

Four Faces of Operant Conditioning

By Jay Pratte, Giant Panda Keeper Zoo Atlanta, Atlanta, GA
AAZK, Inc. Animal Behavior Management Committee

Operant Conditioning is a type of learning, or training, in which behavior is determined by its consequences. Over the past few years, it has evolved into an integral animal management tool in zoos and aquariums. Many facilities have developed training programs for their staff and animals. Keepers possess varying levels of skill and dedication in this burgeoning branch of husbandry, but one thing remains unchanged at the root, and that is the theory and knowledge behind the training itself. Granted, new developments abound in psychology, however the basics of operant conditioning are fairly simple and stable.

Several conversations over the past year have demonstrated that there is a need to educate individuals further in the theory behind operant conditioning - not only to provide further clarification of the processes involved, but also to assist people in communicating more successfully with others in the field by maintaining consistency in terms and applied theory. Animal care managers are becoming increasingly responsible for addressing training programs and for assessing performance of staff and animals alike. These functions are difficult without the intrinsic facts at hand. The facts? Essentially, operant conditioning ("training") as it is used in zoos and aquariums, includes four major facets: *positive reinforcement*, *negative reinforcement*, *positive punishment*, and *negative punishment*. In animal training (using operant conditioning), these four concepts are used constantly, whether the trainer is aware of the terminology or not. Each term is clarified further below. This paper does not address other mechanics of conditioning (discriminative stimuli, conditioned reinforcers, schedules, etc.), but expounds on the practical applications of punishers and reinforcers.

In regard to operant conditioning, *positive* and *negative* have nothing to do with perception or how a subject responds. It is not "good" versus "bad". Think of it in terms of math. Positive means something is being given or added; negative means that something is being avoided or removed. Simple, but often forgotten or misinterpreted by many trainers.

Positive Reinforcement

By definition, a reinforcer is anything that occurs in conjunction with a behavior that tends to increase the likelihood that the behavior will occur again. That said, **positive reinforcement** is the process of pairing an action or response with something that the subject wants, thereby causing an increase in the frequency of occurrence of that behavior. For example, ask dog to sit, dog sits, dog is told "good" and receives a treat. **Positive**, since something is given or added, and reinforcement, since what is given is meant to increase the chances of the response occurring when the trainer asks. Positive reinforcement can be slow in providing results, but usually results in fewer adverse side effects than the other facets (e.g.: displacement), which will be discussed. Positive

reinforcement also has the psychological benefits of being based on a system of rewards. Animals and people alike respond well to a reward system. Administering the reinforcer and enjoying the results can be as rewarding for the trainer as receiving the reinforcer is for the trainee.

Negative Reinforcement

This is the villain that triggered this article. The term's confusion arises from the belief that it is somehow "bad", since it *is* "negative" in name. Many trainers suffer this misconception and a stigma is assumed if it is actually used. As a result keepers are less willing to discuss how and when this technique has been employed. The need to apply an "aversive" environmental factor can be distressing, and misinterpreted by those less versed in methodology. Education and communication can easily help one overcome these barriers and promote understanding.

Negative reinforcement is the process in which a behavioral response increases in frequency (and thus the **reinforcement**) due to the removal (thus the **negative**) of a stimulus that the subject perceives as aversive. This sounds paradoxical, but it is really quite straightforward. For instance, a bear won't shift when asked, so a short burst of water is used as an aversive environmental factor, or aversive stimulus. The bear decides to shift *to avoid being spritzed*, and thus is reinforced by the cessation of the aversive stimulus of the spritzing. The desired behavior (shifting) is more likely to occur once the association is established. The most important thing to remember here is that the trainer is providing concise information. Continuing to hose the bear until it is soggy after it has begun to shift does not send the correct message. In the case of a trained behavior (i.e. under stimulus control), if the aversive stimulus stops immediately when the cue is appropriately responded to, then the subject learns that obeying the cue is good. It is also important to remember that a behavior trained using negative reinforcement can be maintained by using positive reinforcement. Once the desired behavior has occurred and the aversive factor is gone (i.e. the bear shifts on cue before the water hose or spritzer is even visible to it), the subject can be positively reinforced to further strengthen the behavior.

This is not to espouse the use of negative reinforcement over positive reinforcement. There are appropriate times to utilize this training tool, often dictated by circumstance or situation. It is merely another method of providing information to the subject. It can be, however, a less than optimal method as subjects may react to the aversive stimulus with displacement of aggression, or some other less desirable physical or psychological consequence. Negative reinforcement is not in and of itself, a bad thing; it is merely a tool to be used appropriately. Avoiding communicating about how negative reinforcement has been used effectively as a training tool (due to potential adverse perception) can result in confusion about, or an incorrect assessment of, a training program's success.

