (S-S) learning and it is this process that accounts for such responses as the elicitation of the salivation at the sound of a can opener, and milk letdown in dairy cows at the sight of milking parlors. It is also the process by which emotional behaviors are triggered, such as blushing and increased heart rate exhibited by some parrots in the presence of a mate. Similarly, anxiety and fear (e.g., increased respiration, muscle tension, piloerection) can be elicited by seemingly benign conditioned stimuli, such as a white lab coat that has been repeatedly paired with painful injections or restraint. These emotional behaviors are of particular interest when they affect an animal’s ability to learn and, therefore, its quality of life.

With operant learning, new behaviors are acquired and existing behaviors modified based on the past results of doing them. Operant behavior is a purposive tool to control one's environment, and consequences are feedback about how to behave in the future. Behaviors that produce valued results are repeated; behaviors that produce aversive results are modified or suppressed. This is contingency learning (in applied behavior analysis nomenclature, if behavior B, then consequence C: B-C). With operant learning, antecedents are learned signals for the particular behavior-consequence contingency ahead (when A, if B, then C). For example, with experience, a potbellied pig will quickly learn that when the gate is open (A), if it walks through the gate (B), then the result will be novel foraging opportunities (C). However, a tired or satiated pig may choose to disregard the antecedent signal. As can be seen, operant learning (ABC) is quite different than respondent learning (S-S-R), a distinction that eludes professionals too often.

Respondent and operant behaviors are inextricably intertwined. For example, when a bird's flight response is elicited by a sudden, loud noise (respondent), the experience (consequences) of flying away may affect the bird's future flight speed, patterns and destinations (operant), the next time it is startled. In general, problem behaviors and solutions are best viewed through an operant porthole. Operant behavior tends to be the larger repertoire and is more observable, requiring less inference than respondent interpretations. Where operant behavior leads, respondent behavior often follows. However, some respondent behaviors can interfere with operant learning, such as extreme anxiety and fear. When this is the case, the best course of action may be to deal with the respondent behavior problem first, clearing the way for operant learning.

Basic procedures for changing respondent fear

It is not uncommon for animals to learn new triggers for reflexive fear responses through the process of respondent learning. These elicited fear responses are often associated with operant escape or aggressive behaviors, as well. For example, when a ferret is handled at the clinic, restraint can often trigger the physiologic responses of fear such as muscular tension, tachycardia, tachypnea, elevated blood pressure and cortisol release. This may result in biting to escape. There are three well-established procedures to reduce respondent fear to clear the way for animals to be more attentive to operant learning. These include systematic desensitization, counterconditioning, and response blocking (flooding).

Systematic Desensitization

Systematic desensitization is a procedure in which a conditioned emotional response (e.g., fear of a harmless stimulus) is extinguished by gradually exposing the animal to the fear-eliciting stimulus. The first step in systematic desensitization is to arrange a stimulus hierarchy from no response eliciting to extreme response eliciting. Next, the animal is exposed to the first step on the hierarchy after which the next step is presented. This process of gradual exposure continues until the animal shows no fear responses at the last step on the hierarchy. Care must be taken to not elicit the fear response at any level of exposure. There can be several stimulus features to manage when conducting a systematic desensitization program. For example, a pig described as fearful of people, may respond fearfully to intensity (e.g. volume of the person's voice or the rapidity of their behavior), proximity (how close the person is), duration (how long the person is in view), and number (one person vs. several). Each stimulus feature should be arranged on the hierarchy and presented in turn, to allow the animal to desensitize gradually to each trigger. The efficacy of systematic desensitization can often be improved by combining it with reinforcement[2] or counterconditioning.

Counterconditioning

With counterconditioning, the animal's conditioned emotional response to a stimulus is replaced with an opposite response. For example, if a parrot is afraid of the sound of the vacuum (the conditioned stimulus), this sound can be paired with food to elicit an opposite emotional ("pleasure") or physiologic (heart rate reduction) reaction. Counterconditioning will only occur if the new eliciting stimulus triggers a response powerful enough to supplant the problem response. Since this is difficult to accomplish with some stimuli, it is often advantageous to pair the counterconditioning procedure with systematic desensitization, particularly for extreme fear reactions.

