

Teaching Operant Conditioning at the Zoo

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Abstract

Psychology instructors often visit zoos with their classes to teach about observational data collection methods and animal behavior. Unfortunately, they do not generally introduce the positive reinforcement training techniques used in zoos as models of applied operant conditioning. This paper describes a partnership between Zoo Atlanta and the Georgia Institute of Technology in teaching the principles of operant conditioning to undergraduate students in an experimental psychology class. The experience provided a valuable educational opportunity to students who simultaneously assisted zoo keepers with the management of animals in their care. According to both informal and formal student evaluations, the laboratory was an effective way to convey the principles of operant conditioning in an applied setting.

Teaching Operant Conditioning at the Zoo

Traditionally, zoological parks have served as places of recreation and entertainment. More progressive zoos, however, have become models for conservation and education, providing an ideal site for introducing undergraduate students to behavioral research methods (Mellen, Hage, Pfeifer, & Carlson, 1983; Rapaport & King, 1987) and the study of animal behavior (Beck, 1975; Daniel & Perelle, 1987; Greenberg, 1987; Kleiman, 1992; Maple & Archibald, 1993; Rapaport & King, 1987). Partnerships between universities and zoos prove beneficial to all involved: (a) Universities gain comprehensive and unique laboratories for students of animal behavior, and (b) zoos gain an improved understanding of the animals in their care as a result of the implementation of university research projects (Burghardt, 1975).

Although scientists conduct basic operant research and apply basic operant principles in zoos (Desmond & Laule, 1994; Forthman & Ogden, 1992; Markowitz, 1982; Markowitz & Woodworth, 1978; Mellen & Ellis, 1996; Myers, 1978; Stevens, 1978), students generally do not have the opportunity to observe or engage in the application of principles they learn in a classroom to animals in a zoo setting. Zoo Atlanta, however, became a resource for undergraduate students taking an experimental psychology class at the Georgia Institute of Technology in 1994 and 1995. The main objective of the class was to introduce the theory and methods of the experimental analysis of behavior. Throughout the course, students acquired working knowledge of contingencies of reinforcement, stimulus control, and their combined role in shaping behavior. The partnership between Georgia Tech and Zoo Atlanta provided not only a valuable resource for instruction, but also assisted the Children's Zoo keepers in solving behavioral problems exhibited by animals in their care.

Method

Learning the Basics

Both graduate and senior undergraduate students in psychology and other fields composed the experimental psychology class; however, only the undergraduates completed the laboratory portion of the class. The 3 hr. lab met once weekly on zoo grounds, but we encouraged students to come to the

zoo and work with their animals whenever time allowed. In compliance with zoo policy, each student provided proof of a negative tuberculosis test before they worked with the animals.

Prior to the beginning of the quarter, the teaching assistant and professor for the class (the first two authors, respectively) met with the lead keeper in the Children's Zoo to discuss what behaviors the students could train. Together, we chose projects that would most assist the keeping staff with daily duties, including transferring and weighing animals, and would most likely be completed in the time allowed.

Students read Karen Pryor's (1984) book, *Don't Shoot the Dog* within the first week of the quarter as an introduction to behavior modification. They promptly improved their understanding of positive and negative reinforcement, variable schedules of reinforcement, unconditioned and conditioned reinforcers, shaping, targeting, bridging, 10 laws of shaping, and four conditions of stimulus control (Pryor, 1984). To evaluate their understanding of training principles, we administered an open-notebook quiz covering this material.

An experienced animal trainer at Zoo Atlanta spent the following lab session demonstrating the basics of shaping behavior, including targeting and bridging. The class played "The Training Game" (Pryor, 1984), in which one student shapes an arbitrary behavior by selectively reinforcing the movements of another student. This exercise allowed them to experience training from an animal's perspective and emphasized that problems with training are usually the fault of the trainer, not the trainee.

Initial Behavioral Observations

The animal trainer must understand the initial behavioral repertoire of the subject in order to determine the best way in which to shape their behavior. To this end, students paired up, received a project assignment, and conducted a background literature search on both the individual animal, by consulting with keepers and zoo records, and the species, using the zoo's information center and other local libraries.

