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The Use of Classical and Operant Conditioning in Training Aldabra Tortoises (*Geochelone gigantea*) for Venipuncture and Other Husbandry Issues

Emily Weiss and Sandra Wilson
Sedgwick County Zoo
Wichita, Kansas

A variety of nonhuman animals in zoo and research settings have been the subjects of classical and operant conditioning techniques. Much of the published work has focused on mammals, husbandry training, and veterinary issues. However, several zoos are training reptiles and birds for similar procedures, but there has been little of this work published. Using positive reinforcement techniques enabled the training of 2 male and 2 female Aldabra tortoises (*Geochelone gigantea*) to approach a target, hold steady on target, and stretch and hold for venipuncture. This article discusses training techniques, venipuncture sight, and future training.

Nonhuman animal training for husbandry and veterinary purposes in a zoo setting has recently grown within the zoo and research community. Training results have been reported for various primates (Kelly & Bramblett, 1981; Laule, 1992; Priest, 1990), marine mammals (McHugh, Lacinak, & Force, 1989; Reichard, Shellabarger, & Laule, 1993), birds (Atherton, 1996; Oiler, 1996), and hoofstock (Grandin et al., 1995). Training usually involves the use of both classical and operant conditioning responses. Goals range from movement on and off exhibit to collection of blood, urine, and other samples as well as dental examinations, ultrasound, and other veterinary procedures.

The advantages of training for veterinary purposes are numerous. Reichard et al. (1993) reported that training for veterinary procedures decreases stress during

Requests for reprints should be sent to Emily Weiss and Sandra Wilson, 5555 Zoo Boulevard, Wichita, KS 67212. E-mail: research@scz.org

procedures and decreases the amount of time needed to collect samples. Priest (1990) attested to the reliability of treatment when operant conditioning is used to train behaviors conducive to treatment. The ability to collect samples or examine an animal by having the animal choose to cooperate for a small food reward or other reinforcer can be a powerful way of reducing fear reactions and the level of unpredictability in the animal's environment.

Typically, animals are trained using positive reinforcement techniques. Included in these techniques are appetitive reinforcers such as food or touch paired with a secondary reinforcer often referred to as a *bridging stimulus* or *bridge*. Classical conditioning is used to train an association between the bridge and the primary reinforcer by repeatedly presenting the bridge, followed immediately by the primary reinforcer. Once the association has been made, operant conditioning is used to shape or capture behaviors. Often, trainers also use a "time out" as either a negative reinforcer or a punisher (depending on the trainer's interest in increasing or decreasing a behavior, respectively) as a way to refocus or produce particular behaviors.

After an extensive search of the recent literature, we found two papers regarding the applied training of turtles. Streeter and Floyd (1998) reported successfully training a sea turtle to move toward trainers on command, station at a particular site, and even target to a sound for participation in a hearing study. The second paper involved successfully "paper training" a pet leopard tortoise (Mattis, 1994). The Sedgwick County Zoo (SCZ) houses two male and two female Aldabra tortoises (*Geochelone gigantea*). The natural range of this tortoise is limited to the four islands of the Aldabra Atoll in the Indian Ocean (Sterns, 1988). Exploitation in the 19th century left few tortoises, but the population rebounded in the 20th century. In 1974, a census estimated the total number of animals at 129,000, but a census in 1997 found a significant reduction, with an estimated total of 100,000 (Bourn et al., 1999). Any reduction in stress and improvement in husbandry could help captive populations successfully breed in captivity.

Because of the size and temperament of these animals, it was determined that it would be advantageous to train them to approach a target on command for movement on, off, and around the exhibit. Furthermore, venipuncture and veterinary examinations were stressful for the tortoises and staff alike, so training was expanded to having the tortoises hold for veterinary examinations and obtaining blood samples.

METHODS

Subjects

Two male and two female Aldabra tortoises were involved in the training process. The animals were housed in pairs: Group 1 was an on-exhibit pair, and Group 2 was an off-exhibit pair. Both pairs had both an indoor and outdoor area.

The approximate date of birth and weights are as follows: Male 1—May 1932, 252 kg; Male 2—July 1967, 142 kg; Female 1—December 1950, 102 kg; Female 2—July 1959, 123 kg. All animals were naive to training procedures.

Procedure

Phase 1: Training. The tortoises first were classically conditioned to associate the sound of a clicker with food. A training session consisted of 10 to 15 click–food combinations. All four tortoises learned the association by the seventh session. It was determined that the tortoises made the association when they made a food search after the clicker presentation.