Response Blocking

Response blocking (flooding) is another exposure procedure but unlike systematic desensitization, it is not gradual and the animal has no power to move away. With response blocking the animal is presented with the fear-eliciting stimulus at full strength without possibility of escape, until the fear responses are no longer observed. Flooding requires long duration sessions; if the session is aborted before reaching the goal of fear cessation, the process may actually exacerbate the animal's fearful response.[3]

While flooding can be effective, the procedure is a cause of grave concern as it can be traumatic for both the client and the patient. Flooding removes animals' power to choose, which can result in impaired behavior, a condition termed learned helplessness. The animal learns that its behavior has no effect on the environment resulting in decreased responding even when power to escape is restored. Learned helplessness can generalize to situations other than the one in which it was induced[4] and has been associated with detrimental physiologic side effects.[5]

Fundamental principles of operant behavior

The most fundamental law of operant behavior is the law of effect, which states: Behavior is a function of it consequences. Consequences that function to increase the frequency of a behavior are called reinforcers, and the process by which the behavior increases is called reinforcement. Consequences that function to decrease the frequency of a behavior are called punishers, and the process by which the behavior decreases is called punishment.

The operation used to deliver consequences describes another important dimension to consider. When a behavior results in the addition or presentation of a stimulus, the consequence is called positive (+) and when a behavior results in the subtraction or removal of a stimulus, the consequence is called negative (-). These terms are used like mathematical operations without value judgments about the pleasantness or unpleasantness of the consequence per se. Thus, every consequence can be described along two different dimensions: function (increasing or decreasing) and operation (positive or negative), as described in Figure 18.1.

As each individual is unique, this makes applied behavior analysis a study of one. True to form, consequences can affect different animals, even those from the same species, in very different ways. The characteristic of being a reinforcer or punisher is demonstrated solely by the future strength (e.g., frequency, duration, or intensity) of each individual animal's behavior. New reinforcers can be conditioned with the respondent process of repeated, contiguous pairing of a neutral stimulus with an existing reinforcer. The more reinforcers an animal behaves to get, the more successfully it can learn and clients can teach. New punishers are similarly learned. To influence behavior effectively with consequences, reinforcers and punishers, should be delivered immediately and consistently. i.e., consequences are most effective when they are certain, swift and strong.

Examples to Pick the Principle

Although a certain amount of terminology tumult results from the fact that these terms have specific scientific meaning that can be different than common usage, the procedural differences are clear when viewed systematically. Four key questions will help clarify each process when answered in the following order:

1. What is the target behavior being assessed?
2. What is the immediate consequence the behavior produces?
3. Do you predict this consequence will maintain/increase (reinforce) the behavior or suppress/decrease (punish) the behavior?
4. Is the consequence something the animal gets (positive) or is something escaped/removed (negative), as a result of the behavior?

The following examples illustrate the effects of the four consequences with a single behavior and pet – a biting parrot. Of course any individual may respond very differently.

- Positive Reinforcement: When client is on the phone (Antecedent, A), if the parrot bites (Behavior, B), then the client pets the bird (Consequence-C). Biting will likely increase.
- Negative Reinforcement: When client offers hand (A), if the parrot bites (B), then the client removes his/her hand (C). Biting will likely increase.
- Positive Punishment: As client passes doorway with bird on hand (A), if the parrot bites (B), then the client shakes hand sharply (C). Biting will likely decrease.
- Negative Punishment: As client installs seed cup (A), if parrot bites cage bars (B), then the client briefly removes seed cup (C). Biting cage bars will likely decrease.

