



THE USE OF BEHAVIORAL TECHNIQUES TO REDUCE AGGRESSION AND ENHANCE SOCIALIZATION

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Heini Hediger, that sage visionary who in the 1950's wrote on the care and treatment of wild animals in captivity, warned that the idea of imitating nature in captivity is a mistaken objective that can have serious repercussions. "What cannot be avoided in keeping animals in captivity, is isolation from the cycle of life; therefore a fresh artificial cycle must be created. Naturalness in the treatment of wild animals does not consist, therefore, of a pedantic imitation of one model section of nature. It means that a substitute for it must be found suitable for animals, taking into account the new conditions of life in captivity" (Hediger, 1950).

With those words in mind, some observations about a wild animals life in captivity can be made. These animals are spatially limited, in an environment that is sterile and unchanging in comparison to the wild. Animals kept off exhibit at night in small holding areas, spend the majority of their time in extremely close proximity to each other, with nothing to do. Even the nicest naturalistic exhibits are still passive environments devoid of the opportunity, or the motivation, for animals to engage in any significant exploratory behavior. There are no predators or prey, and the number and types of other species encountered is minimal at best. They must eat a fixed diet, when and where and how it is offered. Overall, animals are denied the need and often the opportunity to engage in purposeful behaviors. Furthermore, as their human caregivers we determine when and where they move. When necessary we separate, isolate, and restrain them, examine, inoculate, and anesthetize them. And although we know why all these actions are important, they are often in direct conflict with the natural behavior we're trying to preserve. The net result is an overall loss of choice and control for captive animals.

The natural social behavior of animals is impacted in many ways by the realities of life in captivity, sometimes positively, oftentimes negatively. Aggression and submission are a normal part of living socially in the animal kingdom, and in the wild the stakes are high. Being pressured by the dominant animal and pushed to the outside of the group doesn't just mean you miss your favored treat. It means you now are the most likely target for predators. While captivity protects animals from some lethal consequences, it creates other complications. Social contacts of conspecifics are restricted to whomever is in the enclosure. In many cases, the mix of animals has little resemblance to a natural group composition in terms of numbers, genetics, sex ratio, ages, and lineage. Animals are not free to leave one social group and seek another, nor are some individuals able to find adequate refuge from more dominant group members. Offspring can't leave their mothers when they normally would in the wild, and reproductive choice and subsequent behavior is severely limited by a lack of available suitable mates. When we restrict natural reproduction for perfectly valid reasons, there are consequences to species typical social behavior that results.

So, acknowledging these realities of captivity and their impact on natural behavior, let's return to Hediger's suggestion of creating a "fresh artificial cycle" of life. In accepting that challenge, we must accept our obligation to develop and apply appropriate, and often innovative, methods to the challenges of housing and managing social animals in healthy, functional social groups. We become referees, if you will, in the resolution, or mitigation, of the social conflicts that cannot be avoided. For my part, I would like to offer some behavioral approaches to this daunting task, to enhance your mediation skills and your ability to ease conflict and promote positive social interaction.

I'd like to begin with a little historical perspective, my history, that is. My experience working with marine mammals was the beginning of my appreciation for the value of behavioral methods to address a myriad of issues, from training show behavior, to training voluntary cooperation in veterinary procedures. Marineland was my teacher as well my classroom. It was there I first learned the value of socialization training. The lessons began working sea lions in teams of two. When working an individual sea lion your attention is undivided allowing one-on-one interaction. However, working two sea lions requires addressing social dynamics along with the normal training interaction. Reinforcing the subdominant animal for doing a behavior requires reinforcing the dominant animal for doing nothing at all. In fact, reinforcing cooperation, one animal allowing the other animal to eat and work, was essential to being able to accomplish anything else.

Dolphins normally live and work in larger groups, so the opportunity, and the need, to mediate social issues are even greater. In one particular situation, we put a tremendous amount of effort into socially rehabilitating a very submissive park-born dolphin named Pepe. Unable to successfully integrate into a show community of seven animals, where even the slightest aggressive act by other animals would shut him down, he was moved to another group. Here we instituted the "be nice to Pepe" program, where more dominant animals were reinforced anytime Pepe did anything - show up at the platform, sit with his head up, take a fish, or do a behavior. With the incidences of aggression diminishing, he became braver and began to participate in training sessions and eventually shows. Through a concerted effort of cooperative training and other strategies including tactile work, and human-animal interaction he was successfully integrated into the group and his problem behaviors reduced or eliminated. (Laule, 1984) To me, Pepe was an important lesson in how vulnerable an animal can be to negative social situations and how sensitive and responsive intervention can make a difference.

