Efficiency of verbal and mechanical markers for training a difficult or simple behavior in pet dogs

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"Clickers" and Pet Dog Training

Conditioned reinforcement is when a stimulus (a conditioned reinforcer) becomes reinforcing because it is repeatedly followed by a primary reinforcer (such as food); this can be advantageous over using only a primary reinforcer because conditioned reinforcers can more closely follow the behavior. In this way they can function as a marker, allowing the animal to associate the behavior marked by the conditioned reinforcer with the later delivery of the primary reinforcer.

A "clicker" is a small mechanical noise-making device that makes a double click when pressed. It is used by many dog owners and trainers as a conditioned reinforcer. Research in animal training has shown mixed results in whether or not a marker or "clicker" speeds learning. There is a trend for more significant differences in studies that use more difficult or complex behaviors (Langbein et al., 2007; Williams et al., 2004; Smith and Davis, 2007). Some dog trainers think that conditioned reinforcers are most advantageous in training complex or difficult behaviors (Adamson et al., 2010; McConnell, 2012). To test this idea, owners taught dogs both a simple behavior (to nose-touch a target) and a complex behavior (to put a toy in a box). Dogs learned each behavior either with only primary reinforcers, with a verbal marker, or with a clicker. If secondary reinforcers are only significantly helpful in difficult learning tasks (but not simple learning tasks), then we expect to find a difference between groups for the difficult behavior but not the simple behavior.

A "clicker" is also purported to be a better conditioned reinforcer than a verbal marker because it is a shorter sound, more consistent, and has a particular pitch as compared to a word. We will use audio recordings to observe the length, pitch, and consistency of the verbal markers and clickers. If the verbal marker is less efficient as a marker than the clicker because of its auditory characteristics, then we will expect to see a significant correlation of short markers, consistent markers, and a certain pitch of marker with faster learning.

Methods and Design

Dogs were recruited from dogs owned by the clients and staff of emBARK Dog Training, and by general publicity of the study in the city of Eau Claire. Dogs were at least 4 months of age, did not have current health problems that could impair their mobility or cognitive abilities, and did not have significantly fearful or aggressive behaviors in a training class setting. Owners conducted the training of the dogs and were at least 16 years of age. Twenty-six dogs participated in the study.

Each dog learned two behaviors - one a simple behavior (to touch a target with its nose) and one a difficult behavior (putting a toy in a box). The general steps to follow in shaping the behaviors (i.e. "present the target, reinforce any movement towards the target" as Step 1 in teaching the nose target) were the same for all dogs. The steps in training were detailed in class handouts and explained in the class.

Dogs were assigned to one of six groups (Figure One). Groups were designed so that each dog used a different protocol for the simple and the difficult behavior, and to divide the dogs into the three training methods (Table One). Within each group, dogs followed one of three protocols for each behavior (each dog will encounter two protocols, as different protocols will be followed for each behavior). In the "primary reinforcer only" protocol, a correct response was followed as quickly as possible by the presentation of a food reinforcer. The owner was silent throughout training. In the "verbal marker" protocol, a correct response was marked by a short, distinctive word selected by the owner at the beginning of the class. It was then quickly followed by a food reinforcer. Other than giving the verbal marker, the owner did not talk to the dog. In the "clicker" protocol, a correct response was marked by a click and quickly followed by a food reinforcer. The owner was silent throughout training. Data was collected by the owners as number of treats used per training session and as the step the dog primarily performed in the training session. Finally, recordings were made at each class of the clicker markers and verbal markers used by each owner to create correlations between the traits of the auditory stimulus and the dog's learning speed.

Groups	Toy in Box	Target
1	Verbal Marker	Food Only
2	Food Only	Verbal Marker
3	Food Only	Clicker
4	Clicker	Food Only
5	Clicker	Verbal Marker
6	Verbal Marker	Clicker

Table One. Subject group design for dogs based on the type or absence of an auditory marker for the difficult and the simple behavior.

