Limitations of Prompt-Based Training

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The introduction of "lure and reward" training, pioneered by Dr. Ian Dunbar, was a major turning point in dog training, and marked the beginning of a new era—positive-reinforcement-based training. It became clear, early on, that the prompt—an antecedent stimulus that generates target behaviors in the presence of what we want to become the discriminative stimulus (S^D) for the behavior (Miltenberger, 2004, p. 198)—became part of the S^D unless faded, something many trainers failed to do. This has become a criticism of positive-reinforcement-based training and, specifically, training that utilizes prompts such as food lures. I will identify and explain the most prominent limitations of prompt-based training (e.g., "lure and reward training"), and emphasize the importance of fading the prompt early in the training process. Prompt-based training produces quicker results, but if the prompt is not faded early in the process, it will become a strong component of the discriminative stimulus package and interfere with the transfer of stimulus control to the ultimate S^D. Furthermore, the presentation of food as part of the antecedent package may also act as a consequence, thereby reinforcing behaviors that were performed immediately before it was presented. For example, if the dog is cued to sit and remains standing, repeating the cue while presenting food may reinforce standing, thereby convoluting the conditioning and reducing the efficiency of training. I will elaborate on these processes below.

Dogs learn through respondent conditioning (a process whereby a neutral stimulus becomes a conditioned stimulus by being made contiguous with and contingent on an unconditioned stimulus, so that the subsequent elicited unconditioned response becomes a conditioned response), and operant conditioning (a process that involves changes in the frequency and/or strength of operant behaviors due to consequence history) (O'Heare, 2008). Although these types of conditioning are distinct, they occur simultaneously and continuously, for the dog is always learning new behavior–environment relationships. For example, food can act as both an unconditioned stimulus and an unconditioned reinforcer. It elicits respondents such as salivation and certain emotional responses, and reinforces operants such as sitting. The sight of food may become a conditioned reinforcer, as mentioned above. I will focus here mainly on the effect of food lures on operant behaviors.

Operants are preceded by antecedent stimuli and followed by consequences. For example:

Figure 1. Antecedent–behavior–consequence sequence for "sit."

Operant behavior is maintained or extinguished by its history of reinforcement or lack thereof; it is the result of its historic consequences. The S^D indicates that a particular contingency is available (O'Heare, 2008). Training involves manipulating the antecedents and/or consequences in order to change behavior.

Our power, as dog trainers, lies in arranging the environment and arranging certain contingencies that set the occasion for desirable behaviors. We manage the antecedent and consequence stimuli to achieve our behavioral objectives. It is important to arrange the relationship between the antecedents, behaviors and consequences as efficiently as possible in order to obtain maximal benefits from our training efforts. Establishing an S^D by way of prompting is an important component of our training efficiency (colloquially, a useful tool in our training tool kit).

Prompts help produce an instance of the correct behavior in the presence of the S^D so that it can be reinforced. Prompting is useful, especially if the selected behavior is not part of the dog's current behavioral repertoire (Donaldson, 1996, p. 142), or if the dog doesn't emit the form of the behavior that we want to reinforce. For example, dogs perform sitting behavior regularly, but they might not sit close to and parallel with our left leg, facing the same direction that we are. In this example, because the particular behavior does not occur frequently enough, we cannot use capturing (a process whereby the trainer waits for the dog to emit the target behavior in order to reinforce it). We can free shape (shape without prompting) it, but prompting will generate the behavior more quickly—using a food lure to prompt a sit that is parallel with our left leg is much faster than free shaping it.

The most commonly used prompts are divided into five categories: verbal/auditory, physical/tactile, modeling, visual/gestural (Miltenberger, 2004, p. 199), and olfactory. Auditory prompts involve using sound to encourage the dog to perform the behavior. One example of an auditory prompt is to use squeaking and high-pitched sounds to encourage a dog to approach us. Physical or tactile prompts involve touching the dog in order to generate the behavior. One example is pressing down on the hindquarters to generate a sit. Modeling involves performing the behavior and expecting the dog to perform it afterwards, by mimicry—the trainer demonstrates the behavior, and the dog is expected to imitate it. Modeling is rarely used in animal training, though. Visual prompts involve presenting a stimulus that the dog tracks visually that, in the process, encourages the behavior to take place—for example, a food treat being moved such that the dog follows it and performs the behavior. Food can also be considered an olfactory prompt—the dog likely sees and smells the treat, both of which contribute to the targeting. Using food as a visual/olfactory prompt is commonly referred to as luring.

Prompt-based training generates behavior quickly. In the case of lure and reward training (a type of prompt-based training), the food is used both as a prompt and a reinforcer. The method is not without its limitations, though, especially because food is a primary reinforcer. The prompt-based training or "lure and reward" sequence looks like:
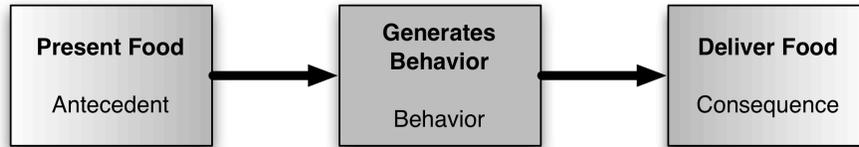
Figure 2. Prompt-based training sequence involving food as part of antecedent and consequence stimulus package.