By far my most important teacher, and the animal that has left the most lasting impression on me, was Orky. He and Corky, adult breeding killer whales, lived together in a woefully inadequate facility, without holding or med pools. They had their small world, each other, and us. Working with the whales was like working with a married couple. In fact, I considered writing them up as a case study for my Marriage and Family Counseling class. They had their roles, dominant male and subdominant female, and all the diversity and subtlety of behavior those labels fail to reflect. In fact, it was Orky who taught me that being dominant is not just a type of behavior, or a position in a pecking order, it is an integral part of who that animal is. And you never want to take that away from him. Yet at the same time, we have an obligation to provide a quality of life for the more submissive animals as well.

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So, at the risk of sounding anthropomorphic, we made a deal with Orky. In theory, the conditions were: we need to be able to give Corky food, attention, playtime, new training, and showtime activities; we need Orky to allow Corky to have those things, and to work in the shows; and we need all these things most of the time. In return, we would offer Orky attention and play (which he could choose to accept or decline), new training challenges (which history had shown were important to him), and the flexibility not to cooperate some of the time.

In practice, we reinforced Orky for allowing Corky to receive those essentials. If show time arrived and Corky was reluctant to work, we made our best guess as to whether it was due to her rebellion or his coercion, and reinforced or took time outs accordingly. We then assessed the animals' reactions to determine if we had guessed right or wrong, and then adjusted if necessary. We required a high yet reasonable level of behavioral performance from both animals. We frequently gave second chances. If Orky was really fired up about something, we gave him the freedom to be that way, if possible. We had the authority to cancel the shows whenever necessary.

The results of our efforts were hard to objectively quantify, but could be characterized as an overall increase in "social harmony"(Laule, 1986). Orky's behavior, on the surface, remained relatively stable, although his cooperation in shows significantly improved and he participated more often in play sessions. A decrease in aggression was hard to measure, since his dominance was rarely expressed in overt aggression. He ruled with much more subtle control, most often witnessed if you happened to be looking through the underwater viewing windows and caught him giving Corky "the eye", giving a tiny jab with his head, or showing her an open mouth. So, success was mostly measured by the changes in Corky's behavior, and those were numerous. She now took full advantage of every opportunity to seek human interaction, engage in play sessions, enjoy her toys, and participate in training sessions and shows. She was still the subdominant animal, but less constrained by that position. So, although there was still the occasional strife, it appeared a balance had been struck, that benefited both animals in their own way. And the lessons I learned from Orky and Corky have served me well with everything from gorillas to elephants. For that I am forever grateful.

My point in taking that brief stroll through my historical perspective, is that no matter what species you're managing, there is tremendous benefit in taking a proactive approach to addressing social problems. Taking into account the realities of captivity, our goals in that effort should be two-fold: 1) to reduce aggression to acceptable levels and 2) to increase positive social interactions and affiliative behavior within the group. We must strive to meet the social needs of each animal, so that all members of the group can have a reasonable quality of life. To achieve this, I suggest adopting a behavioral management approach to the care and welfare of captive animals. This is a proactive approach that incorporates four elements: positive reinforcement training, environmental enrichment, operational considerations, and facility design. From this perspective, I offer the following suggestions for reducing aggression and enhancing social management.

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TRAINING

Positive reinforcement training can be used to address social issues both directly and indirectly. I would suggest that training animals to voluntarily cooperate in a wide array of basic management and husbandry behaviors can have a beneficial impact on socialization.

- We can train animals to come to, go to, or stay at a target, allowing us better access, and greater control over movement and positioning. Stationing a dominant animal in a specific location can allow greater access to subordinate animals.
- Training animals to shift quickly and reliably anytime of day provides greater access to the social group. It can be used to increase activity, provide more enrichment, and reinforce a cohesive group that moves together.
- Desensitization is a training technique where positive reinforcers are paired with a negative object, location, person, or event until that negative stimulus no longer elicits fear or discomfort. Fear can be a precursor or trigger to aggression, so it seems reasonable to assume that reducing fear and discomfort may also reduce aggression. This may be applicable to a wide range of situations including desensitizing animals to uncomfortable or painful medical procedures, new events like nearby construction, the presence of the veterinarian, access to a new cage or cage mate, and cooperation in husbandry activities.
- Training can be used to encourage animals to more readily separate from other group members. It can also be used to enhance the reintroduction process when those animals return to the group, a situation that can trigger aggression, particularly in certain species.
- The flip side of reducing aggression is to increase positive social interactions. Training can be effective in reinforcing animals for being in closer proximity to one another and demonstrating affiliative behaviors like grooming, nuzzling, presenting, etc.