Positive Punishment

Punishment is the application of or removal of a stimulus that occurs after a behavior it is meant to affect, and causes a decrease in the frequency of that behavior. This concept is

simple to understand, and most trainers recognize that it is a tool, just one to be employed carefully. It is also a great example to illustrate how easily the terms can be misconstrued. **Positive punishment** is the providing of (again, adding, and so **positive**) an external stimulus in order to decrease the frequency or occurrence of the associated behavior (thus punishment); the associated behavior in question being the undesirable response. (Remember, the term "reinforcement" refers to the intent of increasing the frequency of a desired behavior occurring.) For example, a dog is given a cue; the dog, instead of offering the corresponding behavior, tries to snap the treat (intended positive reinforcer) from the trainer's hand, so trainer decides to "correct" the behavior by yelling loudly at the dog. The undesirable snapping behavior is likely going to decrease, but the dog is also likely to be wary of the trainer and may shy away from any loud noise/voice. The subject can make an association, and learning may occur, however not by a method either the trainer or the subject would desire.

Any type of punishment can result in distressing consequences. Fear responses and aggression are potential examples. Positive punishment does not benefit the trainer or the trainee. However, it is still termed "positive", thus rendering the terminology confusing and affecting individuals' perceptions (yet ultimately providing the impetus for addressing the issue.)

Negative Punishment

This facet of operant conditioning is an excellent example of how perceptions of ideas affect the employment of a tool. **Negative punishment** is the removal of (**negative**) an external stimulus, and, like positive punishment, is intended to decrease the frequency of an undesirable behavior (**punishment**). For example, a bear won't respond to a cue (or is overly aggressive ...) so the trainer turns or walks away, removing any potential for the bear to receive further attention or positive reinforcers/treats. The clearest and most commonly practiced example of this concept is the use of TIME-OUTS. Many trainers use time-outs with some regularity, but some do not understand that they are actually employing a mild form of punishment - again, with all of the potential psychological side effects that may result from the use of punishment techniques (frustration, displaced aggression, etc.). One of the motivators behind this article was a dispute between two trainers over the use of negative reinforcement in one particular training situation. One trainer did not like the concept of negative reinforcement and argued against using it, while extolling the virtues of time-outs, never once realizing that time-outs are, by nature and definition, actually punishment and therefore a less desirable choice. Negative punishment is, again, a training tool to be used appropriately and effectively, but in practice a less desirable one.

General practice accepts that positive reinforcement is one of a trainer's most effective tools. Any type of reinforcement is preferable to punishment and likely more effective in eliciting desired behaviors. While positive and negative punishment may elicit more (apparently) immediate and changes in behavior, positive reinforcement sends the clearest and strongest message of association to the subject, while maintaining a rewarding relationship.

Finally, a couple of points on using punishment as an operant conditioning tool: To be employed appropriately, the punishment must occur as immediately as possible to send the correct message. The greater the delay between the undesirable behavior and the punishment, the greater the chance of misinterpretation of intent. A dog owner calling the dog over and spanking it an hour after it urinated on the floor is, in reality, punishing the dog for coming to him or her. Animals in particular are unlikely to associate a past behavior with the current punishment. The intent of the trainer therefore should be to provide a response as closely as possible to the behavior in order to strengthen associative learning (which is why reinforcers tend to be more effective than punishers in modifying behavior). Any punishment must also be appropriate in "volume" in relation to the undesirable behavior. A time out given when the subject is merely slow to respond may not be warranted, nor is merely using a sterner voice if the poodle being trained bites off a finger. Again, remember that positive reinforcement techniques are the most effective for associative learning; that said, punishment is still another facet/tool of operant conditioning, and needs to be properly understood and carefully employed only when absolutely necessary.

Remember that since punishment occurs *AFTER* a behavior has occurred, the subject cannot alter its response (change its behavior) accordingly to avoid it. The use of punishment can lead to and increase in both the trainer's and the subject's frustration, and result in less than successful conditioning. The point of conditioning is to modify a subject's behavior in the desired direction; the training will likely be more successful when the subject can alter its behavior and receive a positive reinforcer from the trainer. There is almost always an alternative to punishment. If something is occurring that the trainer finds undesirable, training an incompatible behavior (i.e. training a dog to sit so it cannot jump up and lick someone's face) using positive reinforcement can be a useful solution. Putting a behavior on cue and then never asking for it again can be an alternate solution if the situation lends itself to that, as can extinguishing the undesirable behavior by never reinforcing it so that it eventually dies out.

In conclusion, operant conditioning is not **just** about positive reinforcement. It entails learning about and employing these four techniques (and many others) appropriately and safely. Learning about these mechanisms of the psychology, as well as the potential results or consequences of chosen techniques, will increase a trainer's effectiveness and improve how quickly and well the subjects learn new cues/behaviors. Teaching these skills to new trainers and discussing them openly with experienced individuals can lead to more consistent communication between trainers, trainers and their subjects, and between trainers and those managing the training program. A little bit of knowledge will go a long way to improving one's skills in operant conditioning.

*Source: Animal Keepers' Forum, Vol. 31, No. 11, November 2004
American Association of Zoo Keepers, Inc., Topeka, KS*