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Freeing Up the Operant

Supporting Animals' Core Interests

By Rick Hester and Dr. Susan Friedman

It can be challenging for zoos to provide environments that properly support the core interests of animals. When we look to a species' natural history, our attention is often drawn to what they do rather than the circumstances in which they do it (i.e., the environmental contingencies they contact). Perhaps the most stunning and overlooked quality of behavior in the wild is its inherently free operant nature.

In the wild environment, animals are free to operate on the environment to produce outcomes (thus the term "operant behavior"). They can make any possible response or response form at any time with naturally occurring consequences shaping and maintaining their behavior (thus the term "free"). Like the wild conditions, zoo environments can be designed to evoke a diverse repertoire of free operant behavior. In an appropriately enriched environment, animals will have more opportunities to make choices to control a variety of outcomes.

How Can Natural History Inform How We Engineer Zoo Environments?

The lens through which we view natural history guides assumptions about how to design and build zoo environments. We assume 1) animals have inherited bodies that either expedite or hinder the acquisition of certain patterns of behavior; and 2) animals inherit a susceptibility to reinforcement (or punishment) by particular stimuli (see Skinner 1966, 1984; Baum 2005). Together these assumptions have led us to better understand how to engineer environments that free up animals' operant behavior.

Hal Markowitz (1982) wrote that surveying the field literature can provide a blueprint for an exciting habitat for most species. Recognizing the impact of evolution on behavior is not to say that any behavior is independent of contingencies of reinforcement in the zoo environment. This leads us to a third assumption: Learning, defined as behavior change due to experience, is always happening. The ability to revise what we do in pursuit of reinforcers is part of our biological endowment (Chance, 2009). Learning expands animals' behavioral repertoires far beyond simple reflexes and modal action patterns.

Although understanding how behavior is allocated in the wild environment is an essential part of the story, it is not sufficient to provide for the wellbeing of animals in our care. We must also account for the allocation of behavior in their current (zoo) environments. While we often experience improved success when we recreate some of the most important behavioral features of a species' natural history, the primary issue of zoo environments may not be the lack of wild contingencies per se (see Veasey, et al., 1996), but rather that we have not replaced them with sufficient free operant opportunities to exert control over their daily environments.

Discrete Trial Training vs. the Free Operant Approach

Discrete trial training (DTT) refers to trainer-led interactions with planned contingencies (antecedent cue, behavior, consequence—ABCs). This is an essential strategy for teaching animals to be active partners in their medical and husbandry care, which has resulted in extraordinary welfare benefits and is now the standard of care in modern zoos. However, DTT is, by definition, restricted by trainers' decisions: trainers provide the cues, set the behavioral criterion, deliver the reinforcers, and control the number of repetitions per session. In addition to these restrictions, DTT occupies a relatively small portion of any zoo animal's day. When training is the high point of their day, as it often is, animals are left waiting for the next session to begin.

Free-operant behavior occurs without any specific agent (e.g., trainer) delivered cue or consequence, for example basking, grooming, and interacting with conspecifics. With these behaviors, there are few restrictions on the frequency, duration, or intensity with which a response can occur. An environment that supports free operants, a "free operant environment," is rich with behavioral opportunities and reinforcers that support the core interests of the animal. Animals do what nature sets them up to do: choose what reinforcers to pursue, how, how often, and for how long.

Lindsley (1996) described four free-operant freedoms:

1. The freedom to present stimuli—to start, stop, start over, and skip an activity.
2. The freedom to repeat responses many times to each "signal."
3. The freedom to form responses—to inventively select and vary the most comfortable response to overcome boredom and fatigue.
4. The freedom to speed, or slow, responses (self-pace).

The relevance of these four free-operant freedoms to improving the wellbeing of animals living in zoos is clear and exciting.

Both strategies together, that is, 1) borrowing animals for discrete trial training sessions to meet our medical and husbandry goals, and then 2) returning them to environments that free up their operant behavior, should result in behaviorally healthier lifestyles for animals in human care (G. Creighton, personal communication, August 15, 2017).

Considerations for Freeing Up the Operant

Two important considerations for maintaining a free operant environment are rate of satiation and depletion of resources (reinforcers). Satiation refers to a reduction in the reinforcing effects of a stimulus after repeated presentations or prolonged periods of continued access. An operant behavior is less likely to occur if satiation for its reinforcer has occurred (Carolina Center for ABA, 2023).

For example, to free up our elephants' wallowing repertoire, we added four additional wallows to their habitat. We increased the size and improved the quality by adding screened topsoil and more frequently replenished water. Although these improvements led to bouts of wallowing with varied topography and intensity, they were short in duration. Once the elephants were covered in mud, they left the wallow in search of different behavioral opportunities (reinforcers). These short bouts of active engagement with long intervals in between bouts suggest the satiation effect. In contrast, logs, complete with bark, were much slower to satiate, i.e., tusking and eating the bark resulted in significantly longer bouts of engagement and more frequent returns.

Depletion is particularly relevant when providing food-based enrichment. For example, with giraffe, free-hanging browse depletes very quickly and offers few challenges or problems to solve. To free the operant of browsing, we replaced free-hanging branches with a 2" x 2" mesh cylindrical feeder in which to offer the branches. This resulted in slower depletion of leaves, more complex feeding behavior (increased use of their prehensile tongue and lips), more frequent bouts of foraging and increased total time spent foraging. Like their wild counterparts, the giraffes were more likely to start, stop, and return to foraging because with the mesh feeder there were leaves to return to.

Conclusion

When environments encourage animals to interact freely for meaningful reinforcers, animals build more extensive repertoires unlike those typically seen with discrete trial training. Animals are free to innovate a wide variety of solutions to problems that a dynamic environment presents free from trainer direction. Our best measure of freeing up the operant may be when we cannot predict what an animal is going to do next.

Another measure of an environment that frees up the operant is its responsiveness to animals' behavior. Dynamic environments change and are changed by dynamic behavior. As Skinner (1957) wrote, [Individuals] act upon the world and change it and are changed in turn by the consequences of their action. In this way, both the animal and the environment exert forces on one another—the inextricable relationship between us and our world.

It is not uncommon for physiological health to trump considerations of behavioral health. We suggest that as zoos continue the pursuit of improving animal wellbeing, behavior must be on par with concerns of physiological health. What does it look like to be behaviorally healthy? In large part the answer lies in the opportunity to perform diverse behavior for diverse outcomes in responsive environments—not unlike life in the wild. We are confident we can make significant progress in this direction by freeing up the operant in modern zoos.

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