Luring always involves a compound stimulus (S_1, S_2, etc.). I will label food the S_1 and the hand motion the S_2. They are presented simultaneously, and a response will be made (e.g., sitting). Later, it may be observed that the S_1, presented by itself, produces a response, but the S_2, presented on its own, does not produce a response. This is likely because the S_1 (food) is more salient than the S_2 (hand signal) and, therefore, the food overshadows the hand signal and compromises the conditioning (Chance, 2009, p. 74).

Behavior is said to be under stimulus control when it occurs upon presentation of the S^D. For stimulus control to be achieved, the S^D has to be a relevant and reliable predictor of reinforcement; it must be sufficiently conditioned, with careful attention to contingency and contiguity criteria. At the same time, the reliability of the S^D is determined by the strength of its association with the response–reinforcement contingency (Burch & Bailey, 1999, p. 70). The prompt simply generates the behavior. However, because a prompt utilizing food is so salient, it can become established as the S^D. When using food as a prompt, problems arise when the dog learns that the food, in its role of reinforcer, is only likely when food is presented in its role of prompt.

Food, once well established as the S^D, will interfere with transfer of stimulus control, making it less likely that the dog will respond to the hand signal alone, and later to the verbal cue. It seems likely that this phenomenon is at least partially attributable to overshadowing. Using a primary reinforcer (food) together with the hand signal as a prompt represents an instance of compound stimuli and, as a result, the hand signal (the intended discriminative stimulus) is overshadowed by food. This reduces the efficiency and effectiveness of the training process.

Often, and especially where novice trainers are concerned, food is produced as a last attempt to get compliance from the dog (Sdao, 2005). The scenario looks like the following:

1. "Rover, come".
2. Nothing happens.
3. "Rover, come here" (while walking towards the dog).
4. Rover moves farther away.
5. "Rover, come here now" (while running away from the dog).
6. Rover looks and goes to smell another tree.
7. Trainer waves a food treat at the dog.
8. Rover comes running.

In this example, the dog may have learned, through discrimination, to wait for the final cue, which is waving food at him. But once again, this is a compound stimulus—food and hand-wave—where food has become part of the S^D.

The novice trainer may believe that presenting the food prompted the dog to come. But it seems likely that the food becomes part of the S^D and, furthermore, it likely acts as a conditioned reinforcer for smelling-a-tree behavior, if that was the last behavior the dog emitted before the recall was cued. In short, food became part of the S^D and, through discrimination training, the dog learned that food in hand predicts reinforcement and no food predicts lack of reinforcement. To reiterate, food likely acts as a conditioned reinforcer, because

the mere sight or odor of it predicts its delivery. Once delivered, food acts as a primary reinforcer. Here we have an instance of food playing the role of both a conditioned reinforcer for smelling a tree (undesirable behavior), and the S^D for recall behavior (desirable behavior). If we elect to use food as a prompt, it should be faded early in the training process, before it becomes an established part of the S^D.

Since the S^D has to be a relevant and reliable predictor of reinforcement (in order for the behavior to remain under its control), stimulus control has to be transferred, as early as possible, from the food to the hand signal, and subsequently to the verbal cue. Fading is one way of transferring stimulus control from the food lure to the S^D (Miltenberger, 2004, p. 196). Fading makes learning a new S^D–behavior– reinforcer contingency possible by gradually making the prompt less salient and the S^D more salient.

There are different ways of fading the prompt. One of them entails the sudden removal of the lure. For example, the lure is removed after about three to five trials. In this instance, because food is also an olfactory prompt, it fades in the form of visual prompt first, and then in the form of olfactory prompt; the dog no longer sees the food but can still smell it on our fingers. Another way of fading the lure is to use it intermittently. For example, prompt the behavior two or three times with the food lure; prompt it once with the hand signal only; prompt it once with the food lure; prompt it two or three times with the hand signal only. In this instance, food

is made more and less salient, both as a visual and olfactory prompt, but with a decreasing ratio of salience. By performing these trials in rapid succession, we utilize behavioral momentum. The lure can also be made less salient by changing its size; we can maintain the form of the S^D, and use a smaller lure with each trial. In this instance, food gradually loses its salience, both as a visual and olfactory prompt.

The schedule of reinforcement used will ensure the target behavior does not extinguish once the lure has been faded. Generally, a continuous reinforcement schedule is necessary during the acquisition stage of learning. But an intermittent reinforcement schedule needs to be put in place and gradually thinned, for maintenance.

In conclusion, "lure and reward" is a very useful training technique; it produces fast results, and is a simpler skill set for most guardians than free shaping, minimizing the frustration common with novice attempts at free shaping. However, it has important limitations that can reduce training efficiency. Improper use of food can result in inadvertently training undesirable behaviors; in the food itself taking on stimulus control of the behavior, due to overshadowing and inadvertent discrimination training; and in the food acting as both antecedent and consequence in the stimulus package. Fading the lure, early in the training process, and concentrating more on setting an S^D–behavior–reinforcement contingency and maintaining that contingency are paramount if lure and reward training is to be efficient.

Acknowledgements

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