Operant Behavior Change Procedures

Considerations for designing a behavior-change plan

Reducing problem behaviors is not the only goal when planning an intervention. A good plan is one in which the physical and social context of the environment are redesigned to provide the animal with an opportunity to replace the function served by the problem behavior with an acceptable alternative behavior, and allows the animal to learn new skills that make the problem behavior less likely to occur. The focus on replacing the function of a problem behavior with an appropriate alternative is key to respecting behaving organisms: If the behavior didn't matter to the animal, it wouldn't keep doing it.

O'Neill et al.[6] describe four considerations to increase the effectiveness and efficiency of behavior change plans: First, behavior support plans should describe how the client plans to change the environment to promote and maintain appropriate behavior. This is accomplished by changing a wide range of conditions such as medications, diet, physical settings, schedules, exercise, training procedures, and the use of rewards and punishers. It is also important to describe in detail exactly who in the family will do what and when.

Second, there should be a clear link between the functional assessment of the problem behavior (i.e., the related antecedents and consequences that maintain the problem behavior, discussed below) and the intervention plan. For example, a functional assessment may reveal that a sugar glider repeatedly bites offered hands to remove the hands from its immediate cage area.

Therefore, the intervention plan to reduce this behavior should identify what alternative behavior the animal can use to accomplish this goal in a more acceptable way (e.g. the sugar glider can lean away from the hand rather than bite it). The intervention should also identify new behaviors to teach the animal (e.g., stepping onto a hand by choice and without hesitation). The main focus of an intervention plan should be on what an animal *should do* instead of the problem behavior, not on what it *should not do*. This is why it is important to ask the client, “What do you want the animal to do instead?” With in this in mind, behavior interventions should target one problem behavior at a time. It is not uncommon for a successful intervention to result in generalized improvements to other problem behaviors and to improve the relationship between caregiver and pet. Although caregivers will often choose to change the behavior most problematic to them, it is often a better strategy to start with the behavior that is easiest to change. In this way caregivers will be reinforced for their efforts.

Third, behavior change plans should be technically sound. A technically sound plan is one that adheres to the scientific principles of learning in order to make the problem behavior irrelevant, inefficient, and ineffective. A problem behavior becomes irrelevant when an alternative behavior provides the same, or more, reinforcement to the animal. A problem behavior becomes inefficient when, compared to the wrong behavior, the right behavior can be performed with less effort, fewer responses, and results in quicker reinforcement. A problem behavior becomes ineffective when the maintaining reinforcer is reduced or withheld each time the behavior is exhibited.

Fourth, the behavior-change program should fit the client's setting and skills. The best strategy is the one that can be implemented effectively by the people responsible for the plan. Interventions should fit the client's routines, values, resources, and skills. A good plan is effective in helping the animal and also results in reinforcing outcomes for the client, in both the short and long run, see Figure 18.2).

One mystery that often surrounds problem behavior is its very persistence. Clients may have a litany of failed behavior-change programs by the time they turn to you for help. As they wade through the personal recipes of one Internet charlatan after another, clients don't realize that with each failed attempt at behavior change, the window of opportunity to change the behavior closes a little bit because the problem behavior has been intermittently reinforced. Intermittent schedules of reinforcement build the highly persistent behavior of gamblers, animals willing to behave again and again and again, without reinforcement, for that one jackpot that inevitably arrives. Thus, there should be nothing casual about intervening on an animal's functional problem behavior. Each intervention should start with a careful functional assessment and the intervention should be designed to meets the needs of the animal using the most positive, least intrusive methods.

Functional assessment

Functional assessment is the first step in developing any behavior change program. It is the process of developing hypotheses about the functional relations among antecedents, behaviors and consequences – the ABCs, as demonstrated in the examples in the previous section. The hypothesis generated from a sound functional assessment improves our understanding of behavior and our ability to predict it. Functional assessment also improves the interventions we design in order to decrease problem behaviors, increase appropriate alternative behaviors, and teach new skills.