Cooperative Feeding

As animal trainers, my partner Tim Desmond and I discovered a very useful positive reinforcement training technique, developed over time with the marine mammals, we've called "cooperative feeding". Using cooperative feeding it is possible to enhance introductions, mitigate dominance-related problems, and reduce aggression. Operationally, this entails reinforcing two events within the group simultaneously: dominant animals are reinforced for allowing subdominant animals to receive food or attention, while the subdominant animals are reinforced for being "brave" enough to accept food or attention in the presence of these more aggressive animals.

This technique has been used in many situations with many different species, with positive results. The following is a protocol for cooperative feeding.

- Have some special or preferred items for dominant (target) animal.
- Cue target animal to "sit," then reinforce.

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- Feed other animal(s) one at a time. Each time another animal is given a piece of food, the target animal is reinforced for sitting and staying without interfering.
- Give target animal 2-3 pieces of food or special or preferred food item for each piece others get (if necessary, cut food smaller to keep volume down).
- Provide verbal information to the target animal - "Good_____"! as you feed the other animal(s), "No_____"! if it breaks position.
- Ignore minor interferences (threat, reaching for food, trying to displace etc.) as long as other animal is successful in taking food.
- If the target animal chases or intimidates other animal, bring target animal back to sit/stay, then resume feed.
- Use a high rate of continuous reinforcement at first, then as progress is made, the amount and frequency of reinforcement for the target animal can be slowly reduced.
- Give target animal special treat at the end of every successful session.

Viewed from an operant conditioning perspective, aggression is reinforced when the aggressor gains a reward by intimidating or stealing food meant for the subordinate animal. Cooperative feeding is based on providing the same food reinforcement, but for non-aggressive behavior. It becomes worthwhile - for the dominant animal to cooperate rather than intimidate.

If aggression is particularly bad, initial training can be done with animals separated in adjacent cages. However, they must have visual access to each other so the dominant animal can see what it is being reinforced for. If necessary, this work can begin with more than one trainer. If so, one trainer should control the dominant animal and the other trainer feed the rest of the animals, following the protocol so the dominant animal is being reinforced specifically for the other animals being fed. Whenever possible, the training should progress to doing the feed with one person.

ENVIRONMENTAL ENRICHMENT

The effective use of enrichment is another behavioral technique important to reducing aggression. One of the factors that can lead to an increase in aggressive behavior is boredom. An under-stimulated environment offers little or no opportunity for animals to release normal energy. In the absence of other options, that energy can be negatively directed towards other group members. Furthermore, in a barren environment, the introduction of any new stimulation such as food, enrichment, human attention, etc., will often lead to increased competition and aggression. Therefore enrichment should be designed and used in both exhibit and holding areas to increase over all stimulation and physical activity, encourage species typical behaviors, and increase time spent accessing and consuming food. Enrichment can also be used to create visual barriers and hiding places to allow voluntary separation of animals from one another. Enrichment strategies should be purposeful and used to target specific behavioral responses. For example, providing items and activities that allow animals to redirect and release energy that may otherwise be expressed as aggressive behavior. In this way, enrichment can be used to augment training strategies, and vice versa, enhancing the value of each of these individual techniques (Laule, 1997).

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OPERATIONAL CONSIDERATIONS AND FACILITIES ISSUES

A behavioral approach to reducing aggression and enhancing socialization requires proactively addressing the routine management activities that impact social behavior, including housing options, feeding strategies, and separation of individuals.

Nighttime Housing

Institutions have different policies on housing options for animals at night. It is important to consider how those policies impact social behavior. Housing groups in small holding areas for 15-16 hours per day can lead to heightened aggression by dominant animals and greater fear and discomfort for subordinate animals. It may be most desirable, whenever possible, to keep animals in larger exhibit space at night, or give them access to both exhibit and holding areas. This provides the greatest amount and diversity of space, which in turn gives animals greater choice in finding comfortable, safe resting places. If animals are housed inside at night, the presence of sufficient visual barriers to allow animals to separate from one another, if desired, is critical. Dead ends should be avoided. This is particularly important to allow subdominant animals the ability to find safe resting areas.