The students then conducted systematic behavioral observations of their animal. After developing an ethogram, or a list of species-typical behaviors, they designed data sheets to record which behaviors occurred at 1 min. intervals. This exercise increased the students' knowledge of the animal while introducing methods of observational data collection.

Developing a Shaping Plan

Without a shaping plan, training can be haphazard and frustrating for both the trainer and trainee. The students therefore developed a detailed plan by which they would shape the desired behavior, dividing their method into 10 min. sessions, several of which would occur each day. Each 10 min. session included an attainable goal that would contribute to the overall training objective.

To monitor training progress, each student kept a training diary with comments on the success or limitations of their shaping plan. Students also included notes from their background literature search and on the animal's behavior in the diary, making it a helpful resource when drafting a final shaping report in American Psychological Association (APA) format (APA, 1994).

Results

Summaries of several shaping projects appear in Table 1.

Animal	Species	Training goal	Results
Willie	African Pygmy Goat <i>Capra hircus</i>	to walk a circle around trainer on command	Reached goal (2 nd day)
Olga	Donkey <i>Equus asinus</i>	to approach the fence on command and allow public to pet her	Reached goal
Nonnie	African Pygmy Goat <i>Capra hircus</i>	to jump on to and off of a small structure on command	Reached goal
Pookie	African Pygmy goat <i>Capra Hircus</i>	To allow people to pet her	Able to pet on chin, back, & neck
Cocoa	Ferret <i>Mustele putorius furo</i>	To cease biting when handled	Able to stay in 1 place for 10-count
Roger	Rhinoceros Hornbill <i>Buceros rhinoceros</i>	To move to four locations in response to hand cues	Target trained to fly to left & right
India	Llama <i>Lama glama</i>	To sit on the ground on command	Target-trained only
Pickles	Pot-bellied Pig <i>Sus scrofa</i>	To step on and off a weighing platform	Reached goal (on 3 rd day)
Pierre & Merope	Black Lemur <i>Lemur macaco</i>	To move to specified locations in cage in response to target	Reached goal

Every project was successful to some degree, although some progressed more rapidly than others.

Roger, the Rhinoceros Hornbill

The students wanted Roger to move to four locations (up, down, right, left) in his cage in response to a hand direction cue. The first goal was to have Roger move to those positions through target training, a process by which an animal touches a target and moves to wherever the trainer subsequently places the target in order to touch it again (Pryor, 1984). Eventually, that behavior would be brought under stimulus control so that it would occur in response to hand cues only, allowing keepers to relocate Roger more efficiently.

Before target-training, the students established a bridge, a conditioned reinforcer (e.g., a clicking noise) paired with food delivery (Pryor, 1984). The students then constructed a target from a long, thin dowel

with a round reflector at the tip. They inserted the target through the bars of the cage at selected positions. When Roger approached and touched the reflector with his beak (called "targeting"), the trainers sounded the bridge (the click) and immediately delivered a reinforcer (a grape). The students devised a tool for administering the grapes: a long dowel with a paper clip attached at the end, which held the grape. The keepers provided limited reinforcers in conformity with the animals' normal diet, therefore the students were responsible for rationing the food rewards throughout the 3 hr lab period.

The students were successful in training Roger to fly to the left and right of the cage in response to the target. They concluded that more time was necessary to train Roger to respond to the hand cues alone.

The Black Lemurs

Two students initiated target-training as a first step in crate-training two black lemurs, a process that enables ease of transfer from one enclosure to another using a carrying crate. The students first established a bridge (a tone from a toy phone) and trained each lemur to touch a target (the pink side of a Ping-Pong paddle) on command ("touché!"). By attaching the toy phone to the Ping-Pong paddle, they devised a compact and effective training tool (see Figure 1). Because the two lemurs were housed in the same enclosure, the trainers stood side-by-side, working with each lemur individually. By moving the targets to different positions around the cage, they were eventually able to train each lemur (by calling his or her name) to move to that position. Again, students were resourceful in designing a device for administering reinforcement: In this case it was a small PVC pipe through which the students could pass berry-flavored cereal to the lemurs (see Figure 2).