Functional assessment requires observation skills that client's can quickly develop. The following key questions can help focus their observations on the ABCs:

- What does the problem look like in terms of actual behavior, i.e., what do you see?
- Under what conditions does your animal do this behavior, i.e., what events predict it?
- What does your animal get, or get away from, by emitting this behavior?
- Under what conditions does your animal not do this behavior, i.e., when is the animal successful?
- What do you want the animal to do instead?

The answers to these questions will improve clients understanding of relationships between the problem behavior and the environment they provide. Examining the ABCs reveals that there are no problem *behaviors*; there are problem *situations*. The problem behavior is only one element of problem situations. The other two elements, occasion setting antecedents and functionally related consequences, are environmental elements that can be changed.

The Functional Assessment and Intervention Design Worksheet (FAID)

The Functional Assessment and Intervention Design Worksheet (FAID)[9] was created to teach clients how to systematically solve behavior problems through the process of answering guiding questions. The worksheet can be filled out at home and reviewed during an appointment with the veterinarian or veterinary technician. Often, when one behavior is changed, it affects other behaviors. As a result, every problem behavior should be assessed separately, following the goal of changing one behavior at a time. See Figure 18.3 for the complete worksheet. Two case studies using an abbreviated form of the worksheet follow the chapter (Case studies 1 and 2).

Changing behavior with antecedent strategies

A stimulus becomes an antecedent for a particular behavior if the stimulus is repeatedly present when the behavior is reinforced. A ringing doorbell can become a signal for loud vocalizations if the vocalizations result in social reinforcers when the bell rings. Opening the animal's cage door can become a signal for aggression if the aggression results in the animal being left outside the cage. The strength of a stimulus to signal, or cue, a particular behavior is related to the strength of the reinforcer that follows the behavior. To build strong cues, deliver strong reinforcers in the presence of the cues.

Add or Remove the Cue

One way to reduce the problem behavior is to remove the stimulus that cues the behavior. For example, buttons and jewelry often cue chewing because chewing results in social and sensory reinforcers in the presence of the buttons and jewelry. By removing the cues (wearing T-shirts and removing jewelry) chewing necessarily decreases. Adding a cue for an alternative behavior is another way to reduce the frequency of a problem behavior. For example, opening the food door may cue lunging because lunging has been reinforced with the delivery of food. Teaching an animal to stand in a particular location when the food door is opened prevents lunging at the door.

Increase or Decrease Effort with Setting Events

Setting events are the context, conditions, or situational influences that affect behavior. For example, coming out of the cage can be made easier by selecting cages with large doors, which may ultimately reduce biting. We can make chewing the window frame harder by locating the play area in the middle of the room. The relation between setting events and problem behavior should be considered carefully as the setting is often one of the easiest things to change, to change behavior.

Strengthen or Weaken Motivation

Motivating operations (also known as establishing operations) are antecedent events that temporarily alter the effectiveness of consequences. For example, a few food treats may be a highly motivating consequence to a pet that rarely has access to them but not motivating at all to one that has unlimited access to treats every day. A ferret may be more motivated to go into its cage after a long play session when it is tired and ready to sleep. Chasing the family cat may be less reinforcing after an energetic training session, and stepping onto a hand may be more reinforcing to a bird when the bird is on the floor.

Antecedent behavior-change strategies are often preventative solutions rather than learning solutions. As a result, antecedent strategies are often the most positive, least intrusive, effective behavior-change procedures. Clients often feel they must change the behavior by fixing the animal. Teaching clients that simple changes in the antecedent environment can result in effective solutions to behavior problems is often a big relief.

Decreasing behavior with consequences

Extinction

Once the reinforcer for a problem behavior is identified, it can be permanently withheld or eliminated to reduce the behavior. When the contingency between a behavior and its consequence is eliminated, the behavior serves no function and eventually decreases or is suppressed. This process is called extinction. Extinction is most effective the very first time a problem behavior occurs, i.e., do not give the behavior a reinforcing function in the first place.