Moving animals on and off exhibit is a situation where aggression can be triggered, if care is not taken to avoid it. Most facilities do not have multiple access routes in and out of holding areas, so shifting usually occurs through a single door. Dominant animals can use that single access to block and intimidate more submissive animals. An overlay of training can help to mitigate this point of potential aggression. For example, when shifting animals inside at night, dominant animals can be trained to move through the doorway and go to a specific location and stay there until all animals are inside. This location can be a stationary target, or a special feeding station incorporating an enrichment device. The important feature is that the animal or animals are reinforced for stationing at that specific location while all the group members shift inside. This allows the more subdominant animals to shift with less fear, and reinforces the dominant animals for “allowing” those others to move freely.

Feeding

Competition and arousal during feeding is one of the most likely factors contributing to intragroup aggression (Kollar et al, 1968; Wilson and Wilson, 1968). In captivity, competition and tension surrounding meals is probably exaggerated as animals have less space available in which to access the food (Bloomsmith et al, 1994). How and where food is presented is critical to reducing the incidence of aggression. Various strategies for reducing aggression during meals include scattering food, providing multiple feeding stations throughout the exhibit, and using different feeding devices that prolong feeding. However, with uncontrolled access to the food, no matter how widespread it is, there is still the chance for aggression as dominant animals displace others. Therefore, it is recommended that at least some portion of the diet each day be fed to animals individually with a cooperative feeding approach. This allows you to actively reinforce cooperation by the dominant animals, which should reduce or eliminate aggression during feeds, and may contribute to reduced aggression outside of feeding sessions as well.

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Separation

Responsible captive management of animals requires that periodically they will need to be separated from the group for various reasons, even for brief periods of time. Although it may be necessary or desirable in order to address husbandry, veterinary, and maintenance needs, the consequences of this action can vary substantially for different species and for individual groups, so it should be carefully considered. For some animals, separation into solitary units or smaller groups at night can be advantageous to reduce the incidence of aggression. However, in other species, most notably chimpanzees, separation can lead directly to increased aggression, particularly immediately following reintroduction. There are specific behavioral strategies that can be used to address this issue. We can train animals to voluntarily separate, reinforcing both the single animal and the other group members for tolerating the separation. We can reduce the need for separation of animals from their group for many medical procedures through husbandry training directed at accessing animals in their home cage. This training can also provide a great opportunity to reinforce cooperation between individuals, as dominant animals are reinforced for allowing subordinate individuals to work and eat in their presence. Cooperative feeding is also very useful to facilitate reintroduction of animals after separation, starting with visual then tactile access if needed.

Daily Schedules

Most zoos function on schedules that revolve around visitor viewing. Animals are moved on and off exhibit at specific times each day. The problem is that animals get very good at keying in on schedules. They seem to know when they will go out, and certainly know when they will come in, evidenced by pacing and waiting outside the door to holding as the time approaches. Rigid schedules like this can also have a detrimental impact on social behavior. As animals gather in a smaller space or in closer proximity to one another awaiting access to holding, negative social interactions may be more likely to occur. Anticipatory anxiety can also trigger aggressive behavior, and may be more pronounced if the anticipated event (the door opening) is later than usual. If this issue is relevant, efforts should be made to alter routines, either by varying the time animals come off exhibit, or shifting some animals inside earlier than others. Behavioral strategies include planning enrichment activities near the end of the day that will not interfere with the motivation to come inside (i.e. not large amounts of food), but will draw the animals away from the door and encourage them to spread out and engage in another activity. Training can be used to increase overall cooperation in shifting by all group members, so the process goes more smoothly. Cooperative animals can also be shifted more frequently anytime of the day, quickly and reliably, which allows greater opportunity to increase enrichment on exhibit and reduces the focus on the last shift of the day. We can also reinforce animals for coming to other locations in the exhibit prior to the door opening, and then sending them to the door and directly inside.