Did the use of a marker decrease trials per step?

Speed of learning was measured as trials per step: the number of trials a dog completed in a given step before being able to move on to the next step (or, in the case of the last step, before completing the behavior). Lower trials per step is equivalent to a faster learning speed. No effect of the training method on learning speed was found in ANOVA of either the difficult "toy in box" behavior (Figure One) or in the simple "target" behavior (Figure Two). While there does seem to be an opposing trend between the behaviors (verbal marker had the fewest trials per step for the difficult behavior, but the most trials per step for the simple behavior), the high P values indicate this is almost certainly random variation in the data.
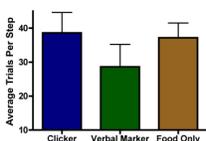

Figure One. Average trials required per step of the toy in box behavior before dog was able to advance to the next step, averaged over all steps per dog. No significant differences were found between groups (P = 0.44).
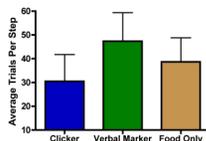
Figure Two. Average trials required per step of target behavior before dog was able to advance to the next step, averaged over all steps per dog. No significant differences were found between groups (P = 0.56).

Did use of a marker help dogs learn the behavior overall?

Overall learning within the three-week training period was measured in two ways: by the number of steps completed and by the number of dogs that completed or did not complete the behavior. This analysis did indicate that the designation of the "toy in box" as a difficult behavior and the "target" as a simple behavior was appropriate – all dogs learned the target behavior within the three-week period, while only 13 of 21 dogs completed learning the toy in box behavior. A Fisher Exact Test of the ratios of dogs that completed or did not complete the behavior showed that the variation is likely to be due to random variance (Table Two), and ANOVA of the steps completed did not indicate a significant difference (P = 0.25). There is a trend towards greater completion in the groups with audio markers, but it is not significant.

Group	Completed Behavior	Did Not Complete Behavior
Clicker	5	2
Verbal Marker	5	1
Food Only	3	5

Table Two. Number of dogs that either completed the toy in box behavior (correctly performed the full behavior 80% of the time or better within one training session) or did not complete the toy in box behavior within the three-week training period. Fisher Exact Test indicated the variation is likely due to chance (P = 0.24).
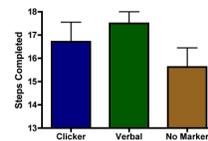

Figure Three. Steps completed by each dog in either the clicker, verbal marker, or no marker group for the difficult "toy in box" behavior. No significant difference between groups was found (P = 0.25).

Discussion

There was no significant effect of any training method on canine learning, although there was a slight trend in the behavior completion measures towards lower completion in the food only group for the difficult behavior. Based on this data, it would be reasonable to recommend to pet dog trainers to advocate for clickers and verbal markers based more on the dog owner's preference than on any effect the clicker or verbal marker may have on canine learning. If canine learning is enhanced by a clicker or a verbal marker, the effect is not large enough to make a truly significant difference for pet dogs in the environment of a trick training class. This could simply be because the many other signals of reinforcement that are portrayed in the body language of the owners are more integral to the dog's learning than any additional auditory markers.

While no significant effect was observed in our study, other researchers have found that learning is enhanced by using a clicker or verbal marker (e.g., Langbein et al., 2007). Further research could attempt to discover what additional factors are required for this positive effect to occur. Langbein et al. (2007) used an automated system – perhaps the auditory marker is most beneficial when no trainer is present to provide feedback via body language. Another alternative is that dogs require more extensive experience with a clicker than was allowed by the three weeks of training, or more accurate timing than could be provided by pet dog owners who are not professional trainers, to receive any benefit in learning speed from an audio marker.

Finally, the audio samples taken during classes have not yet been analyzed. It is possible that there are traits of audio markers that influenced canine learning in this sample that were not present in enough dogs to create an overall difference between groups. Correlating canine learning with audio traits will reveal whether or not such a relation existed in this study.

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