There are very few problem behaviors that are well suited to extinction. First, extinction can be a slow process. This is typically the case with behaviors with an intermittent reinforcement history. Second, there is often an intolerably sharp increase in the frequency and intensity of the problem behavior, called an extinction burst, before it eventually decreases. This escalation in behavior often results in clients reinforcing even more problematic behavior. If extinction is the selected process, clients must be forewarned of the possibility of an initial extinction burst so they don't give up and reinforce the animal at the peak of its behavioral response. Third, extinction can result in frustration-elicited aggression, which adds another problem to contend with. Fourth, the reinforcement for some behaviors is difficult or impossible to control. Physiologic changes associated with the cue or the behavior can also provide intrinsic (e.g., sensory, neuro-chemical) reinforcement. Last, the problem behavior may recover over time requiring the extinction procedure to be implemented again.

Punishment

Punishment is the process by which consequences decrease or suppress behavior. Behavior can be punished by contingently adding an aversive stimulus, called positive punishment (discipline), or by contingently removing positive reinforcers, called negative punishment (fines, penalties, and time-out). For example, when a client passes through a doorway with her bird on her hand (A), if the parrot bites (B), then the client shakes her hand sharply (C). In this scenario biting will likely decrease (punishment) given the addition (positive) of the sharp shake of the hand. Alternatively, when a client installs a seed cup through a cage door (A), if parrot bites cage bars (B), then the client temporarily removes seed cup (C). Biting cage bars will likely decrease (punishment), given the temporary, contingent removal (negative) of the filled seed cup.

As with all consequence procedures, punishers must be delivered consistently, immediately. Punishment should also be strong enough to suppress behavior but not result in fear or harm. Decades of scientific studies demonstrate the detrimental problems with positive punishment. As a result, positive punishment should only used to solve behavior problems when more positive, less intrusive procedures have failed (an uncommon occurrence among experienced practitioners). Punishment is associated with four detrimental side effects: Increased aggression, generalized fear, apathy, and escape-avoidance behaviors.[7] Equally important to consider is that punishment doesn't teach the animal what *to do* in place of the problem behavior. Punishment also does not teach caregivers how to teach alternative behaviors. Caregivers become focused on the problem behavior rather than on productive solutions. Punishment is really two aversive events – the onset of a punishing stimulus and the forfeiture of the reinforcer that has maintained the problem behavior in the past. Additionally, punishment often requires an increase in aversive stimulation to maintain initial levels of behavior reduction. The potential arises for caregivers to deliver physically harmful interventions. Perhaps the most detrimental side effect of punishment is that when it is effective, punishment reinforces the punisher who is therefore more likely to punish again in the future, even when antecedent arrangements or positive reinforcement is the better choice. This can become a vicious cycle where the animal's relationship with the caregiver centers on the caregiver's attempts to punish rather than teach the animal what to do.

Time Out from Positive Reinforcement

Time-out from positive reinforcement is a negative punishment procedure that can effectively reduce problem behavior with fewer detriments than positive punishment. Time-out is the temporary removal, or reduction, of access to positive reinforcers contingent on a problem behavior. When a client reaches down to pet a ferret (A) and the ferret explores her hand by nipping it (B), the client moves away, withdrawing attention (C). Nipping when the client pets the ferret will likely decrease due to the process of negative punishment in which attention, a positive reinforcer, is removed. Time-out can be a relatively unintrusive behavior-change procedure if it is implemented correctly, i.e., consistently, with close contiguity (immediacy) to the problem behavior, and short duration of just a few seconds. The animal should be quickly brought back into the situation and given a chance to do the right behavior and earn positive reinforcement. The client should also let the procedure do the job and avoid injecting emotional responses into the process, which may be reinforcing to the pet.