Examples of Behavioral Strategies

Training techniques have been utilized in a variety of situations to manage social behavior within groups of animals. Training was used with a group of five drill baboons (*Papio leucophaeus*) at the Los Angeles Zoo to increase positive social interactions and reproduction (Desmond et al, 1987). At the time of the study, despite the presence of

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sexually mature animals, no breeding had occurred for over 6 years. In addition, observational studies of the drills showed very little affiliative behavior or positive social interaction between group members. The main strategy employed was cooperative feeding. The drills were cooperatively fed in different dyads and triads, reinforcing them for eating and relaxing in close proximity to one another. To encourage reproductive behavior the dominant male was reinforced for touching the dominant female, and she was simultaneously reinforced for allowing him to touch her. Results of the seven month project showed significant increases in all forms of affiliative behavior including grooming, inspection, and mounting during and following the project. Results also showed that aggressive behavior, although increasing on an absolute level as social interaction increased, dropped from 34% to 25% of total social interaction (Cox, 1987).

A male western lowland gorilla (*Gorilla g. gorilla*), with a prior history of aggressive behavior toward youngsters, was successfully introduced into a family of females including adults, juveniles, and infants at the Toledo Zoo (Laule and Desmond, 1990). A training program was developed for the introduction which included: controlled, progressive exposure of the animals to one another while reinforcing affiliative and non-aggressive behavior as it occurred; teaching the male to handle a variety of objects gently in association with the verbal command "easy"; establishing control over the male's movement by teaching him to come to, touch and follow a target; and attaining reliable movement from one enclosure to another on verbal commands.

Another gorilla project training with a pregnant female gorilla that had not successfully raised a prior infant (Desmond, Laule, 1991). Although a plan for maternal training was developed, after much research including talking to the keepers, curators, and veterinarians, viewing video tapes of her and her infant, and reading her animal profile and history, we formed an hypothesis. We felt that her problem was not her lack of maternal skills, or her desire to utilize them, but her discomfort with other gorillas that interfered with her application of those skills. So our recommendation, and the game plan we implemented, was socialization training.

We began by reinforcing for proximity to other animals, at times as much as 6 to 8 feet away. We particularly focused on the silverback in the group since she had a history of not getting along with any dominant male. There were also a couple juveniles in the group that she had shown some interest in, so we reinforced that relationship whenever possible. Over time the proximity decreased and she could be fed right next to other animals. Keepers continued the training for the four remaining months of her pregnancy. She eventually gave birth, and successfully raised her infant. Although this may be due to several factors, keepers reported that she became more relaxed in the group, and with the keepers themselves. They were able to condition her to allow supplemental feeding of her offspring, an important change since she was wary of people around her baby after her last one was taken from her.

In one study a male chimpanzee, Pug, (*Pan troglodytes*) with a history of excessive agonistic behavior toward other group members during feeding times, was trained, through the use of a cooperative feeding training regimen, to remain calm and seated while other members of the group received their food. These animals live in a large corral, and feeding is done from the wall around the corral by throwing whole foods to individual animals from about 20 feet above them. It was in this circumstance that we initiated

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training of cooperative feeding.

We began by teaching Pug to sit, and reinforcing him for remaining seated throughout the entire feed. Initially, every time another animal got a piece of food, so did Pug. We talked to him when he was sitting still, telling him good as the apple went flying by to the animal behind him. A sharp "Pug No!" as he got up to chase someone would stop him in mid-chase, particularly when he was rewarded immediately for sitting down again. He quickly caught on, and the rate of reinforcement was steadily reduced to one special piece of food at the end of the feed. The results of this project were confirmed, when investigators documented significant reductions in aggressive, submissive, and display behaviors in the group during feeding time (Bloomsmith et al, 1994). The behavior has remained extremely reliable over time, and through many changes in caregivers.

Conclusion

Working with social animals offers unique challenges to animal keepers and managers. Socialization and dominance-related issues will always be a part of their lives, and the source of many of our management problems. However, we have the tools, and the obligation, to address these issues. Our goal should be no less than creating and maintaining as natural of a social grouping as is possible, within the constraints of captivity.

To do so requires that we be pro-active. When aggressive behavior becomes a problem, we should address it behaviorally, using whatever combination of strategies is required. At the same time we can reinforce cooperative behavior, enhance affiliative behavior, mitigate the negative consequences of dominance, without altering the social structure. Our goal is to create social units that all animals can thrive in - the dominant and the subdominant alike. We don't want to settle for separating animals. As Koehler (1931) said, "The single individual is often merely an abstract concept. A chimpanzee kept on its own in captivity is not a chimpanzee at all". That statement is true of more than just monkeys. If we cannot succeed in allowing social animals to live socially, someone, or everyone, loses.

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