Phase 2: Operant conditioning. Once the tortoises had made the association between the clicker and the food, operant conditioning began. The first goal was to have the tortoises approach a target for a food reward. Targets can be any object, such as a stick, a paddle, a ball, or any object that the animal can sense and approach. Because Aldabra tortoises seek out bright-colored fruit in their natural environment, it was decided that the tortoises would be more likely to approach a brightly colored target than one that was dull. The target chosen was a red plastic ball attached to the end of a dowel.

Training began by presenting the target 1 to 2 in. in front of the tortoise's face. If the tortoise made any movement toward the target, the clicker was sounded and the tortoise was given a food reward. Once the tortoises were reliably touching the target, they were placed on a variable reinforcement schedule. (This schedule of reinforcement allows a trainer to shape and modify a behavior with a lower risk of the behavior becoming extinguished because of nonreinforcement.)

Training continued by slowly shaping the tortoises to move further to touch the target to receive a food reward, until the tortoises walked reliably from one end of the exhibit to the other to touch the target. Training for this reliable behavior took 2 months of triweekly training for three of the tortoises. The fourth tortoise, Male 1, refused training for 2 months other than slightly extending his neck to touch the target. However, this animal is now our most eager participant in the training.

Phase 3: Blood draw. Once the target behavior was strong and reliable, we required the tortoises to hold still on target while extending their necks and rising up. The trainer positioned herself in front of the tortoise on either the right or left side. The rising behavior was acquired by stroking the tortoise's neck and legs. The stroking is an appetitive reinforcer for the tortoises, and they will rise and lean into the handler when touched. After three sessions, the tortoises were reliably holding on target.

At this point, a second person was placed at either the right or left side of the tortoise. In the past, the presence of two handlers in such close proximity to the tortoise usually resulted in lifting the tortoise or an unpleasant medical procedure. The second trainer began by just squatting by the front leg of the tortoise, then touching the inner leg, and, finally, desensitizing the tortoise to a small-gauge needle. The tortoises always were on target while the second trainer manipulated the leg.

The tortoises reacted to the needle insertion with a slight neck retraction or a grunt but then immediately returned to holding on target while the blood collection procedure continued. The tortoises are required to focus and hold on target during the procedure.

RESULTS

Blood has been collected successfully from all four tortoises, and we can easily obtain samples whenever we need to. Using the training techniques, the tortoises can be moved from exhibit to night quarters 90% of the time.

Training of new behaviors continues with all four tortoises. At the time of submission, all four tortoises had learned to climb a ramp that held a scale to collect weights easily. In the past, weights were obtained by lifting the tortoises onto a scale and gathering data quickly before the animal moved. With this technique, the tortoises walk onto the scale voluntarily and hold on target until given the verbal release.

DISCUSSION

Collecting blood samples from large tortoises can be a stressful event, especially if the animal must be restrained by being placed on a pedestal or on the side. Through operant conditioning, animals can be trained to accept minor medical procedures with minimal stress. The collection of biological samples for the determination of baseline normal values, genetic studies, and banking of tissues can be done routinely, providing much needed data on captive wild animals.

The tortoises responded better than expected to the training procedure. Because the training program is restricted to positive reinforcement techniques, we were restrained by the strength of our appetitive stimuli. One often does not think of tortoises as being easily motivated; in fact, they are quite motivated. They responded well to food reinforcers of carrot, papaya, and cantaloupe, but more interesting was the fact that they responded equally well to tactile reinforcers such as neck and leg strokes.

An added advantage to the training was a new demonstration for the guests of SCZ. Using a wireless microphone, trainers are able to work with the tortoises

while interacting with the public. Guests are educated on tortoise behavior and physiology as well as operant conditioning techniques.

The purpose of this article was twofold: The first was to report the training results regarding the four Aldabra tortoises housed at SCZ; the second was to bring to light the importance of publishing training results for different species. Personal conversations with zoo professionals indicate that reptile training is occurring in several zoos but that the information regarding that training is not being published.

The advantages of training are numerous. Animals are enriched and are able to predict and control their environment (when positive reinforcement training is used); veterinary staff is able to collect samples quickly and easily; and keeper rapport with the animals in their care is much improved. If training methods are published, those at other facilities will not need to reinvent the wheel when they begin their training program.

CONCLUSIONS

Aldabra tortoises can be trained for venipuncture, movement on and off exhibit, and other husbandry behaviors.

1. The tortoises are motivated trainees using not just food rewards but also tactile stimulation.
2. Veterinary procedures performed using operant conditioning can prove to be less stressful for both animal and handler.
3. There is a lack of published reports regarding training animals in zoo settings.

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