Increasing behavior with consequences

Without question the two sharpest behavior change tools are variations of differential reinforcement. Differential reinforcement is the process of reinforcing one class of behaviors while at the same time extinguishing another behavior. Differential reinforcement of alternative behavior (DRA) is used to replace problem behavior with a more appropriate behavior, and differential reinforcement of successive approximations (shaping) is used to teach new skills. Both procedures avoid the problems and side effects of positive punishment and result in high rates of positive reinforcement so vital to behavioral health. This is why both procedures are close to the top of the ethical hierarchy of behavior-change strategies (discussed later in the chapter). (Figures 18.4-6)

Differential Reinforcement of Alternative Behavior

With DRA, a desirable replacement behavior is reinforced (increased) while the problem behavior is extinguished (i.e., suppressed or returned to baseline levels due to withdrawal of reinforcement). A functional assessment is necessary to identify the reinforcer that has been maintaining the problem behavior in the past, in order to withhold it.

There are three things to consider when selecting an alternative behavior. First, although the behavior targeted for reduction is a problem to people, it serves a legitimate function to the animal or it would not continue to exhibit the behavior. The function is either to gain something of value, e.g., screaming to gain attention (positive reinforcement); or, the function is to remove something aversive, e.g. lunging to remove intruding hands (negative reinforcement). An alternative or incompatible behavior should be selected that replaces the function served by the problem behavior but in a more appropriate way. If the alternative behavior is incompatible with the problem behavior, (i.e., if both behaviors can't physically be performed at the same time) the behavior change program can proceed more quickly. For example, talking is incompatible with a bird screaming, and standing in the back corner is incompatible with lunging at the feed door.

Second, the alternative behavior should produce even more reinforcement than the problem behavior in order to successfully compete with and replace it. According to the principle called the matching law, the distribution of behavior between alternative sources of reinforcement is equal to the distribution of reinforcement for these alternatives.[3] Thus, given a choice between two alternative behaviors, animals preferentially exhibit the behavior that results in the greater reinforcement. The matching law is itself a powerful tool for managing behavior. For example, if stepping onto an offered hand produces twice the reinforcement as biting it, the animal will tend to choose to step on the hand.

Third, the alternative behavior should be one the animal already knows how to do. During the extinction component for the problem behavior, a well-established alternative behavior is more likely to be performed than one that is newly acquired. When alternative behaviors are strengthened and maintained, differential reinforcement can provide long-lasting results. As this method relies on positive reinforcement to teach animals what *to do*, it offers a positive, constructive, and practical approach to managing animals in captivity and meets a high ethical standard.

Shaping

Differential reinforcement of successive approximations is also known as shaping. Shaping is used to teach new behaviors by successively reinforcing subtle variations in responses, called approximations, along a continuum that leads to the final goal behavior.

Shaping starts by reinforcing the closest approximation, the related form or estimate of the target behavior, that the animal already exhibits. Next, an approximation slightly closer to the target behavior is reinforced, at which time reinforcement for the first approximation is withheld. Once the second approximation is performed without hesitation, an even closer approximation is reinforced while withholding reinforcement for all previous approximations. In this manner, the criterion for reinforcement is incrementally shifted closer and closer to the target behavior, until the animal eventually exhibits the final goal. At this stage, every instance of the completed target behavior is reinforced. For example, to teach a parrot to play with a toy, the following approximations can be reinforced in turn: looking at the toy, leaning toward the toy, moving a foot in the direction of the toy, taking one step toward the toy, taking several steps to arrive beside the toy, touching the toy with the beak, touching the toy with a foot, holding the toy with a foot while manipulating it in the beak, and finally reinforcing longer durations of toy-play. If the animal experiences difficulty at any criterion, the client can back up and repeat the previous successful step, or reinforce even smaller approximations. Ultimately it is the learner who determines the pace, the number of repetitions, and the size of the approximations in a shaping procedure, but in general, smaller approximations tend to produce a more fluid progression and more stable learning.

Implementing a shaping procedure requires keen observation of the subtle, natural variation in the way behaviors are performed. For example, each time a parrot lifts its foot, it is naturally done differently than the last time (e.g., left or right; high or low; fast or slow, with toe movement or without, etc.). In daily life these variations are unimportant and simply classified as one behavior, or operant class, called "lifting a foot". However, the subtle variations in foot lifting are exactly what allows us to shape new behaviors, such as offering a steady foot for nail trims.