Evaluation of the Students

Overall, the students were enthusiastic and resourceful in solving the practical challenges of animal training. Although the instructors required the students to be at the zoo only for the scheduled 3 hr lab session each week, most trainers arrived early, stayed late, and worked with the animals two or three days each week. The students worked well in pairs and represented both the zoo and university in a positive manner by politely answering the questions of zoo visitors and erecting a sign that explained their projects. With almost perfect attendance and exceptional quiz and report scores, the students earned very high evaluations for their lab performance.

Evaluation of the Lab

This particular class took place at Zoo Atlanta in 1994 and 1995. The first year, students wrote an evaluation of the class. Their comments included:

"Working at the petting zoo has been a once in a lifetime experience for me, something that I will never forget."

"I felt that by applying the principles discussed in class I was able to learn the material better."

"It was one of the best and most memorable experiences I have had since becoming a student at Georgia Tech five years ago."

Overall, the students felt that the lab was a “unique and enjoyable experience.” They commented that improvements could be made by initiating training earlier in the quarter, providing more time for them to work with their animals, and allowing them to read shaping reports from previous years before beginning their current projects.

In 1995, 15 students completed a 20-item questionnaire at the end of the quarter, requiring them to rate their experiences on a scale ranging from 1 (strongly disagree) to 7 (strongly agree). Excerpts from that questionnaire appear in Table 2.

Question	M	SD	Mode
1. Karen Pryor’s book, <i>Don’t Shoot the Dog</i> , was a valuable tool for understanding the principles of training.	6.27	0.46	6
2. The Training Game is a great way for students to understand the animal’s perspective during training.	5.87	1.51	6
3. Conducting background research was helpful in learning about the animal that we had to train.	4.87	1.64	4
4. conducting behavioral observations of our animal was helpful in learning about the animal that we had to train.	4.73	1.44	3
5. Speaking to the keepers was helpful in learning about the animal that we had to train	5.87	0.99	6
6. We did not have enough time to accomplish our goals.	5.33	1.84	7
7. Overall, I was pleased with my own performance in this lab.	6.20	0.68	6
8. Overall, participating in this lab was a positive experience	6.67	0.68	7
9. This lab was one of the best labs I have had at Georgia Tech.	6.93	0.26	7
10. I will recommend this lab to other students at Georgia Tech.	6.13	1.64	8

Note 1 = strongly disagree and 7 = strongly agree. (N = 15)

In general, the evaluations were positive. For example, the students agreed that reading Karen Pryor's (1984) book and listening to the professional trainer were helpful in learning principles of training. Surprisingly, students did not strongly agree that conducting background research and behavioral observations were helpful in learning about their animals. Overall, they agreed that the lab was a good way to learn the principles of training using positive reinforcement and an enjoyable experience that they would recommend to other students.

Discussion

Applying principles of positive reinforcement training in a zoo setting improved students' understanding of difficult concepts and enabled them to gain practical experience shaping animal behavior. According to student evaluations, there were many successful features of this class. However, the course could be improved by (a) increasing the number of days that students spend training, (b) emphasizing the benefits of conducting background research, and (c) incorporating systematic behavioral observations as an introduction to animal behavior research and as a tool for evaluating behavioral changes that result from training.

Georgia Tech and Zoo Atlanta duly benefited from the partnership formed by this class, which provided a unique opportunity for students to assist in the behavioral management of zoo animals. It is also likely that the animals themselves benefited from the individual attention and stimulation provided by the student trainers. Using the time, talent, and energy of university students to address applied behavioral issues enables zoo staff to manage the animals in a more efficient manner (Beck, 1975). In addition, keepers are subsequently able to continue the work that students initiate to continually improve the quality of animal care.

Training is an integral part of an effective behavioral husbandry program. Because a minority of zoos employ scientific personnel, they present an opportunity for professors and their students to provide scientific services to the diversity of living species that comprise the modern zoo. Instructors who are interested in establishing a zoo/university relationship should consult with the leadership of their local zoo to determine the specifics of their current training program, if any. Professors with expertise in conditioning and training will also discover opportunities in primate centers, aquariums or aquatic parks, nature centers, and modern natural history museums that maintain specialized collections of animals. In addition, opportunities may exist at local animal shelters, where similar training of adoptable pets has been reported to improve the rate of successful adoptions ("Clicker Training Aids Shelter Adoption Rates," 1996).

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Notes

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