With shaping we can theoretically teach any behavior within the biological constraints of the animal. Husbandry, medical, and enrichment behaviors can be shaped to reduce stress and increase physical and mental stimulation. Animals can learn behaviors such as going in and out of crates, staying calm wrapped in towels, moving to designated stations or perches, and playing games. Shaping can also be used to change different dimensions of existing behaviors such as their duration, rate, intensity, topography, and latency (response time).

A Matter of Ethics: Effectiveness is Not Enough

What makes behavior analysis unique according to Bailey and Burch,[8] is also relevant to veterinarians and other animal professionals working with behavior: Both behavior analysts and veterinarians supervise others, such as paraprofessionals and clients, who carry out the behavior intervention plans. The interventions are usually implemented where the behavior problem actually occurs, rather than in an office. The participants are often very vulnerable and unable to protect themselves from harm. These interdisciplinary commonalities suggest that the ethical standards established for behavior analysts may also have widespread relevance.

There is a 30-year-old standard that promotes the least restrictive, behavior interventions (LRBI) with human participants (also referred to as most positive, least intrusive, behavior intervention). This standard appears in public federal law protecting children (IDEA, 1997) and the Behavior Analyst Certification Board Guidelines for Responsible Conduct for Behavior Analysts (2004). According to Carter and Wheeler,[1] intrusiveness refers to the level of social acceptability of an intervention and the degree to which the participant maintains control. Although this definition leaves room for a great deal of judgment at the edges, it is clearer in the middle where most behavior consultations lie. Procedures with aversive stimuli are more intrusive and would be recommended only after less intrusive procedures have been tried.

Figure 18.7 shows a proposed hierarchy of intervention strategies working with animals that takes into account distant and immediate antecedent arrangements. The examples are with pet parrots but apply to all animals. The overwhelming majority of behavior problems can be prevented or resolved with one or more strategies represented in Levels 1 - 4 (i.e., arranging distant and immediate antecedents, positive reinforcement and differential reinforcement of alternative behaviors). Level 5 (i.e., negative punishment, negative reinforcement, and extinction) may occasionally be the ethical choice under certain circumstances. Level 6, positive punishment (i.e., the application of aversive stimuli that reduces the probability of the behavior occurring again), is rarely necessary or suggested by standards of best practice when one has the requisite behavior knowledge and teaching skills. Clearly the animals in our care would benefit from such an intervention hierarchy that is both ethical and feasible to implement.

Conclusion

In the medical field, practitioners are trained to focus on physiological problems. Veterinarians tend to use the same medical modality when presented with an animal displaying an undesirable behavior. Both clients and practitioners are typically focused on determining how to change the *animal* and eliminate the behavior. When you fixatedly stare at an obstacle in the road, your likelihood of a crash is greater than if you evaluate the entire scene for an easier and more successful path of travel. Similarly, an effective behavior change plan should evaluate the animal's environment and behavior in a comprehensive and systematic way, permitting construction of a clear route to success. The science of behavior analysis provides the map and the vehicle with which to structure a humane, effective behavior change plan.

Functional assessment delineates the essential dependency between environmental antecedents, the animal's behavior, and its consequences. This knowledge permits development of strategies for antecedent change (e.g. setting events) and manipulation of consequences (differential reinforcement, shaping) with the focus on teaching the animal what we want it to *do* rather than concentrating on what it should not do.

Perhaps most importantly when changing behavior is that we recognize that animals are sentient, feeling beings, and as such, choice is not only a right but also a biological need for behavioral health. Behavior change methodologies should not be things we do *to* an animal, but interactions we have *with* an animal -- a conversation, not a monologue. Arrangements for behavior change should empower both the owner and the animal, ultimately resulting in an enhanced quality of life for both.

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